

# DoD COVID-19 PRACTICE MANAGEMENT GUIDE

## Clinical Management of COVID-19

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*This Practice Management Guide does not supersede DoD Policy.*

*It is based upon the best information available at the time of publication. It is designed to provide information and assist decision making. It is not intended to define a standard of care and should not be construed as one. Neither should it be interpreted as prescribing an exclusive course of management. It was developed by experts in this field. Variations in practice will inevitably and appropriately occur when clinicians take into account the needs of individual patients, available resources, and limitations unique to an institution or type of practice. Every healthcare professional making use of this guideline is responsible for evaluating the appropriateness of applying it in the setting of any particular clinical situation. The Practice Management Guide is not intended to represent TRICARE policy. Further, inclusion of recommendations for specific testing and/or therapeutic interventions within this guide does not guarantee coverage of civilian sector care. Additional information on current TRICARE benefits may be found at [www.tricare.mil](http://www.tricare.mil) or by contacting your regional TRICARE Managed Care Support Contractor.*

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## Clinical Management of COVID-19

To consolidate resources and optimize the management for patients requiring clinical care during the global COVID-19 pandemic.

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## BACKGROUND

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Coronavirus disease 2019 (COVID-19) is a respiratory illness caused by a novel coronavirus (SARS-CoV-2). COVID-19 was first described in Wuhan, China in December 2019 and is now a global pandemic. Most of those affected have milder illness (80%), 15% will be severely ill (most often some degree of hypoxemic respiratory failure) and 5% will require critical care interventions.(1) Of those who are critically ill, most require early intubation and mechanical ventilation. Other complications include septic shock and multi-organ failure, including acute kidney injury and cardiac injury.(2) Older age and comorbid diseases, such as COPD, hypertension and diabetes increase risk of death.(3, 4) The virus is highly contagious and spread via respiratory droplets, direct contact, and if aerosolized, airborne routes.

The intent of this publication is to provide clinicians and military medical treatment facilities (MTFs) with best practices based on latest evidence to optimize DoD response to the current COVID-19 pandemic.

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## CLINICAL PRESENTATION & CLINICAL COURSE

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1. Incubation period: ~4 days (interquartile range: 2 to 7 days).(5) Some studies have estimated a wider range for the incubation period; data for human infection with other coronaviruses (e.g. MERS-CoV, SARS-CoV) suggest that the incubation period may range from 2-14 days.
2. Frequently reported symptoms of patients admitted to the hospital: (3, 6-10)
  - Fever (77–98%)
  - Cough (46%–82%)
  - Myalgia or fatigue (11–52%)
  - Shortness of breath (SOB) (3-31%)
  - GI symptoms, such as diarrhea and nausea (~50% and may precede respiratory symptoms)
  - Anosmia, hyposmia, or dysgeusia (30-66%)
3. Among 1,099 hospitalized COVID-19 patients, fever was present in 44% at hospital admission, and developed in 89% during hospitalization.(11)
4. Less commonly reported symptoms: sore throat, headache, cough with sputum production and/or hemoptysis, and lower respiratory tract signs and symptoms.
5. Risk factors for severe illness are not yet clear, although older patients and those with chronic medical conditions may be at higher risk for severe illness.(12)
6. Pregnant women: Based on limited data, pregnant women do not appear to be at higher risk for severe disease. Emerging reports from the United States suggest that pregnant women may be at higher risk of atypical presentation with severe disease and preterm labor.(13-16)
7. Children: Overall, an estimated 5% presented with severe illness. In China, COVID-19 made up between 1.5-2% of acute respiratory admissions. Children included in the study had a median age of 7 years. Along with the typical symptoms described, emesis and diarrhea appear to be prominent with the virus found in stool samples suggesting fecal-oral transmission. Critically ill children have presented with ARDS, septic shock, encephalopathy and myocarditis. Co-infections with other respiratory viruses or bacteria common. Limited information is available about the clinical presentation, clinical course, and risk factors for severe COVID-19 in children.(5, 17-22)
8. Prolonged detection of SARS-CoV-2 RNA has been reported in respiratory specimens (up to 22 days after illness onset) and stool specimens (at least 30 days after illness onset).(17, 18)
9. Clinical presentation among cases of COVID-19 varies in severity from asymptomatic infection to fatal illness. Several reports suggest the potential for clinical deterioration during the second week of illness (range: 5 – 13 days).(3, 8)
10. Acute hypoxemic respiratory failure developed in 17–29% of hospitalized patients. Secondary infection developed in 10%, with a median time from symptom onset to of respiratory failure of 8 days.(3, 6, 7)
11. Approximately 20-30% of hospitalized patients with COVID-19 and pneumonia have required critical care. Compared to patients not admitted to an intensive care unit (ICU), critically ill patients were older (median

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- age 66 years vs. 51 years), and were more likely to have underlying co-morbid conditions (72% vs 37%).(3, 7)
12. Among critically ill patients admitted to an ICU, 11–64% received high-flow oxygen therapy and 47-71% received mechanical ventilation. A small proportion (3-12% of ICU patients) have also been supported with extracorporeal membrane oxygenation (ECMO).(6, 7, 12)
  13. Other reported complications include cardiac injury, sudden cardiac death, arrhythmia, septic shock, liver dysfunction, acute kidney injury, and multi-organ failure.(23)
  14. A case fatality rate of 2.3% has been reported among confirmed cases of COVID-19 in China.(12) However, the majority of these cases were hospitalized patients, so this mortality estimate is likely biased upward. Among hospitalized patients with pneumonia, the case fatality proportion has been reported as 4–15%.(3, 6, 7) In a report from one Chinese hospital, 61.5% of critically ill patients with COVID-19 had died by day 28 of ICU admission. Among all critically ill COVID-19 patients in China, the reported case fatality proportion was 49%.(2)
  15. As of 2 Apr 20, the Italian government COVID-19 surveillance group reported 12,550 deaths due to COVID-19, of which 83.4% >70 yr, 11.5% 60-69 yr, 3.8% 50-59 yr, 0.8% 40-49 yr, 0.2% 30-39 yr, 0.05% <30 yr. Approximately 50% of all deaths had >3 pre-existing co-morbidities (hypertension, type 2 diabetes, ischemic heart disease, atrial fibrillation). [https://www.epicentro.iss.it/en/coronavirus/bollettino/Report-COVID-2019\\_2\\_april\\_2020.pdf](https://www.epicentro.iss.it/en/coronavirus/bollettino/Report-COVID-2019_2_april_2020.pdf)

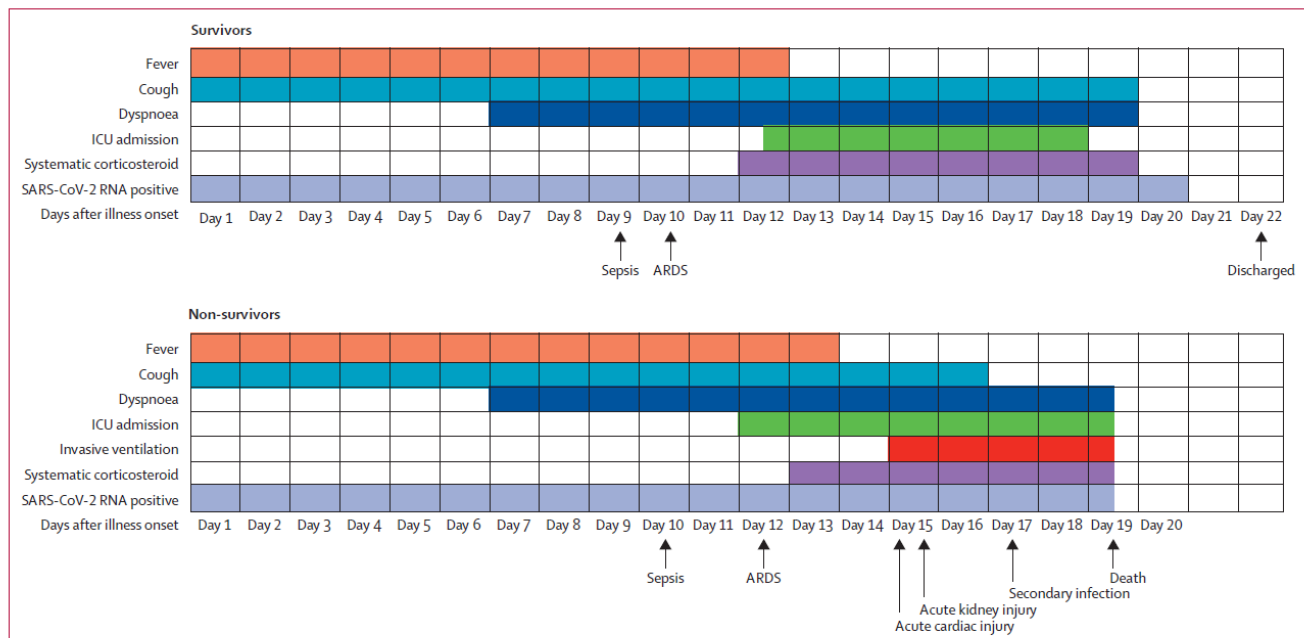


Figure 1: Clinical courses of major symptoms and outcomes and duration of viral shedding from illness onset in patients hospitalised with COVID-19

Figure shows median duration of symptoms and onset of complications and outcomes. ICU=intensive care unit. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. ARDS=acute respiratory distress syndrome. COVID-19=coronavirus disease 2019.

Figure 1. Clinical Courses of Major Symptoms and Outcomes and Duration of Viral Shedding [from Zhou, et al.; Lancet (2020)].(4)

## PLANNING AND PREPARATION

### Facility Incident Command and Systems.

1. A command structure with clearly defined roles and lines of communication should be defined prior to a pandemic and can be part of these exercises.(24, 25) These structures should have the ability to coordinate expansion or restriction of critical care resources through implementation of Contingency and Crisis Standards of Care (CSC) in conjunction with Unit medical directors, help coordinate “just in time” training as well as regional expert consultation (i.e. tele-consultation with critical care, infectious disease, or other specialists), facilitate the flow of critical equipment and patients, and coordinate CSC changes on both a local and regional level liaise with the community as transition depends on regional, not just local, healthcare utilization.
2. Establish and Manage Crisis/Contingency Standards of Care



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- a. CSC are “a substantial change in usual healthcare operations and the level of care it is possible to deliver, which is made necessary by a pervasive (e.g., pandemic influenza) or catastrophic (e.g., earthquake, hurricane) disaster.”(26)
  - b. The establishment of the CSC should enable specific legal and regulatory protections for health care providers when having to operate under conditions of limited medical resources and alternate models of care. For reference, DODI 6200.03 allows for establishment of a CSC within the DoD.
  - c. Design and implementation of these standards for each agency should remain flexible based on each situation and should be tiered (i.e. normal operations, contingency, crisis) and have specific triggers to engage. In general contingency when >120% typical capacity and crisis when >150-200% capacity though this may be revised down or up depending on availability of staff, equipment, and space.
  - d. Contingency Standards of Care are usually more similar to typical care standards with most staff working in their usual environments but with expanded clinical responsibilities. When Crisis Standard is invoked it would typically trigger significantly altered staffing models as described below.
  - e. CSC should be developed by multi-disciplinary groups and collated by the Incident Command Center (ICC) and should be individualized to a facility. A list of topics that should be included:
    - Authority and triggers for enacting escalating from usual to contingency then CSC
    - Emergency credentialing & scope of practice changes as CSC escalate (nursing, physician, etc)
    - Alterations in practice allowed (limiting documentation, changes in work hours and locations, changes in location of patient care and monitoring requirements)
3. Establish clear lines of communication (LOC) to ensure:
    - a. The ability to maintain power, particularly at austere or atypical sites of care.
    - b. The ability to rapidly download a transferrable version of clinical information to follow patients through the system.
    - c. That the systems exist to efficiently share this information with staff.
    - d. That communication be consistent, from designated sources, and information be trusted by staff.(27-29)
  4. Establish Patient Tracking and Re-unificationsystems:
    - a. Command centers should also help plan and coordinate a system for patient tracking, identification, and the ability to communicate with family members and next of kin regarding status and location of loved ones who may be restricted from visitation.(29)
  5. Establish security, access points, and “clean” areas with access restricted:
    - a. Given high levels of stress, limited resources, potentially crowded living conditions, and considerable anxiety surrounding pandemic disease, coordination with security both for a facility and the ICU should be included in the planning process.
    - b. Establish “satellite” units in alternative locations to care for critically ill patients unaffected by the pandemic to group contagious patients, cohort staff, and protect non-infected patients.(30)
    - c. Consider allocating “high risk” staff (underlying medical conditions, age >60) to these sections.
    - d. Consider access to specialty care that may be needed in these sections with screening as patients enter.
    - e. Establish single or controlled points of entry for every facility and initiate screening procedures for possibly infected patients at entrances.
  6. Coordination of re-prioritization of clinical duties:
    - a. Limitation of non-urgent care, well visits, routine visits or imaging
    - b. Focus on urgent care, but ensure a process for providing necessary routine care when unsafe to defer
    - c. Care should be primarily virtual unless a face-to-face visit is necessary as determined by the care team
    - d. Consider consolidating face-to-face care to specific sites and transition others to virtual care only
    - e. Closely track access and demand and adjust as necessary
    - f. If prolonged, give consideration to designating satellite sites to continue routine, but necessary care
    - g. Coordinate re-allocation of assets off loaded by limitations to areas of need (Critical Care, Inpatient care, Initial triage, and Urgent/Emergency Care).(31)
    - h. Limit administrative, educational and academic duties to those necessary to directly support patient care
    - i. Frequently message to patients and staff any changes in services, clinic hours, entry procedures, etc. to manage their expectations

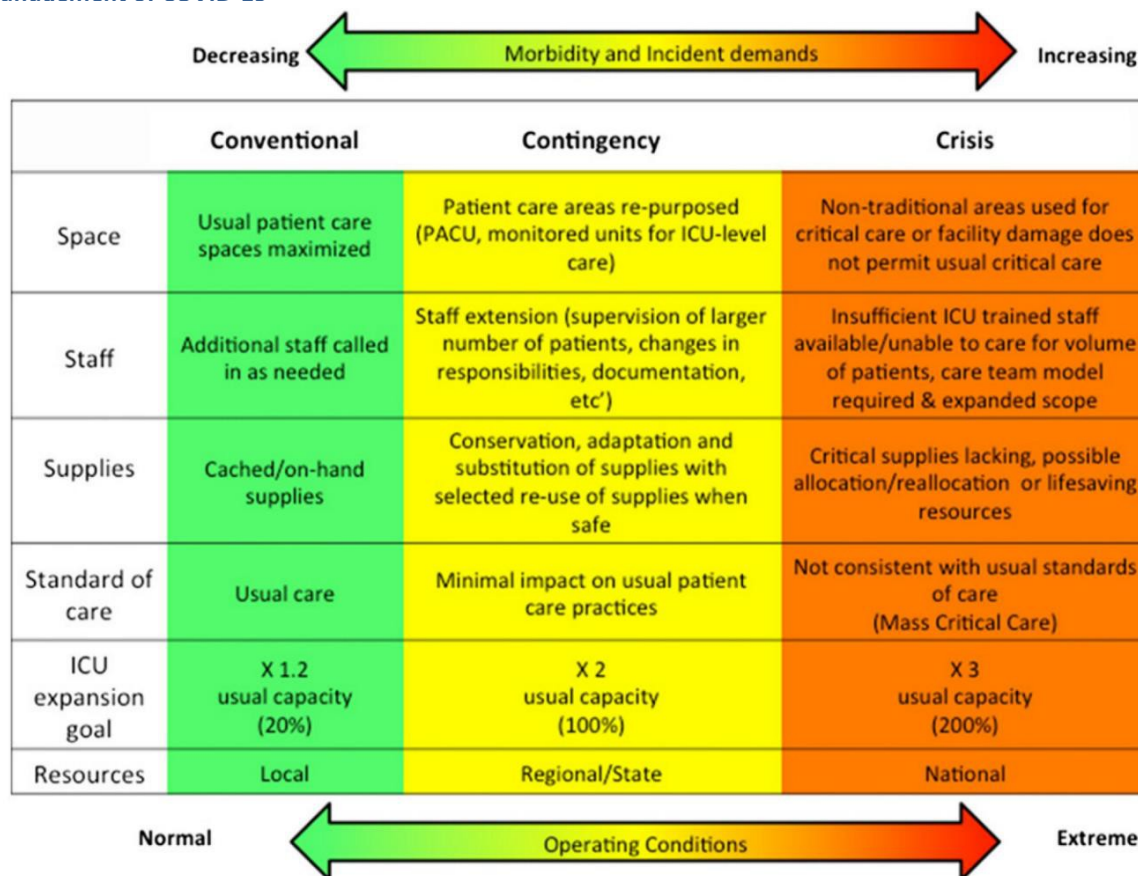


Figure 2. A framework outlining the conventional, contingency, and crisis surge responses. PACU: post-anesthesia care unit. [from Christian, et al.; Chest (2014)].(32)

7. Develop Recall Roster for all assets (nursing, physician, housekeeping, dietary, security, admin, etc) and triggers for re-calling those who may be needed from remote work.
8. Consider logistic/ancillary support needs when determining "Essential Personnel" for tasks including:
  - a. Disposal of personal protective equipment (PPE) and cleaning both "dirty" rooms and shared spaces. These tasks should be prioritized and will be in very high demand.(33)
  - b. Allocation of adequate space for safe, respectful care of the deceased.(34)
  - c. Designating locations and facilities to shelter and feed families of ill patients, staff members, and even families of staff members to augment and limit the up to 40-50% absenteeism anticipated with illness, school/childcare closure, and fear.(30, 31)

#### Preparing Critical Care Resources & Teams.

1. **Staffing.** Many MTFs have reduced staffing capabilities to support their ICUs. However, in a global pandemic requiring care for a surge of critically ill patients, additional staffing models should be considered. Although tele critical care resources should be optimized, there may still be significant deficits in critical care trained healthcare workers.
  - a. Staff Shortages:
    - i. Preparation also needs to be made to compensate for reduced staffing. Illness, fatigue, fear, and care giver duties, particularly with school/daycare closure, limit staff availability with some estimates as high as 60% absenteeism.(30, 35)
    - ii. Augmenting staffing initially with increased "mandated overtime" should be avoided as long as possible to avoid early staff burn out.
    - iii. Facility based alteration of staffing ratios (i.e. less provider staff in the inpatient setting overnight) may help reduce staff burden while maintaining reasonable coverage in keeping with typical hospital processes.
    - iv. Strategies listed above may mitigate (facility based child care, cohort care teams, etc.) but

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planning should consider at least a 25-40% reduction in staff availability. Additional recommendations to augment staff availability include:(36)

- A PPE officer (can be trained non-clinical staff) to train and monitor PPE and staff exposure on each ward
  - Mental health support or “resiliency teams” with focus on staff wellness and support
  - Team “Safety officers” to monitor/ensure breaks, hydration, toileting and nutrition
- v. **Critical Care.** The Society of Critical Care Medicine (SCCM) recommends staffing models to support expanded critical care bed capacity in the event of a global pandemic (<https://www.sccm.org/Blog/March-2020/United-States-Resource-Availability-for-COVID-19>), which includes use of multiple non-ICU trained healthcare workers (noted in red in Figure 3). The staff noted in green are recommended to be ICU trained and experienced, and include: (37)
- Critical Care Physician
  - Respiratory Therapist
  - Advanced Practice Providers (APP)
  - Critical Care Nurse (CCRN or experienced active RN working in critical care)
  - In facilities without intensivists, critical care teams may be directed by anesthesiologists, pulmonologists, hospitalists, or others with experience caring for critically ill patients.(37)
  - Staffing for the roles in red could include but are not limited to those with some previous critical care training or experience and could include:

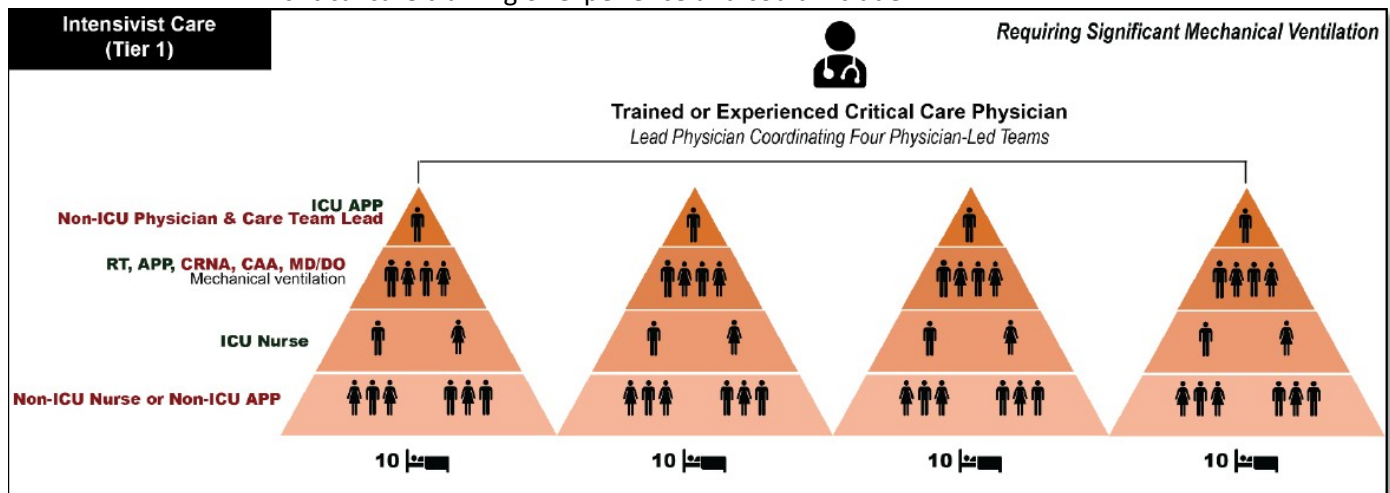


Figure 3. Based on SCCM Tiered Critical Care Staffing Strategy for Pandemic, adjusted by DoD expert consensus. APP: advanced practice provider; RT: respiratory therapist; CRNA: certified registered nurse anesthetist; MD/DO: physician. (37)

- Non-ICU physician: anesthesiologists, hospitalists, general surgeons or others with experience caring for critically ill patients
  - CRNA, CAA, MD/DO: Residents from medical or surgical specialties (with appropriate supervision and graduated responsibility) or other medical or surgical staff preferably with experience in inpatient medicine
  - Non-ICU nurse tiered from best to least suited:(36)
    1. RN currently working in progressive care units (telemetry or step down units)
    2. Ambulatory care setting with previous ICU experience (preferably within 3 years)
    3. Paramedics, EMTs or RNs and medical assistants/LPN that work in urgent care
- vii. **Step-down Care/Intermediate Care Ward (ICW).** Figure 4 provides a framework staffing model for patients requiring more intensive support but not mechanical ventilation/vasopressor support, or those at imminent risk of requiring mechanical ventilation/vasopressor support, such as could be managed in a step-down unit. Ideally, this team would be led by an experienced hospitalist or intensivist who oversees the care of physician-led teams. Ideally, these staffing models would be supported by a minimum of two teams working no longer than 12-hour shifts. (30) In the setting of COVID-19, these are likely patients that would be hospitalized in fixed

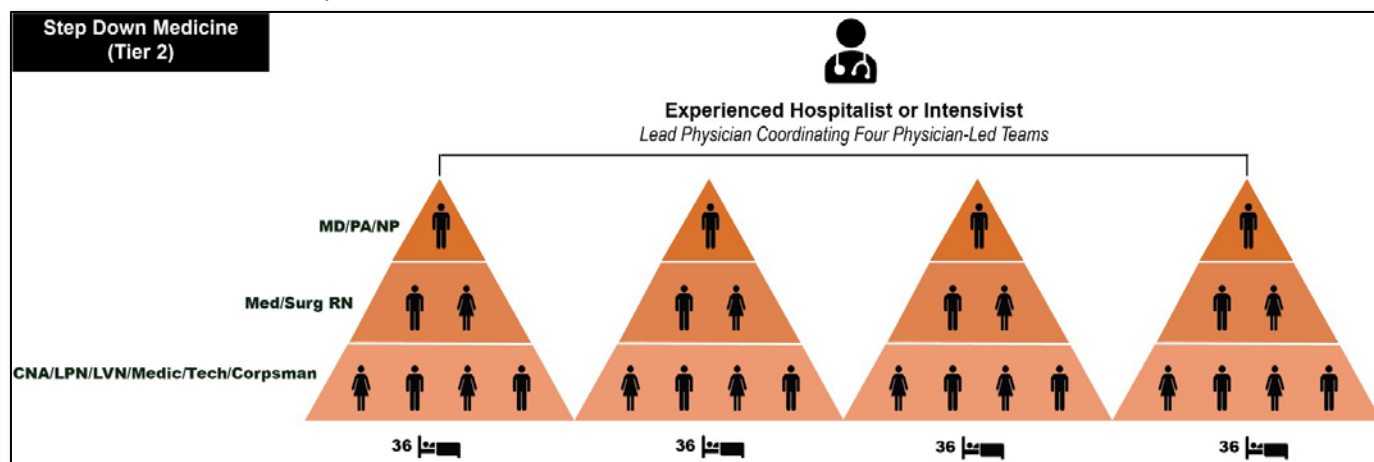


Figure 4. Tier 2 Staffing Strategy for Step-down Level Care during a Pandemic

- viii. **Routine Inpatient/Ward Care.** Figure 5 provides a framework staffing model for inpatient routine medicine care, with an ideal team led by an experienced hospitalist or physician with hospital experience. In the setting of COVID-19, these would likely be patients housed in “off site” facilities with limited resources (e.g., tents, gyms, convention centers, etc).

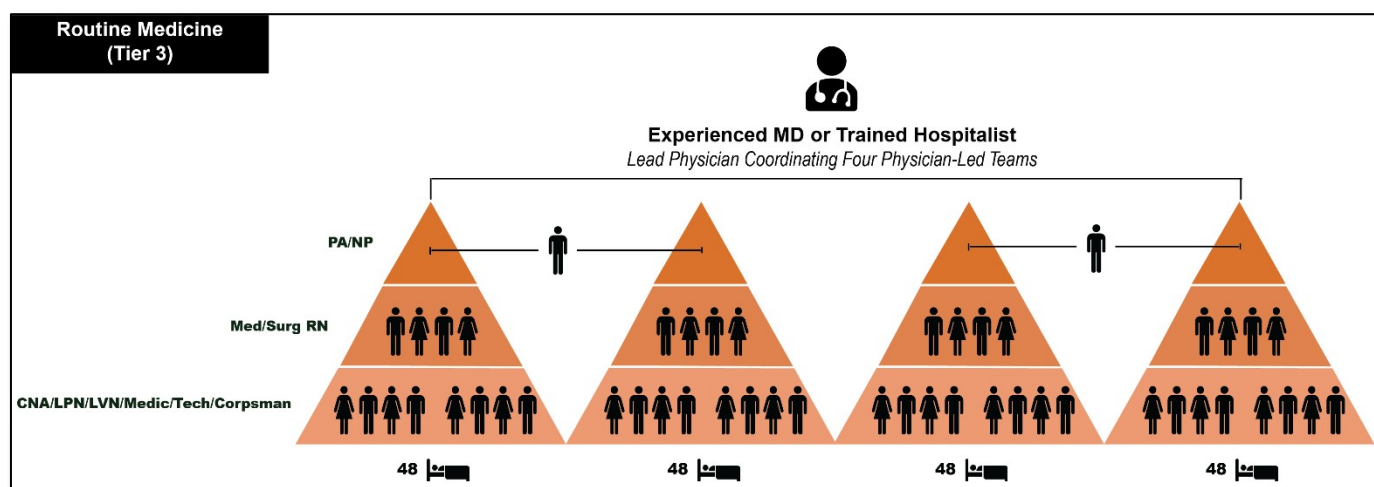


Figure 5. Tier 3 Staffing Strategy for Routine Ward Level Care during a Pandemic

- vii. **Pediatric Care.** For MTFs that have a large footprint of pediatric providers (pediatric residencies, pediatric intensivists, pediatricians, pediatric nursing), there should be consideration to flex pediatric age range up to 30 in the Contingency Stage. This will leverage appropriate expertise to care for young adults, which is common both for these providers especially in the military, and offload patient numbers from the adult care teams. For smaller MTFs that have minimal pediatric beds, minimal pediatricians (i.e., Family Practice caring for children), there should be consideration of diverting inpatient pediatric patients to dedicated children's hospitals. This decision should be made based on available community capacity and there should be communication with local facilities to strategically plan for patient distributions. MTFs must still maintain dedicated non-COVID-19 medical missions, and should not sacrifice care in other areas (e.g., use NICU beds/ventilators for adult patients if needed in the NICU).
- b. **Privileging Options.** In accordance with national standards for accreditation, local leadership may cross-level providers to provide patient care, treatment and services necessary as a life-saving or harm reducing measures, provided the care, treatment, and services are within the scope of the individual's license without modification of existing privileges. Disaster privileges can only be granted to volunteer licensed independent practitioners when the organization's Emergency Operations Plan has been activated. During



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emergencies, providers undergoing “just in time” training for work outside their normal areas may work within the scope of their individual licensure and do not require privilege modification, addition or supervision. Privileging authorities may award disaster privileges on activation of their emergency management plans consistent with provisions established in DHA PM 6025.13, Volume 4.

#### **2. Staff Training.**

- a. ICU “Just in time training” for augmentees are available at <https://www.sccm.org/covid19>, <https://www.chestnet.org/Guidelines-and-Resources/COVID-19/On-Demand-e-Learning>, <https://www.chestnet.org/Guidelines-and-Resources/COVID-19/Updates-and-Resources>, <https://www.sccm.org/disaster>, and <https://covid19toolbox.com>.
- b. *Training and augmentation platforms.*
  - If local expertise is not available, utilization of existing DHA teleconsultation platforms (PATH, ADVISOR) may augment capabilities.
  - Places with ICU care should develop brief local ICU orientation models focusing on safety practices, unit hierarchy, protocols, and consultative relationships (brief, max 4-8 hours).
  - Training platforms for provider and nursing augmentees should focus on remote learning resources to provide baseline didactic training such as those above or those locally developed.
- c. Critical care considerations for pregnant women online training is available at: <https://www.smfm.org/critical-care/cases/new-2019>.
- d. DHE Clinical RN Refresher Training Packet was released with the intent of helping to refresh inpatient nursing experience. (<https://info.health.mil/edu/Pages/COVID.aspx>)
- e. PPE; Donning and doffing officers should be assigned to train and monitor, which can be personnel pulled from non-clinical roles (administrators, support staff, etc.) that can fulfill a vital safety role after being trained. Training video: <https://www.youtube.com/watch?v=bG6zISnenPg> (38)

#### **3. Equipment and Consumables.** Daily assessment of ventilators, ventilator circuits, PPE, fluids, and sedating medication should be tracked with equipment burn rates estimated and updated as information is available.

- a. Consider creating intubation/procedure packs with all necessary equipment and supplies to avoid going in and out of the room repeatedly.
- b. Consider alternative options to reduce and re-use critical items such as PPE and ventilator circuits. Encourage sharing local policies and solutions as they become available.
- c. Consider utilization of anesthesia ventilators when expanding into OR or PACU areas, but ensure some remain in reserve based on facility needs for acute, non-COVID-19 emergencies.
- d. Inventory management.
  - Develop a list of key inventory to include PPE, ventilators and supporting equipment, fluids, key medications, fluids, nutrition, IV and other vascular access supplies, etc.
  - Assign personnel to develop a tracking system and publish regularly to ICC. Utilize models to predict inventory burn rate. A sample PPE utilization calculator available at: <https://www.chestnet.org/Guidelines-and-Resources/Resources/Essential-Institutional-Supply-Chain-Management-in-the-Setting-of-COVID-19-Pandemic> (39)

#### **4. Space:**

- a. **ICU Contingency Units.** Many modern ICUs have rooms capable of holding two patients, though typically are single use. These spaces need to be assessed to house appropriate ventilators, suction, and monitoring, but if so equipped, should be utilized first. Co-locating COVID-19 patients as much as possible will increase the efficiency of staff and supply use. If these spaces are exhausted, other monitored, ventilator capable areas may be available to use as alternative ICU rooms (OR, PACU, etc).
- b. **Ward Cohorting:** Consideration should be given to establishing COVID-19 wards. Clean barriers on open units similar to chemical “hot lines” can be used. This includes cohorting staff to “COVID-positive” or “COVID-negative” teams based on which cohort they are caring for to reduce transmission. If possible, COVID-19 inpatient care should be limited to specific areas of the hospital with designated travel routes reserved for flow of COVID-19 positive patients.

### **Establishment of a DoD Case Registry for Clinical Performance Improvement.**

1. Systematic collection and iterative analysis of key clinical data is essential to optimize delivery of care.

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2. This should be executed urgently in the context of an approved, directed performance improvement initiative, in the setting of a learning health system.

## SCREENING AND TRIAGE: EARLY RECOGNITION OF PATIENTS WITH COVID-19

1. **Screening:** Screen and isolate all patients with suspected COVID-19 at the first point of contact with the health care system (ER/clinic/drive-through screening/labor and delivery). Establish processes for how to handle people screening positive at entrances. Processes should be clear and easy to follow and be standardized across facilities within the Local Command. It is also recommended to direct low-risk patients to drive-through screening facilities as available to reduce exposure and conserve PPE in MTFs.
2. **Triage:** Triage patients using standardized triage tools and initiate the appropriate disposition decision depending on the clinical setting. Ensure standard protocols established in cooperation with Infectious Disease and Public Health that are clear and easy for staff to follow. Try to keep protocols aligned with national (CDC) and local (state or municipal) guidance and update regularly as new guidance emerges. Triage should be conducted telephonically or in a designated outdoor or dirty area when possible. Staff evaluating patients face-to-face should be pre-identified and outfitted and trained on appropriate PPE. Patients can pre-screen themselves using available self-checkers from the CDC and other organizations.
  - a. **A potentially useful tool for initial categorization of clinical severity and aiding in triage is the National Early Warning Score (NEWS).** This is a clinically derived score easily measured in a triage area, clinic, emergency department or other initial assessment environment. It consists of the parameters listed below. (Figure 6)

PHYSIOLOGICAL PARAMETERS	3	2	1	0	1	2	3
Respiration Rate	≤8		9 - 11	12 - 20		21 - 24	≥25
Oxygen Saturations	≤91	92 - 93	94 - 95	≥96			
Any Supplemental Oxygen		Yes		No			
Temperature	≤35.0		35.1 - 36.0	36.1 - 38.0	38.1 - 39.0	≥39.1	
Systolic BP	≤90	91 - 100	101 - 110	111 - 219			≥220
Heart Rate	≤40		41 - 50	51 - 90	91 - 110	111 - 130	≥131
Level of Consciousness				A			V, P, or U

Figure 6. National Early Warning Score (NEWS).(40)

- b. The score ranges from 0-21 and higher scores have been demonstrated to correlate with worsened mortality. A score of above 5 increases the likelihood of eventual ICU level of care.(40)
  - c. NEWS in COVID-19 has distinct advantages over qSOFA which can underestimate the severity of presentation if confusion, and hypotension are absent as they often are in COVID-19 patients.
3. **Initial treatment of hospitalized inpatients** consists of optimized supportive and symptomatic care in the ward or intensive care unit. Patients with increased risk of severe disease and mortality include:
  - Age >60
  - Diabetes mellitus
  - Hypertension

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- Immunosuppression
  - Cardiopulmonary disease
- Patients may present with mild symptoms but have high risk of deterioration and should be admitted to a designated unit for close monitoring.
  - Mild Illness.** For mild illness, hospitalization may not be required unless concern about rapid deterioration. Isolation to contain/mitigate virus transmission should be prioritized. Safe home care can be performed according to CDC guidance (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-home-care.html>).
  - ICU Admission Criteria.** ICU admission and exclusion criteria may be a fluid decision based on the facility. Given that allocation of dedicated ICU beds and surge capabilities amongst individual hospitals are variable, each hospital should provide a specific plan regarding ICU admission/exclusion criteria. This could be based on the percentage of resources utilized (e.g., beds, ventilators). An example plan is provided below.

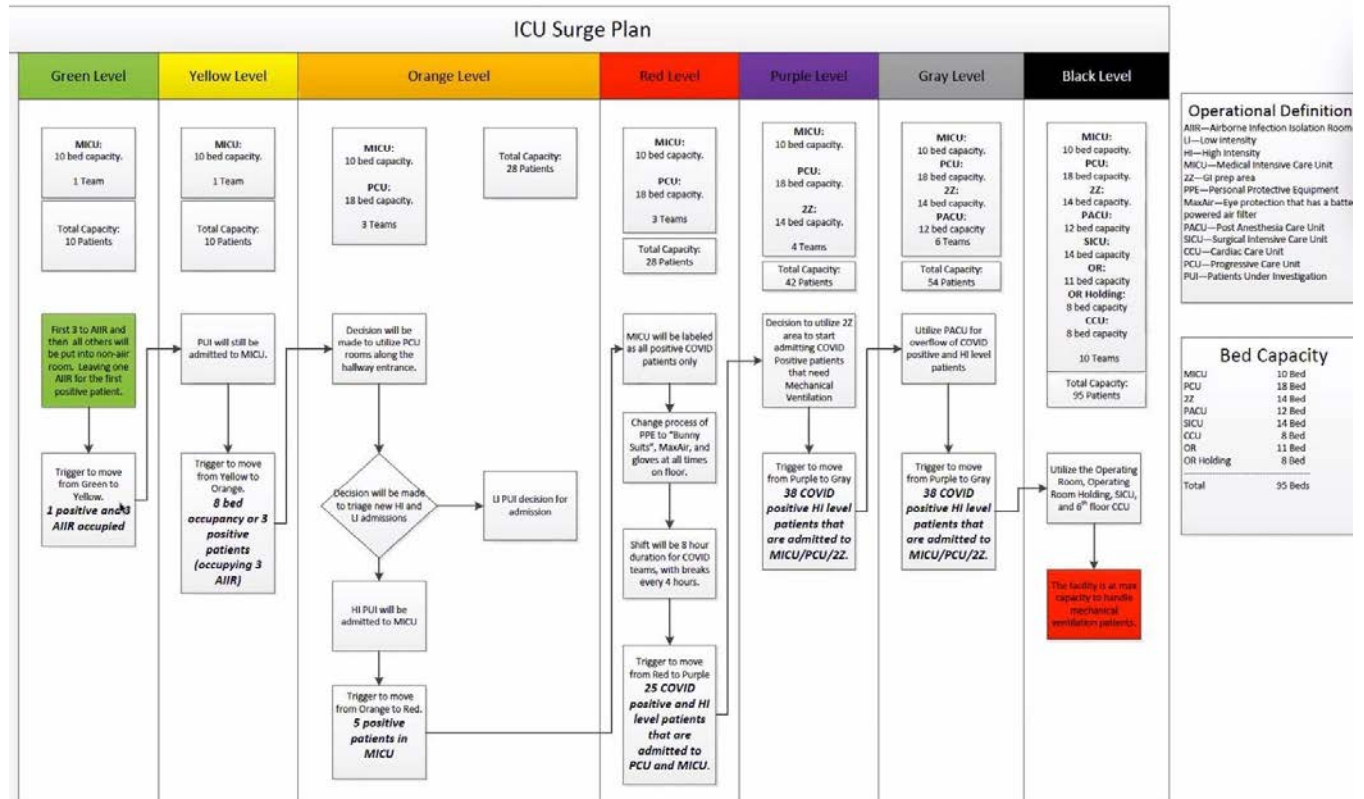


Figure 7. Example of an ICU Surge Plan (from the San Antonio Veteran's Affairs Hospital)

### IMMEDIATE IMPLEMENTATION OF APPROPRIATE Infection Prevention Control (IPC) MEASURES/PPE

- All employees working in inpatient units, ambulatory clinic spaces, and procedural areas should wear a surgical face mask, at all times, while in their respective clinical care settings. Such requirements align with current policies from leading healthcare systems, including the University of Nebraska. Additional information can be found at the following link: <https://www.nebraskamed.com/sites/default/files/documents/covid-19/surgical-mask-policy-and-faq-nebraska-med.pdf>. See **Appendix A** for PPE donning/doffing and mask use.
- Appropriate use of PPE plays an important role in the prevention of disease transmission, however ensuring appropriate work practice and environmental controls are in place is critical. In addition to implementing the PPE guidelines provided below, MTFs should adhere to the following essential practices:
  - Screen all visitors and healthcare workers before entry into the healthcare facility
  - Implement restricted visitation policies for the facility (refer to example provided by Emory Healthcare: <http://www.emoryhealthcare.org/covid/index.html>)
  - Practice social distancing
  - Adhere to frequent hand hygiene and wear a surgical or cloth mask at all times.



CATEGORY	DEFINITION	REQUIRED ISOLATION/PPE
<b>0</b>	Patient not suspected of having COVID-19	<b>STAFF:</b> <ul style="list-style-type: none"> <li>Surgical mask</li> <li>PPE according to task. <i>See Standard Precautions.</i></li> </ul>
		<b>PATIENTS:</b> Avoid close contact with any staff unless necessary for healthcare purposes
<b>1</b>	Asymptomatic patient with known exposure to COVID-19 <b>OR</b> Travelled from high-risk areas within last 14 days	<b>STAFF:</b> <ul style="list-style-type: none"> <li>Surgical mask</li> <li>PPE according to task. <i>See Standard Precautions.</i></li> </ul>
		<b>PATIENTS:</b> MUST wear surgical mask if traveling outside room for medically essential purposes
<b>2</b>	Patient under investigation (PUI) or positive COVID-19	<b>STAFF:</b> <ul style="list-style-type: none"> <li>Contact Precautions (gown and gloves)</li> <li>Droplet Precautions (surgical mask appropriate per current CDC guidelines if no aerosol-generating procedures performed in room)</li> <li>Eye protection (face shield or goggles)</li> </ul>
		<b>PATIENTS:</b> MUST wear surgical mask if traveling outside room for medically essential purposes
<b>3</b>	<b>Positive COVID-19</b> requiring aerosol-generating procedures (i.e., BiPAP, CPAP, endotracheal intubation, high-flow nasal cannula, nebulizers, tracheal suctioning)	<b>STAFF:</b> <ul style="list-style-type: none"> <li>Contact Precautions (gown and gloves)</li> <li>Consider head and foot covers</li> <li>Airborne Precautions (N95 Respirator or PAPR)</li> <li>Eye protection (face shield or goggles)</li> <li>Negative pressure room</li> </ul>
		<b>PATIENTS:</b> MUST wear surgical mask if traveling outside room for medically essential purposes

Figure 8. PPE Recommendations for the MHS (Adapted for the MHS using CDC guidelines accessed 31 MAR 2020:

<https://www.cdc.gov/coronavirus/2019-CoV/hcp/index.html>) ; **PAPR**, powered air-purifying respiratory; **PPE**, personal protective equipment; **PUI**, patient under investigation; **High-risk Area** - Areas with a Level 3 Travel Health Notice identified by the CDC Visit [www.cdc.gov/coronavirus/2019-ncov/travelers/after-travel-precautions.html](https://www.cdc.gov/coronavirus/2019-ncov/travelers/after-travel-precautions.html) for current list.

**Special Situations:** ED staff and outpatient healthcare workers with any patient encounter with a PUI: Follow Category 2.

## COLLECTION OF SPECIMENS FOR LABORATORY DIAGNOSIS

- Triage:** Patients should be triaged and initial testing optimally performed in a manner separated from the general patient population such as in a tent or designated area within a facility. Initial laboratory collection will include nasopharyngeal swab for COVID-19 testing and additional tests as indicated.
- Specimen Collection:** Collect specimens from the upper respiratory tract (URT), as viral density/load is highest in the nasal cavity and nasopharynx. Nasopharyngeal swabs are preferred compared to washings or other methods, as these increase the risk of aerosolization and transmission of the virus. If unable to collect from the URT, consider collecting specimens from the lower respiratory tract (LRT) using expectorated sputum or endotracheal aspirate. Testing for other viral infections such as influenza should be obtained, or if available a respiratory viral panel (i.e. Biofire). Avoid bronchoscopy and nasal endoscopy to minimize aerosolization.(41)
- Confirming COVID-19:**
  - Diagnosis of COVID-19 is primarily confirmed by nucleic acid amplification techniques (NAAT) of SARS-CoV-2. The most common tests are real-time reverse transcriptase polymerase chain reaction (RT-PCR) tests, but other NAATs (in-situ hybridization and others) are also used.
  - The CDC's PCR assay received emergency use authorization (EUA) on 3Mar20. Since then numerous

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commercial laboratories and universities have developed assays with subsequent approval.(42)

- c. These assays are, in general, highly specific, but the sensitivity may depend on the disease process (mild upper respiratory infection vs severe pulmonary disease) and the site of specimen collection. At this time there are few data available to assess sensitivity of these assays and even fewer data to evaluate the assays based on clinical specimen type.
  - d. Nasopharyngeal swab specimens are most commonly recommended as noted above; however in an intubated patient tracheal aspirates should also be obtained. The majority of data on sensitivity of NAATs from different specimen sites are from retrospective, descriptive data from cohorts of Chinese patients with COVID-19. One manuscript describing 1070 specimens from 205 patients with COVID-19 suggested that LRT samples were most likely to be positive for viral RNA.(43)
  - e. Consider retesting if clinical suspicion for COVID-19 remains (false-negative results possible).
  - f. Comparing sensitivity of nucleic acid testing to the experience of Chinese and other researchers may have limitations. The WHO assay uses RNA-dependent RNA polymerase, whereas the CDC assay targets genes which target viral nucleocapsid genes (N genes). One non-peer reviewed publication suggested that the nucleocapsid assays have higher sensitivity than the WHO assay. As a result, any data on sensitivity from a NAAT performed under the WHO assay (to include reports from China) may underestimate sensitivity of assays in the United States.(44)
  - g. Serologic assays are being developed to assess antibody response to COVID-19 infection. As of 3 April the FDA issued the first EUA for an IgG/IgM assay for SARS CoV-2. It remains unclear whether presence of IgG can serve as a correlate of immunity.
4. **Hospitalized Patients:** In hospitalized patients with confirmed COVID-19, repeated URT and LRT samples can be collected to demonstrate viral clearance. The frequency of specimen collection will depend on local epidemic characteristics and resources. **In a clinically recovered patient, two negative tests at least 24 hours apart is recommended.**
  5. **Personal Protective Equipment (PPE):** Use appropriate PPE for specimen collection (droplet and contact precautions for URT specimens; airborne precautions for LRT specimens).
  6. **For pregnant and recently postpartum patients:** COVID-19 testing of symptomatic women may need to be prioritized due to need for inpatient care with delivery and ongoing outpatient visits, to enable access to specialized care, to allow appropriate maternal PPE, and appropriate care for the newborn.
  7. **Co-infection:** Dual infections with other respiratory viral and bacterial infections have been found in SARS, MERS and COVID-19 patients. As a result, a positive test for a non-COVID-19 pathogen does not rule out COVID-19. At this stage, detailed viral and microbiologic studies are needed in all suspected cases.

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## **MANAGEMENT OF MILD COVID-19: SYMPTOMATIC TREATMENT AND MONITORING**

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1. **Overall management:** The mainstay of treatment for mild cases of COVID-19 is supportive care.
2. **Disposition:** Those with mild disease may be managed as an outpatient, but the determination of outpatient vs inpatient care should be individualized based on consideration of symptom severity, risks for adverse outcomes (e.g., underlying illness and age), and the patient's social context:
  - a. Their access to resources such as food and other necessities for daily living
  - b. Their access to appropriate caregivers or ability to engage in self-care
  - c. Their ability to engage in symptom and public-health monitoring
  - d. The transmission risk within the home (e.g., the availability of a separate bedroom to minimize sharing of immediate living spaces; their access to PPE such as gloves and a facemask; their ability to adhere to home isolation, respiratory and hand hygiene, and environmental cleaning; and household members at increased risk for COVID-19 complications).(12, 45, 46)
3. **Monitoring for symptomatic progression:** Monitoring for the evolution of symptoms may be conducted by healthcare providers or public-health personnel, depending on local policy.
  - a. Although 81% of patients in a Chinese case series had mild symptoms, those who progressed to more severe disease were hospitalized a median of 7-11 days after the onset of illness.(4, 6, 47) Therefore, close monitoring for symptomatic progression through the second week of illness is important for

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non-hospitalized patients.

- b. Close monitoring should be emphasized in patients aged  $\geq 60$  years, those who reside in nursing homes or long-term-care facilities, and/or those with underlying medical comorbidities that may increase their risk for disease progression, to include: cardiovascular disease, cerebrovascular disease, chronic respiratory diseases including moderate-to-severe asthma, chronic kidney disease, chronic liver disease, diabetes, severe obesity ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ), hypertension, cancer, immunocompromising conditions, and pregnancy.(6, 12, 47-50) Telehealth follow-up may be an option for these patients.
4. **Home care guidance:** Healthcare providers may provide patients and caregivers with available CDC guidance:
  - a. Preventing the Spread of Coronavirus Disease in Homes and Residential Communities (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-prevent-spread.html>)
  - b. What to Do If You Are Sick (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html>)
  - c. Caring for Someone at Home (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/care-for-someone.html>)
  - d. Caring for Yourself at Home (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/caring-for-yourself-at-home.html>)

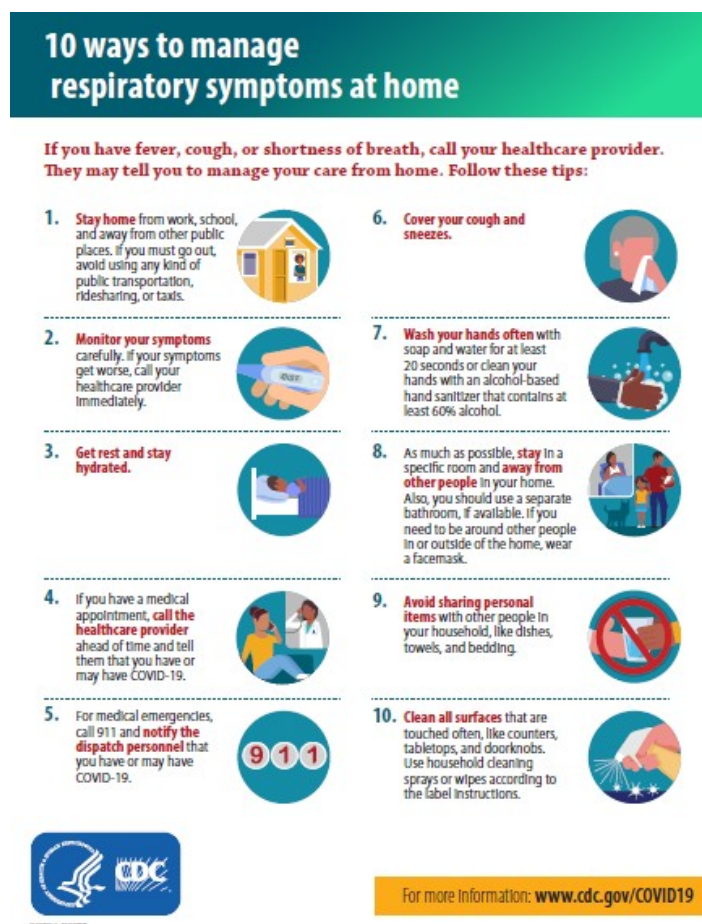


Figure 9. CDC Home Care Management Recommendations for COVID-19 Patients (website above). (46)

5. **Medication management:** The impact of drugs affecting the renin-angiotensin-aldosterone system (RAAS), such as angiotensin-converting-enzyme inhibitors (ACE-Is), angiotensin-receptor-blockers (ARBs), and non-steroidal anti-inflammatory drugs (NSAIDs), on clinical outcomes in patients with COVID-19 is unclear. (51)

a. **ACE-Is and ARBs:**

- Angiotensin-converting enzyme 2 (ACE2) is the cellular binding target for SARS-CoV2, and some preclinical studies suggest that RAAS inhibitors may upregulate ACE2 expression, though this effect is not uniform, and there is insufficient data regarding upregulation in humans.(52) The theoretical concern that RAAS inhibitors may increase the binding sites and infectivity of SARS-CoV2 is countered by the hypothesis that increased levels of ACE2 may help mitigate virus-induced lung injury as well as the known risk of withdrawal of RAAS inhibition in patients with underlying cardiovascular disease.(53)
- The American College of Cardiology, American Heart Association, and Heart Failure Society of

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America issued a joint statement that there was no experimental or clinical data to suggest a beneficial or adverse impact of ACE-Is, ARBs, or other RAAS antagonists in patients with COVID-19. As such, continuation, discontinuation, or initiation of these agents should be based on standard clinical indications and an individual patient's clinical presentation and hemodynamic status, irrespective of a diagnosis of COVID-19.(54)

b. **NSAIDs:**

- The FDA patient advisory states that there is no scientific evidence connecting the use of NSAIDs, like ibuprofen, with worsening COVID-19 symptoms.(55)
- The World Health Organization (WHO) does not recommend against the use of NSAIDs.
- Acetaminophen is recommended for fever control when ibuprofen is not necessary.

6. **Targeted therapy:** There are currently no approved or proven targeted therapies for the treatment of COVID-19. While the majority of clinical trials are focused on hospitalized patients, there are a growing number of clinical trials targeting mild, outpatient cases and investigating the use of repurposed antiviral, antimalarial, and immunomodulatory agents as well as other agents, such as traditional Chinese medicines ([www.clinicaltrials.gov](http://www.clinicaltrials.gov)).

7. **Discontinuation of home isolation:** Clinicians should contact local military public health and/or local/state health departments regarding criteria for discontinuation of home isolation and establish clear and easy-to-follow protocols to guide staff, patients, and commands on return to work/duty criteria.(46) Local implementation of discontinuation strategies may be based on availability of testing supplies, laboratory capacity, and community access to testing. Local authorities may also consider differential application of discontinuation strategies to unique populations based on their risk for transmission to susceptible contacts (e.g., following a test-based strategy for healthcare workers or those living in congregate settings, such as nursing-home residents or basic trainees, vs a non-test-based strategy for the general population). Military bases or units may have administrative requirements for service members to be able to return to work/duty independent of clinical standards. Examples of such protocols can be found in **Appendix B**. The CDC has established two major approaches:

- a. **Non-test-based strategy:** This strategy is predicated on the time since recovery and illness onset. Persons with COVID-19 who have symptoms and were directed to care for themselves at home may discontinue home isolation under the following conditions:
- At least 3 days (72 hours) have passed since recovery, defined as resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms (e.g., cough, SOB), **and**
  - At least 7 days have passed since symptoms first appeared.
- b. **Test-based strategy:** This strategy is contingent on the availability of ample testing supplies and laboratory capacity as well as convenient access to testing. Patients may discontinue home isolation under the following conditions:
- Resolution of fever without the use of fever-reducing medications **and**
  - Improvement in respiratory symptoms (e.g., cough, shortness of breath) **and**
  - Negative results from two consecutive negative molecular assays for SARS-CoV2, obtained via nasopharyngeal swab, at least 24 hours apart.(56)

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## **MANAGEMENT OF SEVERE COVID-19: OXYGEN THERAPY AND MONITORING**

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1. Give supplemental oxygen therapy immediately to patients with respiratory distress, hypoxemia, or shock and target SpO<sub>2</sub> 92-96%, although maintaining SpO<sub>2</sub> above 88% may be acceptable in certain cases.(57, 58) Hyperoxia (PaO<sub>2</sub> >225mmHg) should be avoided and is associated with worse outcomes.(59)
2. Begin with low flow nasal cannula (1-6 L/min) followed by high flow nasal cannula (HFNC, 5-30 L/min, see Figure 10). Place surgical mask over patients face and nasal cannula to minimize aerosolization of particles.
3. Some COVID-19 patients have presented with significant hypoxia but low PaCO<sub>2</sub>. These patients can tolerate this well with just supplemental O<sub>2</sub>. For these patients, consider not intubating solely for hypoxia, rather use other typical indications such as severe distress and/or hypercarbia. (60)
4. Recommendations are evolving regarding risk:benefit, but favor HFNC over bi-level positive airway pressure



### Clinical Management of COVID-19

(BIPAP)/noninvasive ventilation (NIV) if early intubation and mechanical ventilation is not possible. HFNC is a more effective intervention for the non-invasive management of hypoxemic respiratory failure and is less aerosolizing than BIPAP. (41)

5. Awake proning of non-intubated patients is currently being performed at some hospitals across the world.(61) A retrospective study of 15 non-intubated, hypoxemic patients placed in the prone position showed improvement of oxygenation. The effects were not sustained upon supine positioning.(62) See **Appendix F** for full protocol for prone positioning of non-intubated patients.
6. For children, use of nasal prongs or nasal cannula may be better tolerated, but the goal is to target SpO<sub>2</sub> >94% during resuscitation, and >90% once stable.
7. Aggressive fluid resuscitation may worsen oxygenation and outcomes in both children and adults, so in the absence of shock, fluid boluses should be minimized.
8. Avoid nebulizers, as metered dose inhalers are recommended for staff protection/avoidance of aerosols.(41)
9. For intubated patients who progress to Acute Respiratory Distress Syndrome (ARDS) and a PaO<sub>2</sub>/FiO<sub>2</sub> ratio<150, recommend early proning and consideration for transfer to an extracorporeal membrane oxygenation (ECMO) center if possible. Prone patients may require paralysis with cisatracurium but resources may dictate per individual facility.
10. **Admission studies and labs:** Consider the labs/studies in Table 1 for diagnosis, prognosis and risk stratification (and/or safety of agents) for all hospitalized patients with confirmed COVID-19/PUI.
11. Do not allow ICU visitors for IPC purpose during a pandemic except under exigent circumstances.
12. Facilities should assess daily operational status via huddle of equipment including ventilators, medications (e.g. induction agents and paralytics), and staffing (including respiratory therapists, physicians and nursing) and initiate contingency or crisis standards of care as appropriate.

**Table 1. Laboratory and Study Considerations for Hospitalized Patients with COVID-19 (or PUI)**

#### **Recommended Daily Labs:**

- Complete Blood Count (CBC) with diff (trend neutrophil-lymphocyte ratio, NLR)\*
- Complete metabolic panel (CMP)
- CPK

#### **Recommend on Admission (may repeat q2-3 days if abnormal or with clinical deterioration)**

- D-dimer, PT/PTT, Fibrinogen
- Ferritin/CRP/ESR
- LDH
- IL-6
- Vitamin D-25 Hydroxy, Zinc-RBC
- Troponin (if suspect acute coronary syndrome or heart failure)
- SARS-CoV-2 test, Biofire rapid viral testing
- Electrocardiogram (ECG) (daily with severe infection)
- Portable CXR

#### **If Clinically Indicated**

- Blood cultures
- Tracheal aspirates for intubated patients
- Viral serologies if LFTs are elevated if clinically indicated (HBV sAb/cAb/sAg, HCV Ab, HIV q/2 Ab/Ag)
- For acute kidney injury (i.e. serum creatinine >0.3 above baseline), send urinalysis and spot urine protein:creatinine)
- Procalcitonin

\* <https://emcrit.org/pulmcrit/nlr/>

### **Resource Limitations for Oxygen Delivery and Mechanical Ventilation**

1. As the COVID-19 pandemic places additional strain on available resources, the supplies of available ventilators may not meet clinical demand of patients in respiratory failure in need of invasive positive pressure ventilation (IPPV). Facilities should assess respiratory support operational status daily to account for equipment including ventilators, medications (induction agents, anxiolytics, sedatives, analgesics and paralytics), and staffing (respiratory therapists, providers and nurses).
2. Facilities must be prepared with alternate methods to support patients requiring IPPV in the event the number of patients with respiratory failure exceeds the number of ventilators. Alternate strategies in a crisis resource-limited clinical environment include the following:(63-66)

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- a. Deliver manual breaths via a manual resuscitator (“self-inflating bag”).
  - b. Transport mechanical ventilators may be used for prolonged ventilation of stable patients in the MTF (e.g. Impact 754 and 731 transport ventilators, see **Appendix G**), but need to be used with a viral filter.
  - c. Ventilators in storage (Home Station Medical Response materiel, War Reserve Material, and national stockpiles)
  - d. Anesthesia gas machines capable of providing controlled ventilation or assisted ventilation outside of the traditional use for anesthetic indication.
  - e. NIV ventilators can be used for invasive mechanical ventilation, but should only be used if the standard ventilator supply is exhausted and it is confirmed with the manufacturer (e.g V60) that they are invasive capable and can deliver prescribed breaths. In this case, a HEPA filter should be inserted into the expiratory limb to prevent aerosolization.
3. Conserve accessories used with ventilators, but use viral filters if available. Consider extending the duration of use of breathing circuit supplies and in-line heat and moisture exchangers for treating individual patients.(63)
  4. Civilian industry efforts to rapidly develop ventilators as well as evolving respiratory support technologies and techniques may provide additional options in the future.
  5. In accordance with professional society consensus statements, U.S. Public Health Service Commissioned Corps, and FDA guidance:(63, 64, 66)
    - a. Use FDA-cleared conventional/standard full-featured ventilators to support patients with respiratory failure.
    - b. Use one ventilator per patient, matching ventilator settings with the patient’s individual respiratory requirements.
    - c. While ventilators may have mechanical capacity to split circuits to support multiple patients, it is excessively difficult to safely implement. There is insufficient body of evidence to support consistent application of this practice. Neither research using animals and test lungs nor case reports of crisis or contingency application of this technique establish clinical safety.

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## MANAGEMENT OF SEVERE COVID-19: TREATMENT OF CO-INFECTIONS

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1. Clinical judgment and patient severity will dictate provider decision on early antibiotic therapy.
2. Procalcitonin levels have been low in COVID-19 with minimal bacterial co-infections reported except in pediatric patients where >80% are reported to be elevated.(67)
3. Post-mortem results reported from China suggest concern for *Aspergillus* pulmonary infections.
4. Consider empiric antimicrobials for intubated patients with COVID-19. Recommend antibiotic guidance as per ATS/IDSA Community Acquired Pneumonia (CAP) guidelines or as per critical care or infectious disease consultation.(68) As a starting point upon intubation, Table 2 can be used until consultation is available:
5. Recommend obtaining blood cultures and tracheal aspirate prior to initiation of antibiotics if feasible.
6. As noted in section on diagnostic testing, co-detection of other respiratory pathogens has been observed with SARS-CoV-2. For example, Stanford researchers recently provided rapid communication of experience with 562 SARS-CoV-2 tests; of 49 positive SARS-COV-2 results, 11 (22.4%) also had a co-infection, and of 127 positive for other viruses, 11 (8.66%) had a SARS-COV-2 co-infection.  
(<https://medium.com/@nigam/higher-co-infection-rates-in-COVID-19-b24965088333>)

**Table 2. Empiric Antimicrobial Considerations for Intubated COVID-19 Patients (or PUI)**

Starting Antibiotic Regimen	
No comorbidities or immunosuppression or risk factors for MRSA or <i>Pseudomonas aeruginosa</i> *	● Ceftriaxone† 2 g once daily, <u>and</u> Azithromycin† 500 mg once daily

With comorbidities†

- Cefepime 1-2 g every 8-12 hours, and Azithromycin† 500 mg once daily  
OR
- Piperacillin-Tazobactam 4.5 g every 6-8 hours, and Azithromycin† 500 mg once daily

*Definition of abbreviations:* MRSA = methicillin-resistant *Staphylococcus aureus*

\*Risk factors include prior respiratory isolation of MRSA or *P. aeruginosa* or recent hospitalization AND receipt of parenteral antibiotics (in the last 90 d). If concern for MRSA, add **Vancomycin** 15-20 mg/kg q 8-12 hours (usually 2g/dose)

†If Ceftriaxone not available, replace with **Ampicillin/Sulbactam** 3 g q6h; If Azithromycin not available, replace with **Doxycycline** 100 mg q12h

‡Comorbidities include chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; immunodeficiency/asplenia.

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## MANAGEMENT OF CRITICAL COVID-19: ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS)

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### Endotracheal Intubation

1. Intubation should be performed early for a number of reasons, including the rapid disease progression, but also the additional time required to prepare for intubation in full PPE.
2. Intubation has the highest risk of aerosolization and exposure to COVID-19 of all procedures, and the person performing intubation is most at risk.(41) For this reason, the most experienced person should perform endotracheal intubation to reduce exposure to the healthcare team and all team members should be in appropriate PPE with powered air purifying respirator (PAPR) during intubation. If PAPR is unavailable, an appropriate alternative may be the M50 CBRN gas mask. If these options are not available, N95, hair cover, gown, double gloves, face shields, goggles, and shoe covers should be used, along with a protective clear plastic cover over the patient to optimize protection for the providers. Consider intubation teams and limit the number of staff members during airway manipulation to reduce unnecessary exposure.  
(<https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/>)
3. A pre-intubation checklist is encouraged, which should include supplies to be brought inside the room by specific team members and others that should remain outside the room. **Appendix C** provides an example intubation checklist (adapted from University of Washington). *Note: a disposable stethoscope should be used to avoid viral transfer and staff should touch as little as possible in the room to avoid fomites.*
4. For patients with a normal airway assessment, awake intubation should be avoided and modified RSI with sufficient muscle relaxation is strongly encouraged. For patients with difficult airways, good preparation of airway devices and detailed intubation plans should be made in advance.(69)
5. Some centers have advocated for further reducing exposure during pre-oxygenation and ventilation through preparing an additional COVID-19 Intubation Pack, in addition to intubation meds, a video laryngoscope (if used, or direct laryngoscopy), and a non-vented BiPAP mask. The following video demonstrates the set-up: (<https://youtu.be/C78VTEAHhWU>).
6. **Appendix D** provides a framework for intubation with medications and doses, although this is not a substitute for clinical judgement.
7. Additional cognitive aids have been developed and might be useful. **Appendix E** provides examples.

### Management of ARDS

1. **Non-invasive ventilation (NIV).** It is recommended to avoid NIV because of increased aerosolization generated by the facemask and lack of an exhalation filter. If there is an exception to this such as patients that chronically use NIV or DNI patients, these patients will require airborne isolation regardless of ICU/acute care status.
2. **High-flow nasal cannula (HFNC).** Although an area of controversy, early expert opinion favors HFNC over other NIV modalities ([https://emcrit.org/ibcc/COVID-19/#high\\_flow\\_nasal\\_cannula](https://emcrit.org/ibcc/COVID-19/#high_flow_nasal_cannula)) because it appears to be well tolerated and less aerosolizing. There is presently no definitive evidence that HFNC augments transmission of virus, however HFNC will disperse air farther the higher the flow is set, (but not as far as CPAP). (70) A surgical mask should be placed over the HFNC in an effort to minimize aerosolization risk. Consider intubation for higher flow rates (>30 L/min), especially if the patient is not in a negative pressure room.
3. **Helmet ventilation.** The helmet can be connected to either a BiPAP circuit or a HFNC circuit (up to 60 L of

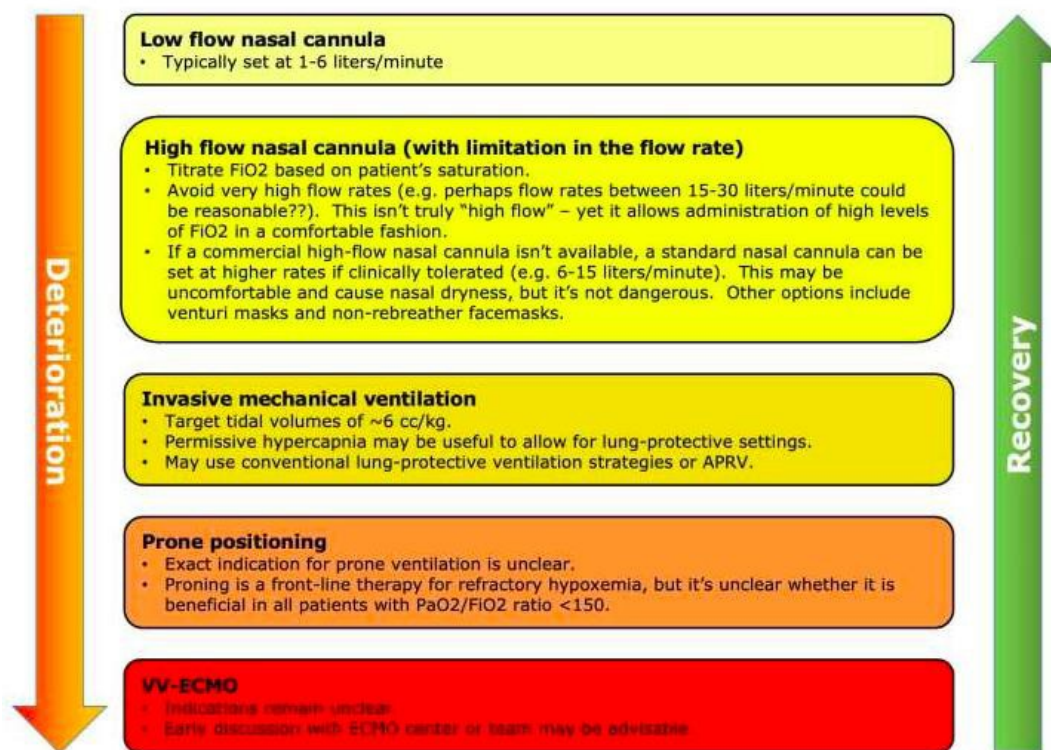


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flow) to increase the PEEP that the patient receives.(71, 72) The helmet has a tight seal around the neck and should decrease the amount of leak usually seen with mask interface NIV (such as BiPAP and CPAP). In one study comparing helmet to mask NIV with ARDS, there was a decreased rate of intubations.(72) There has been concern that CO<sub>2</sub> washout was inefficient using the helmet,(73) but a follow up study did not support that concern.(71) Helmet ventilation can prevent aerosolizing the virus.

4. **Mechanical Ventilation.** COVID-19 does not appear to cause substantially reduced lung compliance as is typical with ARDS, but rather atelectasis and interstitial pneumonia. Physicians in Italy have described severe hypoxia with decent pulmonary compliance. (<http://www.ventilab.org/2020/02/29/ventilazione-meccanica-e-polmonite-da-coronavirus/>)
  - a. Target an *ARDSnet lung-protective strategy (4-8 mL/kg ideal body weight)*, and lower inspiratory pressures (**plateau pressure <30 cm H<sub>2</sub>O**). (58, 74)
    - i. Start with 6 mL/kg ideal body weight tidal volume and titrate to as high as 8 mL/kg as long as the lungs are compliant.
    - ii. In patients with moderate to severe ARDS, suggest titrating to a higher PEEP as tolerated. PEEP tables are available to guide titration: <http://www.ardsnet.org/tools.shtml>
    - iii. In younger children, maximal PEEP setting is 15 cm H<sub>2</sub>O as higher PEEP can result in decreased cardiac output.
  - b. *Permissive hypercapnia* ensuring adequate hemodynamics and a pH >7.15 may be tolerated
  - c. Humidification will likely be needed to manage thick secretions. However, keep in mind the risk of aerosolization associated with breaking the circuit to change heat and moisture exchangers (HME) if this is all that is available. Ventilators with heated humidifiers do not require breaking the circuit to humidify the inspiratory limb and are preferred. Consider clamping the ETT during any circuit breaks.
5. **Proning.** Evidence has shown that patients who are unable to adequately ventilate in the supine position may benefit from being placed in the prone position to improve oxygen saturation (PaO<sub>2</sub>), pulmonary mechanics, and arterial blood gases (ABGs).(75-79) Anecdotal reports from Italy and Singapore have found that patients with COVID-19 usually respond well to early pronation.(61)
  - a. Prone positioning requires proper sedation/pain medications and paralytic agents if necessary.
  - b. Length of pronation cycle should be a minimum of 16 hours in the prone position with a return to supine positioning at least once a day.
  - c. Prone positioning should be performed as clinically indicated within the first 24 hours of the diagnosis of severe hypoxemia.
  - d. Recommend use of a manual proning protocol with coordination if mechanical beds are not available. **Appendix F** provides an example protocol, which was adapted from University Medical Center in Las Vegas, NV. Additional protocols (including videos) are available.(80)
  - e. Pregnancy is *not* a contraindication for proning or neuromuscular blockade.(81)
6. **Neuromuscular Blockade.** In patients with moderate-severe ARDS (PaO<sub>2</sub>/FiO<sub>2</sub><150), neuromuscular blockade by continuous infusion should **not** be routinely used, but may be considered in the setting of worsening hypoxia or hypercapnia and in situations where the patient's respiratory drive cannot be managed with sedation alone resulting in ventilator dyssynchrony and lung decruitment.
7. **Airway suctioning.** Use in-line catheters for airway suctioning and clamp endotracheal tube when disconnection is required (for example, transfer to a transport ventilator). Avoid disconnecting the patient from the ventilator, which results in loss of PEEP and atelectasis.
8. **Bronchoscopy.** Routine diagnostic bronchoscopy (including nasal endoscopy or any instrumentation of this area) is **not** recommended. It is not necessary for the diagnosis of viral pneumonia and should be avoided to minimize aerosolization. Tracheal aspirate samples for diagnosis of COVID-19 are usually sufficient. If bronchoscopy is required for another reason, it should be performed with the same level of PPE as recommended for intubation.

## General schema for respiratory support in patients with COVID-19



The optimal strategy for respiratory support in COVID-19 remains unknown. The above strategy seems reasonable, adapted largely from experience with other types of viral pneumonia. Patients with more complex respiratory disease (e.g. COPD plus COVID-19) might benefit from BiPAP.

-The Internet Book of Critical Care, by @PulmCrit

Figure 10. General Schema for Respiratory Support in Patients with COVID-19 (<https://i1.wp.com/emcrit.org/wp-content/uploads/2020/03/respsup.jpg?resize=713%2C600&ssl=1>).

- Inhaled nitric oxide and prostacyclin.** There is no evidence for routine use of inhaled nitric oxide, prostacyclin or other selective pulmonary vasodilators in acute respiratory failure. However, during emerging infectious disease outbreaks when resources are exhausted, inhaled nitric oxide and prostacyclin may be considered as a temporizing measure when patients develop refractory hypoxemia despite prone ventilation, or in the presence of contraindications to proning or ECMO.
- Extracorporeal Membrane Oxygenation (ECMO).** In settings with access to expertise in ECMO, consider referral of patients who have refractory hypoxemia despite lung protective ventilation who are otherwise appropriate candidates. For more information: <https://www.else.org/COVID-19>.

## MANAGEMENT OF CRITICAL ILLNESS AND COVID-19: PREVENTION OF COMPLICATIONS

### Cardiovascular Disease (CVD)

Among 44,672 confirmed COVID-19 cases, those with CVD, diabetes (DM) and hypertension (HTN) suffered from an increased case-fatality rate -10.5% for CVD, 7.3% for DM, 6.0% for HTN vs 2.3% overall. Furthermore there several published reports suggesting SARS-CoV2 infection leading to exacerbation of CVD conditions, or CVD complications.(4, 47, 82)

- Troponins and Basic Natriuretic Peptide (BNP) Evaluation.** Elevated troponin is common (especially high sensitivity troponin), which is a strong predictor of mortality. Mild troponin elevation often does not represent a type-I (plaque rupture) myocardial infarction. Troponin value, velocity of change in troponin level, and echocardiographic imaging should guide the management of the elevated troponin, although current opinion advises that troponin and BNP should only be measured if clinical evaluation suggests acute coronary syndrome or heart failure.(83)
- Electrocardiogram (ECG).** Recommend ECG in suspected or acute coronary syndrome. May consider of obtaining from cardiac tele-monitoring screen.

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3. **Echocardiogram.** An echocardiogram should only be ordered if it is likely to provide clinical benefit. Consider repeat echocardiograms only for clear change in clinical status. Point of Care Ultrasound (POCUS) exams may be used to screen/triage patients. Transesophageal echocardiogram (TEE) requests should only be considered when no other alternative imaging modalities are available.
4. **Acute Myocardial Injury.**
  - a. *Definition:* An algorithm for the interpretation of myocardial injury is provided for reference and is based on the 4th Universal Definition of Myocardial Infarction (<http://www.onlinejacc.org/content/72/18/2231>).
  - b. *Incidence and Prognosis:* Recent reports found that up to 19% of hospitalized patients with COVID-19, have a combination of elevated cardiac biomarkers, in addition to electrocardiographic and echocardiographic abnormalities.(3, 4, 6, 84) There are two patterns of myocardial injury, one pattern of a continued rise with inflammatory markers, and a second pattern similar to the pattern seen in patients with predominantly cardiac symptoms.(85) Myocardial injury appears to be a late manifestation (up to 14 days from illness onset) and has been found to be independently associated with an increased risk of mortality.(4, 84)
  - c. *Evaluation:* There may be a role for the use of Cardiac Computed Tomography (CCTA) as a non-invasive means to rule out significant coronary pathology as a cause of myocardial injury. Assessment for the appropriateness of testing and imaging protocols should be made in conjunction with a consulting Cardiologist and Radiologist as capabilities are site specific.
5. **Myocarditis.**
  - a. *Incidence:* In a case series of 150 patients with COVID-19 patients, nearly 10% of deaths were attributed to myocarditis with circulatory failure, and in 33% of cases it was believed to have contributed as a mechanism for multisystem organ failure.(82)
  - b. *Diagnosis:* There is currently no role for endocardial biopsy. POCUS at initial evaluation to help protocol TTE. Serial TTE/POCUS only if it will impact management.
  - c. *Management:* Supportive care depending on hemodynamic status. Case reports on different treatment strategies (glucocorticoid and IVIG) but none are validated by clinical trials.
6. **Acute Coronary Syndrome.**
  - a. *Incidence:* Based on available published data, there is a potential symptom overlap between acute coronary syndrome and COVID-19 infection.(2)
  - b. *Evaluation:* Goal is to differentiate acute plaque rupture, demand related ischemia or myocarditis. Recommendation is for cardiology consultation when unable to determine etiology.
    - i. *ST segment elevation on the 12 lead EKG has been reported in the absence of coronary thrombosis or spasms in COVID-19 patients.* The mechanism for these EKG changes is uncertain but is felt to be attributable to myocarditis vs possible endothelial dysfunction with micro thrombus formation.(23, 86) Confirmation of a wall motion abnormality, indicating regional myocardial ischemia, can be made with POCUS prior to invasive angiography to aid selecting a revascularization strategy.
  - c. *Management:* Once the diagnosis of acute coronary syndrome is made, medical management should be coordinated with cardiology.
    - i. *Cardiac Catheterization Laboratory Considerations:* As most Cath labs are either normal or positive pressure rooms, the benefits of invasive therapeutics must be weighed against the transmission risk to staff and patients. Deferral of invasive management can be considered based on these factors in favor of medical stabilization if needed. Right heart catheterization, pericardiocentesis, and intra-aortic balloon pump placement can be done at bedside when appropriate. Fibrinolytics protocols should be reviewed institutionally with cardiology to discuss care plans if strained resources.(87)
7. **Cardiac Arrhythmias.**
  - a. *Incidence:* Common CV manifestation in COVID-19 patients. Current cases series report an occurrence of unspecified arrhythmias in 17% of hospitalized patients with COVID-19 (44% of ICU patients vs 7% non ICU patients).(4) The new onset of malignant tachyarrhythmias in combination with acute myocardial injury should raise suspicion for potential underlying myocarditis.(2)
  - b. *Management:* Follow ACLS protocols. Cardiology consultation. In patients with atrial fibrillation requiring cardioversion, CCTA may be preferred over TEE to rule out left atrial appendage or intracardiac thrombus.

**8. Heart Failure and Cardiomyopathy.**

- a. *Incidence:* In a recent report it was observed that 23% of patients with COVID-19 had presentations consistent with heart failure. More frequently observed in patients who did not survive the hospitalization (51.9% vs 11.7%).(4) Fulminant cardiomyopathy can occur and is thought to be a late feature described in patients recovering from respiratory failure. Cardiogenic shock and cardiac arrest contributes to 7-33% of deaths.(82)
- b. *Mechanism:* SARS-CoV-2 is thought to infect host cells through ACE2 to cause COVID-19, while also causing damage to the myocardium, although specific mechanisms are uncertain.(88)
- c. *Management:* In the absence of high grade AV block or unstable bradycardia, cardiogenic shock, or acute kidney injury (AKI), guideline directed medical therapies should be continued in patients with heart failure. Assessment of continuation of these therapies should be determined on a frequent basis depending on the patient's clinical status. As discussed, continuation of ACE-I/ARB therapy in patients with COVID-19 is recommended at this time.(54)

**Acute Kidney Injury**

1. The reported incidence of AKI with COVID-19 varies from 0.5% to 19.1%.(4-7, 89, 90) This wide range is likely due to in part to the definition of AKI used and to the population studied. Rates of severe AKI requiring renal replacement therapy (RRT) range from 1.4% to 9%.(6, 7) Mortality is increased in patients with AKI, a relationship that appears to be dose-dependent based on AKI severity.(90)
2. The etiology of AKI in COVID-19 is predominantly acute tubular necrosis in the setting of multi-organ failure and shock. However, there have been unpublished reports of SARS-CoV-2 being isolated from urine and observed on kidney pathology. In conjunction with evidence that hematuria and proteinuria are common findings in COVID-19, this suggests that direct viral injury to the kidney may also play a role.(90)
3. The standard of care for critically ill patients with severe AKI is continuous RRT (CRRT). The dose of CRRT is the same as that recommended for other critically ill patients: 25mL/kg/hr.(90, 91)
4. If a MTF admits a large number of patients, it is likely that there will be a shortage of CRRT supplies. If this occurs, slow low efficiency dialysis (SLED) should be considered. SLED is a hybrid therapy that utilizes standard dialysis machines.
5. Regardless of the modality of RRT used, special attention should be paid to volume status and ultrafiltration, consistent with the goals of a restrictive fluid strategy.
6. The preferred location of a dialysis catheter is the right jugular vein, followed by a femoral vein, followed by the left jugular vein.(91) The subclavian vein should be avoided.
7. Patient with COVID-19 are hypercoagulable and will likely require anticoagulants to maintain filter patency. Regional anticoagulation with citrate is preferred, however this should only be done by centers that are already familiar with the technique given the risks of hypocalcemia and citrate toxicity. Second line anticoagulation is heparin. This topic is reviewed extensively in section 5.3 of the Kidney Disease: Improving Global Outcomes Guidelines on AKI.(91) Other methods to improve filter patency are to increase blood flow (up to 400 mL/min), periodic 100mL flushes of the circuit, and pre-filter replacement fluid (if doing continuous veno-venous hemofiltration).

**Hematology**

1. There is emerging evidence that many severe COVID-19 patients are hypercoagulable with varying degrees of DIC. Microthrombosis may play a significant role in end organ damage and specifically in the lung pathology causing micro pulmonary embolic with severe hypoxemia. Therefore, there should be some consideration for anticoagulation in severe COVID-19 patients in the ICU, especially those with elevated d-dimer and fibrinogen, decreasing platelets, coagulation derangements, RV dysfunction, increasing dead space (ETCO<sub>2</sub> - PaCO<sub>2</sub> gradient) and/or hypoxemia recalcitrant to PEEP.
2. Strongly recommend discussing use of anticoagulation and/or thrombolytics with an intensivist if this is suspected. Also recommend continued surveillance for DVTs and pulmonary emboli.

**Nutrition**

1. Nutrition care decisions are based on the patients' clinical presentation and the need to limit healthcare provider's exposure to patients, minimize contamination of equipment, and avoid transport.



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2. Oral and enteral routes of nutrition are preferred. See **Appendix I** for Enteral Nutrition Pathway.
3. Ensure patients deficient in Vitamin D and Zinc are properly supplemented.(92-101)
4. Ensure patients get adequate amount of Vitamin A and Vitamin C either in their diet or other route of nutritional support.(102, 103)
5. Enteral Nutrition (EN) for COVID-19 Patients:
  - a. Consult a Registered Dietitian locally or via virtual health
  - b. Give early enteral nutrition (ideally within the first 24-36 hours of admission or within 12 hours of intubation), including patients on ECMO
  - c. Prefer gastric feeding for ease of placement and potential to use an existing NGT or OGT
  - d. Energy supply should target 15-20 kcal/kg actual body weight; target protein content is 1.2-2.0 g/kg daily.
  - e. Choose an nutrition formula based on facility availability and patient's medical presentation:  
[https://www.nutritioncare.org/Guidelines\\_and\\_Clinical\\_Resources/EN\\_Formula\\_Guide/EN\\_Adult\\_Formulas/](https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/EN_Formula_Guide/EN_Adult_Formulas/)
  - f. Note: A standard high-protein (>20% protein) polymeric isosmotic enteral formula is recommended pending no renal insufficiency and normal GI function
  - g. Assess for risk of malnutrition/refeeding syndrome; if present, start at 25% of caloric goal (monitor serum phosphate, magnesium & potassium)
  - h. Continuous infusion is recommended; start nutrition at a slow rate (10ml-20ml/hr) and advance to goal as tolerated (ideally within 3-7 days of initiation)
  - i. If patient is to be placed in the prone position, raise HOB 10-25%. Patients in prone position generally tolerate gastric feedings
  - j. Monitor fluid intake closely
  - k. Consider medications that provide calories and adjust tube feeding rate as needed: Propofol (1.1kcal/ml); Dextrose (3.4kcal/ml); Glycerol (4.3kcal/ml)
  - l. See The American Society for Parenteral and Enteral Nutrition's (ASPEN) Resources for Clinicians Caring for Patients with Coronavirus:  
[https://www.nutritioncare.org/Guidelines\\_and\\_Clinical\\_Resources/Resources\\_for\\_Clinicians\\_Caring\\_for\\_Patients\\_with\\_Coronavirus/](https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Resources_for_Clinicians_Caring_for_Patients_with_Coronavirus/)

**Table 3. Prevention of Complications**

Anticipated outcome	Interventions
Reduce days of invasive mechanical ventilation	<ul style="list-style-type: none"> <li>• Use weaning protocols that include daily assessment for readiness to breathe spontaneously</li> <li>• Minimize continuous or intermittent sedation, targeting specific titration endpoints (light sedation unless contraindicated) or with daily interruption of continuous sedative infusions</li> </ul>
Reduce incidence of ventilator-associated pneumonia	<ul style="list-style-type: none"> <li>• Oral intubation is preferable to nasal intubation in adolescents and adults</li> <li>• Keep patient in semi-recumbent position (head of bed elevation 30–45°)</li> <li>• Use a closed suctioning system; periodically drain and discard condensate in tubing</li> <li>• Use a new ventilator circuit for each patient; once patient is ventilated, change circuit if it is soiled or damaged, but not routinely</li> <li>• Change heat moisture exchanger when it malfunctions, when soiled, or every 5–7 days</li> </ul>
Reduce incidence of venous thromboembolism	<ul style="list-style-type: none"> <li>• Use pharmacological prophylaxis (low molecular-weight heparin [preferred if available] or heparin 5000 units subcutaneously twice daily) in adolescents and adults without contraindications. For those with contraindications, use mechanical prophylaxis (intermittent pneumatic compression devices)</li> </ul>
Reduce incidence of catheter-related bloodstream infection	<ul style="list-style-type: none"> <li>• Use a checklist with completion verified by a real-time observer as reminder of each step needed for sterile insertion and as a daily reminder to remove catheter if no longer needed</li> </ul>
Reduce incidence of pressure ulcers	<ul style="list-style-type: none"> <li>• Turn patient every 2 hours</li> </ul>
Reduce incidence of stress ulcers and gastrointestinal (GI) bleeding	<ul style="list-style-type: none"> <li>• Give early enteral nutrition (within 24–48 hours of admission)</li> <li>• Administer histamine-2 receptor blockers or proton-pump inhibitors in patients with risk factors for GI bleeding. Risk factors for GI bleeding include mechanical ventilation for ≥ 48 hours, coagulopathy, renal replacement therapy, liver disease, multiple comorbidities, and higher organ failure score</li> </ul>
Reduce incidence of ICU-related weakness	<ul style="list-style-type: none"> <li>• Actively mobilize the patient early in the course of illness when safe to do so</li> </ul>

6. If unable to initiate EN due to failed EN trial with appropriate gastric tube placement, use of prokinetic agent, and/or postpyloric tube placement, or EN is contraindicated (ileus, SBO, Mesenteric ischemia, high pressure respiratory pressure etc.), consult Registered Dietitian locally or via virtual health immediately for possible parenteral nutrition (PN) initiation. For patients with COVID-19, the threshold to utilize PN may be lower than other critically ill patients.

Other

1. Implement the following interventions in Table 3 below to prevent complications associated with critical illness. These interventions are limited to feasible recommendations and are based on Surviving Sepsis or other guidelines and have been adapted from the WHO guidelines for COVID-19.

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## MANAGEMENT OF CRITICAL ILLNESS AND COVID-19: SEPTIC SHOCK & CARDIAC ARREST

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### Recognition of Septic Shock.

1. Recognize septic shock in adults when infection is suspected or confirmed AND vasopressors are needed to maintain mean arterial pressure (MAP) 60-65 mmHg AND lactate is  $\geq 2$  mmol/L, in absence of hypovolemia.(57, 104)
2. Recognize septic shock in children with any hypotension (systolic blood pressure [SBP]  $< 5^{\text{th}}$  percentile or  $> 2$  SD below normal for age) or two or more of the following: altered mental state; bradycardia or tachycardia (HR  $< 90$  bpm or  $> 160$  bpm in infants and HR  $< 70$  bpm or  $> 150$  bpm in children); prolonged capillary refill ( $> 2$  sec) or feeble pulses; tachypnea; mottled or cold skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia.
3. Standard care includes early recognition and the following treatments within 1 hour of recognition: antimicrobial therapy, and initiation of fluid bolus and vasopressors for hypotension (Surviving Sepsis Guidelines). The use of central venous and arterial catheters should be based on resource availability and individual patient needs. Detailed guidelines from the Surviving Sepsis Campaign and WHO are available for the management of septic shock in adults and children.
4. Due to physiologic changes in pregnancy, standard risk scoring systems are less predictive for sepsis in pregnancy, although the Modified Early Obstetric Warning Score (MEOWS) has a sensitivity of 89% and a specificity of 79% in predicting morbidity in the obstetric population.(105,106)

### Septic Shock Resuscitation.

1. For septic shock in adults: give 250–500 mL crystalloid fluid as rapid bolus in first 15–30 minutes and reassess for signs of fluid overload after each bolus.(104)
2. For septic shock in children, give 10–20 mL/kg crystalloid fluid as a bolus as quickly as possible using a manual push and reassess for signs of fluid response after each bolus.(107)
3. **Avoid Excessive Fluid Resuscitation.** The cause of death from COVID-19 is most often ARDS and subsequent complications, which may be exacerbated by fluid administration. (2) Patients usually present with normal lactate and blood pressure, but some patients do suffer from superimposed bacterial septic shock. Conservative fluid therapy consistent with FACTT trial should be considered for patients with evidence of hypoperfusion and a history suggestive of total body hypovolemia (e.g. prolonged nausea/vomiting and diarrhea).(108) Consider use of point of care ultrasound (POCUS) to guide fluid resuscitation and prevent volume overload. If there is no response to fluid loading or signs of volume overload appear (e.g. jugular venous distension, crackles on lung auscultation, pulmonary edema on imaging, or hepatomegaly in children), then reduce or discontinue fluid administration.
4. Resuscitation endpoints include perfusion targets (e.g., MAP 60-65 mmHg in adults; urine output  $> 0.5$  mL/kg/hr in adults or 1 mL/kg/hr in children; improved level of consciousness; and lactate).
5. In **pregnant women**, ( $>18$  weeks gestation or when the uterus reaches the umbilicus) compression of the inferior vena cava can cause a decrease in venous return and cardiac preload and may result in hypotension and hypoperfusion. For this reason, pregnant women with sepsis and or septic shock should be placed in the left lateral decubitus position at 30 degrees to off-load the inferior vena cava. Respiratory failure and sepsis are managed similarly to non-pregnant adults.
6. Clinical trials conducted in resource-limited studies comparing aggressive versus conservative fluid regimens suggest higher mortality in patients treated with aggressive fluid regimens.
7. Do **not** use hypotonic crystalloids, starches, or gelatins for resuscitation.
8. Vasopressors should be administered when shock persists during or after fluid resuscitation to maintain MAP goal 60-65 mmHg.

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9. If central venous catheters are not available, vasopressors can be given through a peripheral IV, but use a large vein and closely monitor for signs of extravasation and local tissue necrosis. If extravasation occurs, stop infusion, aspirate as much as possible, and consider subcutaneous phentolamine. Vasopressors can also be administered through intraosseous needles.
10. If signs of poor perfusion and cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine.
11. Norepinephrine is considered first-line treatment in adult patients; epinephrine or vasopressin can be added to achieve the MAP target. Vasopressors are safe in pregnancy and MAP goal is >65 mmHg.
12. Angiotensin II (Giapreza) is a vasopressor that may provide benefit in vasodilatory refractory shock as a third-line or fourth line agent.
13. In children, epinephrine is considered first-line treatment, while norepinephrine can be added if shock persists despite optimal dose of epinephrine.

### **Rapid Response and Code Blue.**

1. A local Protected Code Blue and Rapid Response Team (RRT) Protocol should be developed for resuscitating COVID-19 patients that is peer-reviewed and based on the best available data and evidence. It should be updated based on performance improvement data and experience.
2. Protecting healthcare workers is a major priority. The main strategies include efficient placement of appropriate PPE, minimizing personnel in the room, and regular training.
3. Medical personnel should be trained appropriately regarding the expectations, roles, and responsibilities for the individual participants, as outlined below. Mock simulated scenarios should be regularly used to practice these clinical situations.
4. For activation of a RRT or Code Blue on a suspected or confirmed COVID-19 patient, the following are recommended:
  - a. Donning of enhanced PPE in an expeditious fashion should be performed with a PPE Buddy to confirm the appropriate infection control procedures.
  - b. Entry to a patient's room during a RRT or Code Blue should be minimized to essential personnel.
  - c. The patient should be assessed by the most senior medical staff available to determine appropriate management and disposition, unless deferred by the responsible staff.
  - d. If a patient starts to decompensate or is found unresponsive, the initial responder should prioritize the placement of a closely available surgical mask on the patient.
  - e. Chest compressions during cardiopulmonary resuscitation (CPR) is aerosol generating. Before commencing CPR, all medical personnel should wear airborne PPE, including PAPR if able. If available, an automated compressor device should be used to minimize personnel and exposure.
  - f. Depending on local availability of resources, consider modifying the protocol for bringing the crash cart into the room. Due to the high risk of aerosol generation that occur during these clinical events, attempts should be made to minimize the degree and amount of door opening that occurs.
  - g. If not intubated, a non-rebreather mask should immediately be placed on the patient for apneic oxygenation. Depending on local protocol, a bag-valve mask (BVM) with a viral filter may be considered if using a two-person technique.
  - h. If the patient is connected to a ventilator, attempt to remain connected and adjust the settings to replicate the bag-valve mask delivery of oxygen, unless airway obstruction or ventilator malfunction is suspected. Consider adjusting the set respiratory rate to 10 breaths per minute during CPR. Alternatively, or if it is felt that the patient is not getting adequate ventilation through the ventilator, the ETT can be clamped and the patient can be disconnected from the ventilator and connected to a bag at which point the ETT can be unclamped for traditional bag ventilation.
  - i. Focus on potentially reversible conditions (H's and T's): DOPE (Displacement of breathing tube, Obstruction, Pneumothorax, Equipment failure) mnemonic for sudden hypoxia, and identification and treatment of shockable rhythm. Consider use of portable ultrasound and obtain a blood gas.
  - j. Avoid prolonged codes in patients with cardiac arrest. Consider discontinuation after 20 minutes.
5. The following table identifies best practices based on a "Minimum, Better, Best" model, as the COVID-19 outbreak could ultimately result in limited resources based on observational data from other countries. The



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goal is to achieve all elements of each category, as “Good” equates with the minimum standard-of-care while “Best” equates with the most ideal condition.

**Table 4. Minimum-Better-Best Paradigm for Limited Code Blue**

	Minimum	Better	Best
<b>Advance Directives</b>	Discuss & document with every patient’s medical power of attorney (MPOA) if patient unable to speak for self	Discuss & document with every patient;  Involvement of Palliative Care for high risk	Develop a script for clinician that incorporates unique circumstances & ethical considerations if worsening pandemic. Ideally, with DNRs for those who might code due to refractory shock/respiratory failure
<b>Alert mechanism</b>	Educate current Code Team members about who should respond to “Overhead Code Blue” to COVID-19 patients	Early activation	Directed announcement ONLY to COVID-19 Code Team
<b>PPE / Precautions</b>	Droplet for room; Minimize door opening	Airborne/Negative ISO; Infection Control Gatekeeper; Door remains closed	Use of PPE Checklist
<b>Communication (via PAPRs or individuals outside room)</b>	Whiteboard for written instructions; Closed-loop	Vocera; Speakerphone in room; Gatekeeper	Personal communication devices; Dedicated audiovisual devices
<b>CPR</b>	Rotate 2 individuals who don’t leave room	Rotate 2 individuals who don’t leave room and accomplish multiple tasks based on pre-established priorities	Automated compressor device (e.g. LUCAS) for high risk patients
<b>IV access</b>	Two standard functioning PIVs for all COVID-19 patients	Tibial IO (if needed)	Early placement of central access before potential arrest
<b>ACLS Equipment</b>	Dedicated Code Cart for COVID-19 ICU and wards;  Accounting for Code Carts to ensure appropriate backups	For high-risk patients: consider early placement of defib pads in room or on patient, or prepositioning the Code Cart outside patient room	Specialized cart/kit containing appropriate meds, modular packs of equipment, and designated defibrillator; Dedicated COVID-19 ward: US, EKG machine, portable CXR
<b>Airway (see “Intubation” protocol)</b>	NRB mask immediately over patient mask	BVM with viral filter and ETCO2 Consider LMA placement by trained and experienced personnel	Strict adherence to COVID-19 Intubation Protocol  Early intubation BEFORE arrest
<b>Simulation/Practice</b>	Ongoing review and regular familiarization with Protected Code Blue policy; Development of “Mock COVID-19 Code Blue” scenarios and ppt	One-time practice with all members of the COVID-19 response teams	Regular practice and policy updates to all members of the COVID-19 response team

### Patient Transport.

1. If COVID-19 is widespread in the community, surgical masks should be considered for ALL patients irrespective of COVID-19 status.
2. The movement of patients with COVID-19 should be limited with all efforts made to ensure the patient is initially admitted to the appropriate location.
3. If patient transport is necessary:
  - a. Non-intubated patients should be transferred wearing a surgical mask over their oxygen delivery device which may include nasal prongs or a non-rebreather mask up to 15L/min.
  - b. Staff should wear airborne PPE.
  - c. Once a patient is admitted to the ICU, transport outside of the ICU should be limited. If transport is required, then coordination should occur to ensure safety standards are maintained.
  - d. Hallways must be cleared where possible and only essential staff should accompany the patient. Staff not involved in the transfer should not come within 6 feet of the patient.
  - e. Intubated patients should have closed circuits with a viral filter in situ and cuff pressure should be maintained to avoid air leaks.

## IMAGING OF COVID-19: RADIOLOGY DEPARTMENT GUIDANCE & IMAGING FINDINGS

Imaging findings have been widely reported in the context of COVID-19 but local policies for when and how to use imaging are widely variable and must take into consideration many site-specific, regional and organizational

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factors. Imaging exams for non-COVID-19 patients will be impacted as facilities work to limit avoidable exposures for patients and healthcare workers. The American College of Radiology (ACR) has consolidated generalizable guidance for imaging department workflow, COVID-19 imaging findings and standardized reporting on its “ACR COVID-19 Clinical Resources for Radiologists” page which is updated regularly.(109)

#### **Radiology Department Guidance for Rescheduling Exams.**

1. The ACR fully supports CDC guidance advising medical facilities to “reschedule non-urgent outpatient visits.” These include but are not limited to the following imaging procedures:(109)
  - Screening mammography
  - Lung cancer screening Computed Tomography (CT)
  - Non-urgent radiography, fluoroscopy, CT, US, and MRI exams
  - Non-urgent or elective image-guided procedures
2. The Society for Breast Imaging (SBI) and the American Society of Breast Surgeons (ASBrS) agree that medical facilities postpone all breast screening exams including screening mammography, ultrasound and MRI effective immediately as of 26Mar20. (110, 111)
  - FDA’s Division of Mammography Quality Standards (DMQS) has issued guidance for specific scenarios covering facilities that either decide to close, cannot schedule an annual medical physicist survey or continue to operate and have non-compliance citations due to circumstances outside their control. (112)
  - FDA temporarily postponed domestic routine surveillance facility inspections on 18Mar20. (113)
3. If rescheduling exams, Radiology departments should work directly with referring providers to ensure only non-urgent studies are delayed. All other imaging exams should continue as scheduled or be accelerated in order to expedite necessary imaging prior to local/regional incidence of COVID-19 increases with a corresponding influx of COVID-19 patients expected to occupy more healthcare resources.

#### **Use of Imaging for COVID-19**

1. The ACR, Society for Thoracic Radiology (STR) and the American Society of Emergency Radiology (ASER) recommend that CT should not be used to screen or as a first-line test to diagnose COVID-19. (114)
2. Imaging should be reserved for cases where it will impact management or in order to evaluate for urgent/emergent alternative diagnoses. (115)
3. The reported sensitivity of Chest CT for COVID-19 ranges from 80-90% and the reported specificity ranges from 60-70%. (116, 117)
  - A normal chest CT does not mean a patient does not have COVID-19; a normal imaging study should not keep a patient from being quarantined if they meet other clinical criteria.
  - An abnormal CT is not specific for COVID-19 and it does not obviate the need for confirmatory laboratory testing. (118)
4. Screening questionnaire for symptoms or significant exposure history should be repeated by the Radiology front desk personnel.
5. **Infection control and PPE:** When imaging is performed on patients who are positive or suspected positive for COVID-19, consider implementing the following infection control precautions.(115)
  - Portable imaging is preferred when possible, preferably using a portable x-ray machine dedicated for imaging COVID-19 suspected/positive patients [N.B. when possible, similar designation of other radiology equipment (e.g. ultrasound, CT and MRI) specifically for imaging COVID-19 suspected/positive patients should be made to limit cross contamination.
  - Imaging should be performed nearest to the patient location to minimize exposure
  - Droplet precautions should be employed for all patients who are positive or suspected positive for COVID-19. Patients should be masked throughout the imaging exam and deep cleaning of all surfaces is performed afterward by someone wearing proper PPE.
  - Airborne precautions are reserved for patients undergoing aerosol-generating procedures (bronchoscopy, intubation, nebulization, or open suction).
  - Healthcare providers (technologist, nurse, etc.) should wear appropriate PPE (gloves, mask, eye-shield and possibly gown depending on the possibility of close or direct contact with the patient)

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- Record a census of other patients and staff present at the time of the patient visit, should the patient later test positive for COVID-19
6. When performing image-guided procedures on patients who are positive or suspected positive for COVID-19, consider implementing the following infection control precautions: (119)
- Store all PPE in secure locations with limited access, implement inventory controls, and clearly define PPE to be used based on patient status.
  - Identify a dedicated room to perform procedures on PUIs and COVID-19-positive patients. An air-negative room is strongly recommended if available.
  - Empty rooms designated for procedures on COVID-19-suspected/confirmed patients of all non-essential equipment and supplies to avoid contamination.
  - Create a staffing plan designed to preserve physician and staff availability if individuals become exposed and sick. Consider backup teams.
  - Minimize staff in the procedure room.
  - Develop clear plans for removing and disposing contaminated PPE.
  - Have a clear exit plan for COVID-19-suspected/confirmed patients to minimize staff exposure.
  - Ensure staff scrubs are changed and lead aprons are cleaned with EPA-approved disinfectants.

### **Imaging Findings of COVID-19 on Chest Radiographs**

1. If imaging is part of a pre-hospital assessment of COVID-19 positive or PUI patients, portable x-ray is preferred (preferably using a dedicated portable x-ray machine to limit cross contamination).
2. In one study of 64 patients, baseline chest radiograph (CXR) had a sensitivity of 69%. (120)
3. Bilateral consolidation and ground glass opacities were the most common findings (59% and 41% respectively) in a peripheral and lower lung distribution (51% and 63% respectively).
4. Severity of CXR findings peak at 10-12 days from date of symptom onset. (120)

### **Imaging Findings of COVID-19 on Chest Computed Tomography (CT).**

1. CT findings of COVID-19 overlap with findings of other viral pneumonias including influenza, H1N1, SARS (Severe Acute Respiratory Syndrome caused by a unique coronavirus) and MERS (Middle East Respiratory Syndrome caused by a unique coronavirus).
2. CT findings of COVID-19: (116, 121-124)
  - Extent - bilateral, multilobar
  - Distribution – peripheral and basilar or random
  - Characterization – rounded or peripheral ground glass opacities (GGO) without or with septal thickening (“crazy paving” pattern), consolidation, central low attenuation (reverse halo sign of organizing pneumonia)
3. Lymphadenopathy, pleural effusions and a nodular pattern are not common.
4. CT finding severity peak from 6-11 days after symptom onset. (125, 126)
5. Standardized reporting guidelines were developed and endorsed by the Radiological Society of North America (RSNA), the Society of Thoracic Radiology and the American College of Radiology. (127)
  - Consultation with clinical colleagues at each institution is suggested to establish a mutual approach.
  - If features of COVID-19 are discovered *incidentally* on exams performed for other indications, contact referring providers to discuss the possibility of viral infection and consider using the more general term “viral pneumonia” in the differential diagnosis. However, if after discussion COVID-19 is felt to be likely, then the authors suggest using one of the four structured reporting categories listed below.
6. Structured reporting categories for COVID-19 on chest CT.
  - Typical appearance
    1. Findings: Peripheral, bilateral GGO with or without consolidation or visible septal lines (“crazy paving”); multifocal rounded GGO; reverse halo sign or other signs of organizing pneumonia (later in disease).
    2. Suggested reporting language: “Commonly reported imaging features of COVID-19 pneumonia are present. Other processes such as influenza pneumonia and organizing

pneumonia, as can be seen with drug toxicity and connective tissue disease, can cause a similar imaging pattern.”

- Indeterminate appearance
  1. Findings: Absent typical features AND multifocal, diffuse, perihilar or unilateral GGO with or without consolidation lacking a specific distribution; lacking a rounded or peripheral characterization; few very small GGO non-rounded and non-peripheral.
  2. Suggested reporting language: “Imaging features can be seen with COVID-19 pneumonia, though are nonspecific and can occur with a variety of infectious and noninfectious processes.”
- Atypical appearance
  1. Findings: Absent typical or indeterminate features AND isolated lobar or segmental consolidation without GGO, discrete small nodules (centrilobular or “tree-in-bud”), lung cavitation, smooth interlobular septal thickening with pleural effusion.
  2. Suggested reporting language: “Imaging features atypical or uncommonly reported for COVID-19 pneumonia. Alternative diagnoses should be considered.”
- Negative for pneumonia
  1. Findings: No CT features to suggest pneumonia.
  2. Suggested reporting language: “No CT findings present to indicate pneumonia. (Note: CT may be negative in the early stages of COVID-19.)”

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## **ADJUNCTIVE THERAPIES FOR COVID-19: TREATMENT PROTOCOLS**

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**Note:** *All therapies are investigational and none are proven as the literature is evolving quickly. No FDA unapproved medications should be routinely recommended for use outside of a randomized clinical trial. Additionally, there is no evidence for use of the following medications for outpatients or mildly ill patients. Use of these resources for that purpose should be discouraged through prescribing restricted to critical care, infectious disease, or rheumatology physicians. For up to date information on medications and pharmacy information, the American Society of Health-System Pharmacists (ASHP) website has a number of regularly updated resources at: <https://www.ashp.org/Pharmacy-Practice/Resource-Centers/Coronavirus>.*

**Ethics of Clinical Research during a Pandemic:** There is genuine uncertainty in the expert medical community over whether proposed off-label and investigational treatments are beneficial. Randomized, placebo-controlled trials (RCT) are the gold standard for determining if an experimental treatment can benefit patients. Some may question whether it is ethical to deprive patients of an agent that could potentially prevent or treat COVID-19, given the high mortality rate among critically ill patients and lack of known and available treatment options. A Committee of National Academies of Science, Engineering, and Medicine reviewed and conducted an analysis of the clinical trials conducted during the 2014–2015 Ebola virus disease outbreak in West Africa and found that the RCT was an ethical and appropriate design to use, even in the context of the Ebola epidemic. The position of “ equipoise ”—genuine uncertainty in the expert medical community over whether a treatment will be beneficial—“is the ethical basis for assigning only some participants to receive the agent. If the relative risks and benefits of an agent are unknown, participants who receive the experimental agent may receive a benefit or may be made worse off. Providing the experimental agent to all would expose all participants to potentially harmful effects.” (128)

### **Steroids.**

1. There is a strong consideration to avoid routine steroids based on early data out of China as well as other studies related to Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) which have shown that steroids delay viral clearance.(129)
2. However, new consensus guidelines recommend considering **methylprednisolone** for intubated COVID-19 patients with ARDS.(57, 130)
3. Steroids may be indicated for vasopressor-refractory shock, asthma, COPD exacerbation, or for antenatal therapy at risk for preterm birth from 24-34 weeks of gestation (see Pregnancy Section).

## Remdesivir.

1. Remdesivir is an investigational intravenous drug with broad antiviral activity that inhibits viral replication through premature termination of RNA transcription and has in-vitro activity against SARS-CoV-2 and in-vitro and in-vivo activity against related betacoronaviruses. It has been tested in humans against Ebola virus disease, where it was not found to be superior to other therapies in the PALM RCT.(131) It has shown promise in vitro and in animal models for coronavirus infection.(132-134)
2. National Institute of Allergy and Infectious Diseases (NIAID) is leading a multicenter adaptive design randomized placebo-controlled trial of candidate therapies for COVID-19, initially focused on comparing Remdesivir to placebo “A Multicenter, Adaptive, Randomized Blinded Controlled Trial of the Safety and Efficacy of Investigational Therapeutics for the Treatment of COVID-19 in Hospitalized Adults.” MAMC, NMCS, BAMC, NMCP and WRNMMC MTFs are participating sites through IDCRP. Potentially eligible candidates are adult DoD Health Care Beneficiaries meeting inclusion criteria (SARS-CoV-2 positive with evidence of pneumonia with oxygen saturation of  $\leq 94\%$  on room air or requiring supplemental oxygen or mechanical ventilation). Exclusion criteria include alanine aminotransaminase (ALT) or aspartate aminotransaminase (AST) levels  $>5$  times the upper limit of normal, stage 4 severe chronic kidney disease or a requirement for dialysis [i.e., estimated glomerular filtration rate  $<30$ ]. (<https://clinicaltrials.gov/ct2/show/NCT04280705>)
3. Gilead has two Phase 3 randomized open-label trials of remdesivir (5-days vs. 10-days vs. standard of care) open to enrollment for adults with COVID-19, radiographic evidence of pneumonia and oxygen saturation of  $\leq 94\%$  on room air (severe disease: <https://clinicaltrials.gov/ct2/show/NCT04292899>) or  $>94\%$  on room air (moderate disease: <https://clinicaltrials.gov/ct2/show/NCT04292730>). Exclusion criteria include ALT or AST levels  $>5$  times the upper limit of normal, participation in another clinical trial of an experimental treatment for COVID-19, requirement for mechanical ventilation, or creatinine clearance  $<50$  mL/min..
4. Remdesivir is potentially available under compassionate expanded use from Gilead for pregnant patients or patients  $<18$  years with severe pneumonia: [COVID\\_Expanded\\_Access\\_HCP@gilead.com](mailto:COVID_Expanded_Access_HCP@gilead.com) to initiate the process. Please note that the site must first be enrolled before a patient can be considered and the process may take several days to weeks. [compassionateaccess@gilead.com](mailto:compassionateaccess@gilead.com). From Gilead’s website; “Compassionate use requests must be submitted by a patient’s treating physician. Gilead is currently assessing requests on an individual basis and require, at a minimum, that the patient be hospitalized with confirmed COVID-19 infection with significant clinical manifestations.” For information, including inclusion and exclusion criteria, visit: <https://clinicaltrials.gov/ct2/show/NCT04323761>.
5. USAMMDA Force Health Protection Division has established an expanded access treatment Investigational New Drug (IND) with a limited number of treatment courses of Remdesivir for Active Duty Service Members CONUS/OCNUS (and Federal civilian and contract employees deployed OCNUS while in support of operational forces) meeting inclusion criteria. “Intermediate-Size Patient Population Expanded Access Protocol for Treatment of Coronavirus Disease 2019 (COVID-19) with Remdesivir.” Clinicians should contact USAMMDA FHP Division to determine eligibility to receive product, 24-hour international telephone: +1-301-401-2768.

## Chloroquine (CQ) and Hydroxychloroquine (HCQ).

1. FDA gave Emergency Use Authorization (EUA) for use in COVID-19 patients on 28 Mar 2020: <https://www.fda.gov/media/136534/download>
2. These drugs have been used as anti-malarial prophylaxis and to treat autoimmune conditions.
3. BLUF: No high-quality evidence exists to support use at present. *Potential toxicities include QTc prolongation, risk for arrhythmias, and retinal pigmentation and vision loss.*
4. In vitro studies have reported antiviral activity against SARS-CoV and more recently against SARS-CoV-2. Mouse studies for SARS-CoV demonstrated improved lung pathology without reduction in viral titers; similar animal studies for SARS-CoV-2 have not yet been completed. Recent studies conducted in China indicate in vitro activity of these agents against SARS-CoV-2, and a small survey in French patients showed reductions in viral load. An additional preliminary report on chloroquine clinical activity was released by investigators in China, but detailed information is pending.(134-137) Both CQ and HCQ concentrate in the lung. Optimal dosing needed to reach adequate concentrations in lung tissue for treatment of COVID-19 are unknown; modeling has suggested high doses might be required.(137) Despite showing in vitro antiviral activity, prior clinical trials demonstrated



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no benefit of CQ against other viral infections such as dengue virus, chikungunya, influenza, and HIV, though none investigated the use of chloroquine for coronavirus infection.(138-141) In a non-human primate study, hydroxychloroquine appeared to paradoxically enhance chikungunya infection.(142)

5. A report of 20 treated COVID-19 patients who received HCQ alone and in combination with azithromycin suggested that treatment was associated with viral load reduction over 6 days, compared to a nonrandomized control group, and were more pronounced in patients who received the combination; clinical impact was not assessed and methodologic issues limit the strength of the observation.(143) A brief report of a Chinese study of 100 COVID-19 patients suggested clinical improvement (“improved lung images, time to viral negative conversion, and shortening of disease course”) with CQ or HCQ treatment versus an unspecified control; methodologic details were absent from the report, limiting the strength of conclusions.(144) If these comparisons are substantiated after availability of adequate additional data, this would be the first time chloroquine or hydroxychloroquine was found to be effective for the clinical management of a viral infection.
6. Hydroxychloroquine/chloroquine are associated with QTc prolongation. Given the short duration of treatment the small risk of drug-induced arrhythmia may be acceptable. Prior to initiation of therapy a 12 lead EKG should be performed. Consider alternative therapy in subjects with known Long QT syndrome; discontinue combination with other QT prolonging drugs if QTc >500msec (or >530-550msec if QRS >120msec).(143, 144)
7. Several clinical trials have been initiated/are planned to study CQ/HCQ for treating or preventing COVID-19.
8. A variety of dosing regimens have been reported in use, including: Hydroxychloroquine 400 mg PO BID x 1 days, then 200 mg PO BID x4 days.

### **Lopinavir/Ritonavir.**

1. Coronavirus cellular infectivity and replication are dependent on virally-encoded and cellular protease activity. Clinically used protease inhibitors effective for HIV and HCV infection have been examined for potential utility in treatment of SARS, MERS, and COVID-19, but are currently not recommended.
2. Unconfirmed media reports from China suggested this combination to be effective for COVID-19 treatment. However, on 18 March 2020, RCT results were reported that found no benefit in patients who received lopinavir/ritonavir compared to standard care for treatment of severe disease.(145-147)
3. Do not use in combination with amiodarone (fatal arrhythmia), quetiapine (severe coma), or simvastatin (rhabdomyolysis).

**Host-directed anti-inflammatory strategies.** ARDS and sepsis, life-threatening downstream complications of COVID-19, and many other infectious and non-infectious conditions, remain significant unmet therapeutic gaps. Historically, numerous anti-inflammatory and anti-cytokine agents, as well as many other drug candidates, have been tested and failed to meaningfully affect morbidity and mortality in ARDS, sepsis and/or septic shock.

### **Anti-IL6 monoclonal antibodies.**

1. A variety of therapies are being administered to severely ill patients in China and elsewhere. One that is receiving substantial attention currently is an anti-IL6 receptor humanized monoclonal antibody, tocilizumab (Actemra®), which was added to the treatment guidelines published by China’s National Health Commission (4 Mar 20) to treat serious coronavirus patients with lung damage.
2. Tocilizumab and sarilumab are licensed in US for treatment of giant cell arteritis, rheumatoid arthritis, and cytokine release syndrome following CAR-T therapy. They carry a black box warning for risk of severe, potentially fatal, infections.
3. No high-quality evidence currently exists to support use. Some reports from China have suggested elevated IL6 levels are associated with severe disease in COVID-19 infection, though other reports have not found the same association. Tocilizumab has been used in Italy according to anecdotal reports and an unpublished uncontrolled case series from China treated 21 hypoxemic patients with tocilizumab 400 mg IV x1 and reported improvement in respiratory parameters.(52, 148)
4. Manufacturer-supported US randomized controlled trials of tocilizumab and sarilumab are planned.

### **Convalescent Plasma.**

1. Convalescent plasma from patients who have recovered from SARS CoV-2 infection has been proposed as a potential therapy for patients with severe COVID-19.(149) Although no clinical trials have been conducted to

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date, prior use of convalescent plasma for patient with SARS CoV1, MERS CoV, and influenza H1N1 demonstrated benefit for recipients of plasma from patients who recovered from these infections. In a preliminary, uncontrolled case series in China, 5 patients were given plasma from patients that had recovered from COVID-19 with improvement in clinical status.(150)

2. As of 3 April, the FDA has authorized the use of convalescent plasma to treat “serious or life threatening” COVID-19 disease under Investigational New Drug (IND) protocols.(151) Requests may be made by email and there is a number to call for expedited use. The following website provides instructions for requests: <https://www.fda.gov/vaccines-blood-biologics/investigational-new-drug-ind-or-device-exemption-ide-process-cber/investigational-covid-19-convalescent-plasma-emergency-ind>
  - a. Severe disease is defined by the FDA as follows: dyspnea, RR>30 breaths/min, SpO<sub>2</sub> <93% on RA, PaO<sub>2</sub>:FiO<sub>2</sub> ratio of <300, or increases in lung infiltrations by >50% within 24-48 hours.
  - b. Life threatening disease is defined by the FDA as follows: respiratory failure, septic shock, or multiple organ dysfunction or failure.

**Several additional agents are under investigation and information is expected to emerge rapidly. Discernment of benefits and harms from novel therapies will require diligent attention to quality of evidence reported.**

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### **CARING FOR SPECIAL POPULATIONS: Pregnancy, Nursing Mothers, Infants, Children, and the Elderly**

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#### **Caring for Pregnant Women during the COVID-19 Pandemic**

1. Based on limited data, pregnant women do not appear to be at higher risk for severe disease. Emerging reports from the United States suggest that pregnant women may be at higher risk of atypical presentation with severe respiratory morbidity and preterm labor.(13-16) Clinical findings in reported cases were similar in cases of non-pregnant adults. Pregnant women experience immunologic and physiologic changes that make them more susceptible to viral respiratory infections.(14) Pregnant women are at greater risk for severe illness, morbidity, or mortality compared with the general population, as is observed with other related coronavirus infections.(15, 16) Pregnant women should receive the same care as those not pregnant in regards to screening, radiology studies, laboratory evaluations and critical care.
2. Pregnancy care should be considered non-elective.
3. The report to WHO from China suggests pregnant women were not at increased risk for severe disease.(152) More recent literature has suggested that pregnant women may be at increased risk of being asymptomatic carriers and developing more severe forms of the disease. (13, 15, 16)
4. **Pregnancy complications:** Pregnancy in the setting of a COVID-19 infection is associated with higher rates of miscarriage (39.1%), preterm birth less than 37 weeks (24.3%), preeclampsia (16.2%), cesarean delivery (84%), increased incidence of neonatal admission (57.2%) and perinatal death (11.1%) Some cases of preterm birth were iatrogenic and not due to spontaneous preterm labor. (14, 15)
5. Providers are encouraged to enroll patients confirmed with COVID-19 in pregnancy or deemed persons under investigation should be considered for enrollment in the Pregnancy Coronavirus Outcomes Registry (PRIORITY)(<https://priority.ucsf.edu/>).
6. Health care providers should be familiar with the physiologic changes of pregnancy that make pregnant women more susceptible to some respiratory infections.
  - a. Immune modulation of pregnancy
  - b. Pregnant women are more susceptible to respiratory failure and can decompensate quickly (especially in the third trimester) due to 20% decrease in functional residual capacity.
  - c. Respiratory changes: Pregnancy is a metabolically compensated respiratory alkalosis
    - i. Normal pregnancy ABG pH 7.4-7.47
    - ii. Normal pregnancy PaO<sub>2</sub> 75-106 mm Hg (PaO<sub>2</sub> increases by 30 mm Hg)
    - iii. **Normal pregnancy PaCO<sub>2</sub> 26-32 mm Hg (PaCO<sub>2</sub> decreases by 30 mmHg)**
    - iv. Normal pregnancy HCO<sub>3</sub> 18-21
  - d. **A PaCO<sub>2</sub> in pregnancy of 35 to 45 is ABNORMAL in pregnancy, and signifies impaired ventilation and impending respiratory compromise.**



- e. Critical care considerations for pregnant women; online training available at <https://www.smfm.org/critical-care/cases/new-2019>
- 7. **Screening Guidelines:** American College of Obstetricians and Gynecologists (ACOG) and Society for Maternal-Fetal Medicine (SMFM) algorithm for outpatient assessment and management for pregnant women with suspected or confirmed novel coronavirus (COVID-19): <https://www.acog.org/-/media/project/acog/acogorg/files/pdfs/clinical-guidance/practice-advisory/covid-19-algorithm.pdf?la=en&hash=2D9E7F62C97F82315616FFDCA3B1A6>
- 8. **Risk of vertical transmission:** Case series to date suggest no evidence of vertical transmission, similar to other viral respiratory illnesses, such as influenza. (14, 15)
- 9. **Changes to routine OB care** during COVID-19 pandemic: To decrease opportunities of exposure to coronavirus OB providers should be taking steps to reduce patient encounters and optimize TeleHealth visits and home blood pressure monitoring. Guidance for practice has been published and we recommend developing plans at each MTF to standardize changes in Prenatal Care. (153)
- 10. **Intrapartum Care during COVID-19 pandemic:**
  - a. Screen all patients and support person(s) according to ACOG SMFM as above.
  - b. Recommend a designated staff member at the front of the unit to verbally screen for URI symptoms, diagnosis of COVID-19 or PUI within the past 2 weeks.
  - c. Any patient with fever, cough, or respiratory symptoms (+/- fever) should put on a surgical mask and be evaluated by a nurse or provider (and put in a room).
  - d. All birthing partners should be screened. If they have any symptoms they should NOT be admitted to L&D and directed to appropriate testing or medical care as indicated.
  - e. Recommend screening patients and their birthing partner (support person) by phone the day before scheduled inductions or cesarean delivery to determine if either person has:
    - i. Symptoms fever, cough, or respiratory symptoms (+/- fever)
    - ii. Been diagnosed with COVID-19 (based on positive COVID-19 test) within 2 weeks
    - iii. Been designated as a COVID-19 PUI within the past 2 weeks
  - f. If a patient screens positive to any of the above prior to scheduled delivery (IOL or CD), evaluate to determine if re-scheduling in 2-3 days is feasible to allow for results of COVID-19 testing.
  - g. For COVID-19 positive patients with mild or moderate symptoms not requiring immediate care, it is important to recognize that the severity of disease peaks in the second week, so planning delivery prior to that time is optimal.
  - h. If a birth partner (support person) has a fever, cough, or respiratory symptoms (+/- fever) (or confirmed COVID-19 positive or PUI), they should not come to L&D, and will not be admitted to L&D as a support person.
  - i. Visitors are limited to one (healthy) support person during the entire admission. (153)
  - j. Support persons of a COVID-19 positive or PUI mother should wear a mask during their hospital stay, and are restricted to the patient room (should not visit hospital areas outside patient room). They should use the bathroom in the patient room, and should have all meals brought to the room.
  - k. Routine preop labs for scheduled cases should be drawn on procedural day to minimize hospital trips.
- 11. **Care for the pregnant patient with PUI or COVID 19**
  - a. **Admission:** Patients with suspected or confirmed COVID-19 should be admitted to a unit capable of caring for the respiratory needs of the patient as well as provide appropriate fetal monitoring as clinically indicated. Patient should be in isolation per hospital and CDC guidance.
    - i. Pregnant women should be admitted to the hospital for treatment of COVID symptoms if there is concern about respiratory status (O2 requirement to maintain saturations above 92%, increased work of breathing, RR > 24 breaths per minute), tachycardia > 110 bpm, dehydration, obstetric concerns.
  - b. COVID-19 may be associated with a transaminitis and thrombocytopenia, this is an important consideration when assessing women with a hypertensive disorder to determine if she has features of preeclampsia or HELLP syndrome.

- c. **Guidance for treatment:** Aggressive infection control, testing for COVID-19, testing for co-infection, oxygen therapy as needed, avoidance of fluid overload, empiric antibiotics (due to risk of superimposed bacterial risk), fetal and uterine contraction monitoring for viable pregnancies, early mechanical ventilation for progressive respiratory failure, individualized delivery planning, Maternal Fetal Medicine (MFM) consultation, Pulmonology, Critical Care and Infectious disease involvement as indicated. Team based management is recommended. Consider early transfer to higher level facility if unable to provide services at MTF.(154)
  - d. Chloroquine and Hydroxychloroquine are well tolerated in pregnancy and human data in exposed pregnancies do not suggest harm.(155)
  - e. Remdesivir is not studied in pregnancy and no human or animal data could be found.(155)
  - f. **Imaging: Necessary radiographic studies should not be withheld from a pregnant patient. Fetal risk of anomalies, growth restriction or abortion have not been reported with radiation exposure of less than 50 mGy, a level above the range of exposure for most diagnostic procedures.**
12. **Delivery:** Timing of delivery, in most cases, should not be dictated by maternal COVID-19 infection. For women infected early in pregnancy who recover, no alteration to the usual timing of delivery is necessary. For women infected in the third trimester who recover, it is reasonable to attempt to postpone delivery (if no other medical indications arise) either until a negative COVID-19 testing result is obtained or quarantine status is lifted in an attempt to avoid transmission to the neonate. ***In general, COVID-19 infection itself is not an indication for delivery.*** Recommend health care team wear appropriate PPE during delivery and delivery should occur in a negative pressure room. Skin to skin care following delivery is not recommended. In cases of severe maternal infection with a term infant, care teams may consider avoiding delayed cord clamping to minimize the risk of transmission to the neonate.
13. **Cardiac arrest:** in pregnancy should be managed similar to cardiac arrest in non-pregnant adults. If pregnancy is  $\geq 20$  weeks (uterus at or above the umbilicus), significant aortocaval compression exists. Left uterine displacement is recommended during high-quality CPR, with resuscitative cesarean delivery (perimortem cesarean delivery) if ROSC not achieved by 4-5 minutes. Resuscitative cesarean delivery should be performed at the bedside (do not move to the OR).(156)
14. **Antenatal surveillance:** Gestational age appropriate fetal monitoring should be part of the initial assessment of any women with respiratory symptoms. Continuous fetal monitoring in the setting of severe illness should be considered only when delivery would not compromise maternal health, or as another noninvasive measure of maternal status. For women who recover from an acute infection, antepartum testing later in the pregnancy is not needed.
15. **Ultrasound** consider a detailed level 2 anatomic survey for women following recovery from a first trimester infection and a fetal growth assessment in the third trimester for women who recover from an infection later in pregnancy (later second trimester and third trimester infections) due to lack of data on teratogenic risk.
16. **Follow up after diagnosis of COVID-19:** When patient is discharged from the hospital a plan for follow up should be established. Recommend follow up with patients via phone or video telehealth assessments 5-7 days after discharge. Return precautions should be reviewed with the patient prior to discharge. If patients symptoms worsen arrangements should be made for patient to be seen in person by a health care provider to assess clinical status.
17. **PPE Considerations during COVID Pandemic for Pregnancy:**
- a. Screen positive patients or Patients Under Investigation (PUI):
    - i. PPE during admission: Surgical mask for all patients with symptoms or COVID-19+/PUI. Airborne precautions: N95 masks and droplet PPE (Gown, gloves, mask/face shield) for all healthcare workers (HCW).
  - b. Screen negative patients:
    - i. PPE during delivery: Surgical mask and droplet PPE (Gown, gloves, mask/face shield) should be used during all patients in the second stage. N95 Mask could be considered for the surgical team for any cesarean section as there is the potential risk of requiring intubation during the surgery. Provider discretion and individual MTF PPE availability can be considered.(153)

Table 5. Suggested PPE During Obstetric Care (153)

Care situation	Surgical mask	Droplet PPE (gown, gloves, surgical mask/ face shield)	N-95 mask or PAPR
Patient (cloth mask acceptable if no resp sx)	X		
Provider during routine encounters	X		
Provider during patient encounters with URI symptoms		X	
Provider during patient encounters with suspected or confirmed COVID-19		X	X

- c. Women who are COVID-19+ or PUI should wear a surgical mask at all times as clinically able.
- d. Women who are COVID-19+ or PUI should be placed in an isolation room. Airborne infection isolation rooms (negative pressure rooms), if available, can be used if performance of aerosolizing procedures is anticipated. In general, isolation rooms with droplet precautions are recommended.
- e. Proper donning and doffing of PPE takes time. Training in the use of PPE should emphasize safety of healthcare workers, recognizing that clinical response times may be slowed by these precautions.
- f. Proper donning and doffing procedures should be reviewed and practiced frequently; Recommend simulated patient transfers (e.g. from L&D to OR).
- g. Recommend posting diagrams and checklists in areas where donning and doffing will occur.
- h. Have an observer witness donning/doffing when possible.
- i. Anticipate emergencies as best as possible; plan ahead and proactively intervene for situations that could result in emergent cesarean delivery (e.g. Category II FHR), early peds notification.

#### 18. Considerations for VISITORS to L&D and ANTEPARTUM/POSTPARTUM

- a. One designated (healthy) support person during the entire admission, easily identifiable by L&D staff. Consider a colored wrist band for identification. Support person should be screened as above, wear a mask, and remain restricted to the patient room for mothers that are COVID-19 positive or PUI.
- b. No children < 16 years permitted.
- c. Additional visitors for end-of life situations or bereavement (e.g. IUFD) may be considered/evaluated on a case-by-case basis.
- d. All efforts should be made to limit the movement of COVID-19 positive/PUI women from one care area to another. Consider postpartum care in the same room as delivery if possible.
- e. If increased prevalence of disease and community transmission is present, individual MTFs could consider a no visitation policy to minimize potential exposure of staff and patients.

#### 19. Anesthesia Considerations for Intrapartum Care

- a. Recommend early epidural to minimize need for general anesthesia in the event of an emergent cesarean.
- b. COVID-19 is not a contraindication to neuraxial anesthesia.
- c. Anticipate emergencies as best as possible; plan ahead and proactively intervene for situations that could result in emergent cesarean delivery (e.g. Category II FHR tracing).
- d. Recommend limiting exposure of trainees to COVID+/PUI, with experienced staff providing care.

#### 20. Postpartum Care

- a. Women should be notified that in order to limit the risk of infection to themselves, staff and other patients, mothers and infants should be discharged in an expedited and safe fashion. Vaginal deliveries – goal of discharge on postpartum day 1 (same day for select women). Cesarean deliveries – goal of discharge on postpartum day 2. Home blood pressure monitoring devices may be needed.
- b. All postpartum visits, including wound checks, should be via telehealth. Can optimize by uploading photos through EMR/patient portals.

#### 21. Obstetric medications

- a. Use caution and consult a MFM physician prior to using Indomethacin, Nifedipine, or Terbutaline.
- b. Betamethasone/Dexamethasone for fetal maturation – given the association between steroids and worsening morbidity of viral pneumonia, specifically COVID-19, steroids for fetal maturation should be used judiciously. **AVOID late preterm steroids 34-46 weeks** in COVID+/PUI patients.

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- c. Magnesium sulfate is recommended for fetal neuroprotection for anticipated preterm delivery <32 weeks or for seizure prophylaxis for preE with severe features. Given potential respiratory complications, ***use judiciously in the setting of severe respiratory symptoms***. Magnesium sulfate may be used in patients with mild-moderate symptoms, may consider single 4 gm bolus.
22. **Pregnant patient work restrictions:** Delivery is a unique scenario in the COVID-19 pandemic. Hospital admissions for delivery are anticipated around the patient's due-date. In anticipation of hospital admission for delivery, if feasible and mission permitting, consider having pregnant women work from home at 37 weeks (2 weeks prior to 39 weeks or 2 weeks prior to anticipated delivery), and practice strict social isolation during this time. (153) Strict social isolation is encouraged for the entire family unit. The goal is to limit risk of exposure around the time of delivery. Depending on mission requirements and increasing disease burdens, such accommodations may not be possible but should be considered.(153)
23. **Pregnant health care workers:** Facilities consider limiting exposure of pregnant healthcare personnel (HCP) to patients with confirmed or suspected COVID-19 infection, especially during higher-risk procedures such as aerosol generating procedures (intubation, extubation, BiPAP, high flow nasal cannula, nebulized medications and second stage of labor) if feasible based on staffing availability. With ongoing stresses in the MHS and increasing disease burdens, such accommodations may not be possible.

### **Caring for Infants and Mothers with COVID-19: IPC and Breastfeeding**

1. Current evidence is inconclusive about in utero transmission of SARS-CoV-2 from mothers with COVID-19 to their newborns. Vertical transmission does not appear to occur, but perinatal infection leading to severe manifestations has been documented. It is unknown whether newborns with COVID-19 are at increased risk for severe complications, but transmission after birth via contact with infectious respiratory secretions is a concern.(157)
2. To reduce the risk of post-natal transmission from mother to infant, the CDC and American Academy of Pediatrics recommends consideration of temporarily separating a symptomatic PUI or COVID-19 positive mothers from her infant (e.g. separate rooms). In the absence of more definitive data, this decision should reflect an individualized risk - benefit consideration for the mother and infant, cognizant of the potential for delayed maternal-child bonding and impaired breastfeeding. This will require an additional healthy (non-infected) adult to care for the infant while separated from mother.
3. COVID-19 positive postpartum mothers as well as postpartum PUIs will be counseled about the risks and benefits of colocation vs. separation.
  1. If a postpartum PUI mother elects to be separated from infant and then her test is negative for COVID-19, the mother and infant can be reunited and 'room in.'
  2. Postpartum COVID-19+ or PUI mothers who elect to co-locate (also referred to as 'rooming in') with their infants should be instructed to wear a facemask at all times. They will also practice hand hygiene before each feeding and wear gloves during infant contact. They will also be encouraged to wash any skin that may come in contact with the infant (e.g. breasts, chest, arms, etc.). They will be encouraged to limit other close contact with the infant(s) and a separate non-infected caregiver should be present to help care for the infant. This separate non-infected caregiver should perform a majority of the infant's care. While not breastfeeding, infants should be kept greater than 6 feet away from the mother within the room, per CDC guidance.

### **Pumping / Expressed Breast Milk (158)**

1. Mothers who wish to breastfeed should be provided with a dedicated breast pump.  
(<https://consultqd.clevelandclinic.org/managing-pregnancy-during-the-covid-19-pandemic/>)
2. Postpartum patients who are pumping should follow CDC guidelines on equipment use and feeding.
3. Collecting Milk:
  - a. Wipe the surface where syringes/bottles will be placed after collection with a germicidal disposable wipe, and cover surface with clean paper towel or cloth.
  - b. Mother will wash hands and breasts before use and cleaning equipment before and after use. Mother will wear a mask while pumping.
  - c. Mother collects breast milk by hand or by pump into clean syringes or bottles then ensures

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syringe/bottle cap is secured. The outside of the container will be wiped with a germicidal disposable wipe. A label is then placed to identify date, time, and patient.

- d. Transport and storage of breast milk from isolation room to common refrigerated storage should follow strict infection control procedures per hospital policy.

### **Infants**

1. Infants born to mothers with confirmed COVID-19 should be considered PUIs.
2. All infants born to mothers with suspected or confirmed COVID-19 should, if the infant's clinical condition allows, be bathed immediately following delivery.
3. If local resources allow, PUI infants should be tested at ~24 hours with repeat testing at 48 hours.
4. All elective procedures to include circumcision should be deferred while infant is a PUI.
5. If hearing tests can be performed outpatient, it is acceptable to defer until COVID-19 testing is negative. If it is not easily available outpatient, ensure proper disinfection measures are used when cleaning audiology equipment.

### **Neonatal Intensive Care Unit (159)**

1. COVID-19 positive postpartum mothers and their household contacts should not be allowed to visit in the NICU until they meet the following requirements:
  - a. Resolution of fever without antipyretics for 72 hours.
  - b. Improvement in respiratory symptoms
  - c. Negative results of a molecular assay for detection of SARS-CoV-2 from at least 2 consecutive nasopharyngeal swab specimens collected at least 24 hours apart.
2. Any infant who has symptoms that meet criteria for NICU admission will be assessed by the NICU team and admitted to a COVID-19 cohort pod or other segregated section of the unit.
3. For care teams assigned to infants requiring CPAP, SiPAP or undergoing aerosolizing procedures such as intubation, full PPE including N95 (or PAPR), eye shields, gown, hair cover, and gloves should be worn when caring/handling the infant.
4. Patients requiring nasal cannula or those who are intubated on mechanical ventilation (closed circuit) require contact/droplet precautions when handling to include surgical mask, gown, hair cover, and gloves.
  - a. Per WHO guidance for clinical management of COVID-19, "newer high-flow nasal cannula (HFNC) and non-invasive ventilation (NIV) systems with good interface fitting do not create widespread dispersion of exhaled air and therefore should be associated with low risk of airborne transmission." These patients could be cared for with contact/droplet precautions only (to include facemask) but could consider N95 (or PAPR) if readily available.

### **Newborn Visitation**

1. No visitors experiencing cough, fever, or shortness of breath should be allowed in any care setting.
2. For NICU: COVID-19 positive persons or their household contacts should not be allowed to visit until they meet the following requirements:
  - a. Resolution of fever without antipyretics for 72 hours
  - b. Improvement in respiratory symptoms
  - c. Negative results of a molecular assay for detection of SARS-CoV-2 from at least 2 consecutive nasopharyngeal swab specimens collected at least 24 hours apart.
  - d. Entrance to other family support personnel should be determined on a case-by-case basis.
3. For Labor and Delivery, Post-partum / Newborn Nursery: each COVID-19 positive or PUI postpartum mother may be allowed to have one support person with her who must remain with her throughout the admission. This support person should be isolated to the post-partum room and not traveling elsewhere in the hospital.
  - a. If the mother chooses to co-locate with the infant, the support person should help with infant care.
  - b. If the mother chooses to be separated from her infant, the support person may help with the infant's care when they are brought to the room.
  - c. AAP recommends that well newborns, defined as negative molecular testing and asymptomatic, can receive circumcision. Newborns who are PUIs are not eligible for elective circumcision.



## **Newborn Discharge**

1. After hospital discharge, a mother with COVID-19 is advised to maintain a distance of at least 6 feet from the newborn, and when in closer proximity, to use a mask and hand-hygiene for newborn care until:
  - a. She is afebrile for 72 hours without use of antipyretics; and
  - b. At least 7 days have passed since symptoms first appeared.
2. A mother with COVID-19 whose newborn requires ongoing hospital care should maintain separation until:
  - a. She is afebrile for 72 hours without use of antipyretics; and
  - b. Her respiratory symptoms are improved; and
  - c. Negative results are obtained from at least two consecutive SARS-CoV-2 nasopharyngeal swab test collected  $\geq 24$  hours apart.

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcare-guidance.html>

University of Washington Handling of Breast Milk of COVID-19 Mothers (<https://covid-19.uwmedicine.org/Pages/default.aspx>)

<https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/>

## **Caring for Children with COVID-19**

1. Children (0-18 years) with COVID-19 are more likely to remain asymptomatic or have mildly symptomatic disease. Severe symptoms requiring admission for supplemental oxygen have been described in up to 10% of symptomatic children, particularly those under the age of 5, with the highest risk in those under 12 months of age. The mortality rate appears to be extremely low. As of 2 April 2020, there have been 0 pediatric deaths in Italy (age <19 years) and 1 pediatric death in Spain (age <14yrs old) due to COVID-19. Sporadic reports of infant and child deaths in the United States have occurred in the lay press. One study out of China reported only one death in 2,143 pediatric patients with COVID-19.(21)
2. The intersection with chronic pediatric respiratory conditions such as asthma, cystic fibrosis, and chronic lung disease, and with the attendant increased risk of severe disease, is unknown.
3. Respiratory virus co-infections and secondary bacterial infections are possible. In addition, the detection of a non-COVID-19 virus does not exclude COVID-19 infection. There are anecdotal, but as yet unpublished reports from Seattle Children's Hospital of co-infection with Rhinovirus/Enterovirus but the clinical impact is unknown.
4. During periods of community transmission and in the absence of targeted therapy for mild and moderate disease, the decision to test children for SARS-CoV-2 is driven by resource availability, infection prevention and control principles, and epidemiologic contact tracing or hot-spot case finding.
5. Pediatric symptoms, if present, are similar to common viral respiratory infections with a majority of symptoms affecting the upper airway. This differs from adults, who tend to have lower respiratory symptoms most prominent. (18, 21)
  - a. Fever 80-95% – majority <24hr duration (for COVID-19, CDC defines fever as 100°F)
  - b. (Dry) cough 45-80%
  - c. Myalgias or fatigue 10-45%
  - d. Pharyngitis 10-40%
  - e. Rhinorrhea and/or congestion 10-30%
  - f. Diarrhea 10-20%
  - g. Dyspnea or hypoxemia 5-10%
6. Most labs are normal to include inflammatory markers (ESR, CRP), chemistries, kidney and hepatic function. White blood cell count is typically normal but may be low. Procalcitonin may be elevated but might suggest co-infection.(67)
7. When imaging is abnormal in children with COVID-19, CXR reveals non-specific increased lung markings or patchy infiltrates, and chest CT reveals glass opacities and halo signs.(67)
8. Treatment of severe disease remains supportive, to include critical care interventions as required. Enrollment in clinical trials, or compassionate use of experimental therapies, should be considered for children with severe disease just as they would be for severely affected adults. There is no evidence to suggest that prophylaxis is necessary or effective for the majority of children.
9. Remdesivir is available from the manufacturer for children <18 years as compassionate use (see adjunctive therapies section above for more information).

### ***Clinical Management of COVID-19***

10. Children appear to efficiently shed the virus, even if asymptomatic. RNA viral load is detectable in respiratory secretions for up to 2 weeks and in stool for up to 4 weeks.(160, 161)
11. Given the prolonged duration of shedding of respiratory viruses in children, during periods of community transmission of SARS-CoV-2, it may be prudent to assume symptomatic children are infected, unless proven otherwise from an infection control standpoint - an issue particularly relevant to caregivers from vulnerable risk populations.

### **Caring for Older Persons with COVID-19**

1. COVID-19 can result in severe disease and death among older adults. Data from China and Italy suggest that the majority of deaths have occurred among adults aged  $\geq 60$  years, especially those with underlying health conditions. In the United States, 8 out of 10 deaths have been in adults above age 65. Mortality rates in patients  $> 85$  have ranged 10-27%, and 4-11% among patients 65-84 years.(48,162)
2. Older adults, especially those that are frail and have multiple comorbidities, may not present with the typical syndrome of fever, fatigue, or cough. Atypical presentation of disease includes tachypnea, delirium, malaise, myalgias, and diarrhea early in the disease course; fever was not as prominent in several cases.(163)
3. Older adults are the highest risk patient group.
4. Have a high index of suspicion for COVID-19 in those patients not at their baseline, especially those residing in long term care facilities who present with respiratory difficulties, changes in vital signs other than temperature or other signs of infection or sepsis.
5. Ensure that care for the older adult and severely ill is in keeping with their goals of care, advance directives and patient and family wishes.
6. Conversations regarding goals of care should continue to be part of routine care.
7. Patients should be informed about their condition & their prognosis (if desired), in a way easy to understand.
8. If the patient is unable to communicate meaningfully, ensure that a surrogate decision maker or health care agent has been identified in accordance with state law based on facility location.
9. All providers should provide basic symptom management, perform routine discussions about goals of care and code status in seriously ill patients. If complex symptom management or difficult discussions surrounding goals of care or code status arise, consult a palliative medicine subspecialist if available at your institution.
10. Symptom management: Aggressive control of symptoms such as pain, dyspnea, or other symptoms relieves unnecessary suffering, which is crucial for all patients regarding of age, function, comorbidities and prognosis.
  - a. *Pain*
    - Acetaminophen should be used first, typically 500mg every 6 hours as needed.
    - If acetaminophen is insufficient, and other modalities such as topical agents are ineffective, start an opioid for moderate to severe pain (drug, dose, route, and frequency should be individualized and based on symptom severity, kidney/liver function and prior opioid exposure: See Table 7). Consider local supply in drug selection to mitigate risk of drug shortage.
    - Start a stimulant laxative, such as Senna 8.6mg PO daily, if prescribing an opioid to prevent constipation. Titrate to effect. Escalate bowel regimen as needed, with a goal of one soft bowel movement at minimum every other day.
  - b. *Dyspnea*
    - If providing supportive care and supplemental oxygen is ineffective for management of severe dyspnea, a low-dose opioid may be used to help alleviate symptoms.
11. Communication challenges may be exacerbated by the use of PPE. In patients with sensory impairments it is important to remember to eliminate or minimize background noise, state information slowly, and avoid yelling. It may be helpful to display information in writing. Hearing aids/glasses should be worn if available.
12. Older adults, especially those with cognitive impairment, when ill, hospitalized, or placed in a new environment may become anxious, agitated or less interactive. Delirium, a diagnosis not exclusive to older adults, manifests as acute onset inattention, disorganized thinking and an altered level of consciousness. Delirium may be seen any patient, especially those with severe infection, and those requiring mechanical ventilation. Hyperactive delirium (delirium with agitation) may make management and risk mitigation challenging in those diagnosed with COVID-19. (164)

### **Clinical Management of COVID-19**

- a. Early recognition and management of delirium is important. Regular delirium screening should occur using validated methods such as the Confusion Assessment Method, bCAM, or the 4AT ([www.the4AT.com](http://www.the4AT.com)). (165, 166)
  - b. Risk factors for delirium include older age, sensory impairment (vision and hearing), history of dementia, nursing home patients, and those with serious infection. (167)
  - c. Management of Delirium: (168, 169)
    - Prevention of delirium is the best strategy. Strategies include maintaining normal circadian rhythms, exposure to natural light, regular reorientation, mobilization, treating pain, fever, and nausea, maintaining oxygenation, avoiding constipation and urinary retention, and performing medication reconciliation to minimize potentially inappropriate medications. Ensure basic needs are met for food and water.
    - Standard non-pharmacological approaches such as frequent reorientation, family at bedside, hospital environmental manipulation (maintenance of day/night cycle, appropriate use of TV and lights), calming music, phone calls from family, and professional sitters should be employed but may not be feasible in an isolation setting.
    - In patients with hyperactive delirium, try nonpharmacological techniques first.
    - Current evidence does not support routine use of antipsychotics in management of delirium. (170)
    - If severe agitation occurs, and nonpharmacological approaches have not been effective or more rapid control is needed for the safety of the patient or others, antipsychotics may be used but are off-label. When using an antipsychotic, use the lowest effective dose for the shortest amount of time. Of note, all antipsychotics carry a FDA Black Box warning due to an increase in mortality when used in patients with dementia. The patient should be monitored closely for side effects such as QTc prolongation and over sedation.
      - Some examples of antipsychotics are Quetiapine 25mg - 50mg PO, Olanzapine 2.5mg - 5mg PO/IM, and Haldol 0.25mg - 1mg IV
  - d. Cautious use of antipsychotic medication is needed especially in patients with movement disorders such as Parkinson's disease and Lewy Body Dementia as this class of medication may exacerbate extrapyramidal symptoms. Quetiapine is preferred if antipsychotic medications are needed in patients with movement disorders given its lower risk of extrapyramidal symptoms. (171) Any patient is at risk for acute dystonic reaction to antipsychotic medications.
13. Many older adults will recover from their illness, and it is important to not forget other complications such as hospital-associated deconditioning, falls and wounds. Standard of care should be provided for these other common complications alongside supportive care for COVID-19. Prompt mobilization and therapy should be started, when able, in accordance with infection control practices. Focusing on other treatable conditions should continue alongside supportive care for COVID-19.

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## **PALLIATIVE MEDICINE DURING THE COVID-19 PANDEMIC**

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Palliative medicine can assist at all stages of contingency/crisis planning. Prepare for increased use of symptom management resources including opioids (morphine IV and PO, hydromorphone IV and PO, oxycodone PO, fentanyl IV and transdermal), and benzodiazepines. Consider dedicated space for end-of-life care beds. Where possible, symptom management resources should be de-conflicted with highly utilized intensive care medications use to prevent and adapt to shortages (e.g. consider higher use of non-opioid sedation in the ICU to preserve opioids for palliation in active dying and ventilator de-escalation use).

### **Goals of Care Discussions**

(Adapted from [vitaltalk.org](http://vitaltalk.org) COVID-19 Open Source Resources. [www.vitaltalk.org](http://www.vitaltalk.org))

1. Eliciting a patient's goals of care is integral to providing the best and most appropriate medical care and can improve resource allocation during a time of scarcity. Engage patients proactively in goals of care discussions informed by personal values and clinical context.
2. Treat patients and their families with respect and compassion. Quickly and effectively elicit a patient's concerns, values, and preferences with a few key statements. Table 6 offers suggestions and examples to help guide your conversations.

Table 6. Difficult Conversations and Scripts for Communicating with Patients and Families

What the patient/family says	What you may say
<b>Admitting a Patient</b>	
How bad is this?	<ul style="list-style-type: none"> <li>From the information I have now and from my exam, your situation is serious enough that you should be in the hospital. <b>We will know more in the coming hours to days</b>, and we will update you. Who else should know about your/their situation and how will they know?</li> </ul>
Is my grandfather going to make it?	<ul style="list-style-type: none"> <li><b>I imagine you are scared.</b> Here's what I can say: because he is 90, and is already dealing with other illnesses, <b>I worry that he is at risk of dying if this worsens in the hospital. While it is too soon to say for certain, what worries you most about that?</b></li> </ul>
Are you saying that no one can visit me?	<ul style="list-style-type: none"> <li><b>I know it is hard to not have visitors.</b> The risk of spreading the virus to other vulnerable people is so high that <b>they and those they contact will be in more danger if they come into the hospital.</b> I wish things were different.</li> </ul>
How can you not let me in for a visit?	<ul style="list-style-type: none"> <li>The risk of spreading the virus is so high that I am sorry to say we cannot allow visitors. We can help you be in contact electronically. <b>I wish I could let you visit, because I know it's important, but it is not possible now.</b></li> </ul>
<b>When things aren't going well, goals of care discussion, code status discussions</b>	
I want everything possible. I want to live.	<ul style="list-style-type: none"> <li>We are doing everything we can. This is a tough and scary situation for many of us. Could we step back for a moment so I can learn more about you? <b>What do I need to know about you to do a better job taking care of you?</b></li> </ul>
I don't think my grandfather would have wanted this.	<ul style="list-style-type: none"> <li>Well, let's pause and talk about your concern. <b>Can you tell me what we should know to take the best care of him?</b></li> </ul>
I don't want to end up being a vegetable or on a machine.	<ul style="list-style-type: none"> <li>Thank you, it is very important for me to know that. <b>Can you say more about what you mean?</b></li> </ul>
I am not sure what my grandfather wanted – we never spoke about it.	<ul style="list-style-type: none"> <li>You know, many people find themselves in the same boat. This is a hard situation. To be honest, given his overall condition now, I worry that further treatments may not be successful in preventing him from dying. <b>In a situation like that, I have recommended that we allow a natural death.</b> That could be hard to hear. What do you think?</li> </ul>
<b>When coping needs to be boosted, or emotions are running high</b>	
I'm scared.	<ul style="list-style-type: none"> <li>This is such a tough situation. <b>I think anyone would be scared.</b> Could you share more with me?</li> </ul>
I need some hope.	<ul style="list-style-type: none"> <li>Tell me about the things you are hoping for? <b>I want to understand more.</b></li> </ul>
You people are incompetent!	<ul style="list-style-type: none"> <li>I can see you are not happy with things. <b>I am willing to do what is in my power to improve things for you.</b> What could I do that would help?</li> </ul>
I want to talk to your boss.	<ul style="list-style-type: none"> <li>I can see you are frustrated. <b>I will ask my boss to come by as soon as they can. Please realize that they are juggling many things right now.</b></li> </ul>
Do I need to say my goodbyes?	<ul style="list-style-type: none"> <li>I'm hoping that's not the case and I worry time could indeed be short. <b>What is most pressing on your mind?</b></li> </ul>

## Symptom Management Guidelines

(Adapted from BC Centre for Palliative Care COVID-19 Resources and Information, [bc-cpc.ca/cpc/](https://bc-cpc.ca/cpc/))

1. Patients with COVID-19 infections experience many of the same symptoms as other patients: dyspnea, oral secretions, anxiety and pain. Symptom management should be individualized based on clinical status. The following recommendations are initial guidelines and will require titration and adjustment based on patient response or progression of symptoms.

### a. Dyspnea – dyspnea can present as anxiety – treat the dyspnea!

- Non-pharmacologic management for shortness of breath:
  - Positioning
  - Cool room temperatures
  - Removing restrictive clothing
  - Avoid bedside fan for patients with COVID-19. Consider bronchodilator therapy (MDI preferred in COVID-19), fluid overload therapies (furosemide if fluid overloaded), and heart rate control if >120 BPM. The mainstay of comfort care in severe dyspnea is opioids--all opioids (morphine, hydromorphone, oxycodone, fentanyl) have the ability to relieve dyspnea and can be helpful for cough as well. Limit use of tramadol and codeine which are not as helpful.
- Pharmacologic management for shortness of breath:
  - Opioids help relieve acute respiratory distress and agitation and can contribute to energy conservation for mild-moderate dyspnea. When dosed effectively to control dyspnea, they do not contribute to a hastened death.
  - Treat and reassess. IV opioids works within 10-15 min, oral opioids within 30-45 min.
- Goals for treatment: respiratory rate <25, minimal use of accessory muscles, resolution of pursed

lip breathing, nasal flaring, and retractions or subjective dyspnea. O<sub>2</sub> sat is not a goal of treatment! Patient comfort is the goal.

- See Table 7 for recommended opioid dosing. If the dose does not work, increase it!

**b. Respiratory Secretions/Congestion Near End of Life**

- Discuss congestion and secretions with family and bedside staff. Pharyngeal secretions are normal at end of life and rarely require treatment. A productive cough may benefit from mucolytics or opioids (Table 6). The “death rattle” or “wind over waves” is a normal part of dying and is not uncomfortable for the patient. Limit oropharyngeal suction as this may cause the patient distress and provide no benefit-- secretions are usually far beyond the scope of a Yankauer. The noise is due to loss of normal swallowing as the body shuts down.
- Reduce or stop saline infusions which are no longer beneficial.
- Medications may include:
  - **Glycopyrrolate** 0.4 mg SQ/IV q4H PRN
- If severe and refractory to above medications, consider:
  - **Furosemide** 20 mg SQ/IV q2h PRN with close monitoring of response.

**Table 7. Opioid Dosing to Relieve Dyspnea and Pain in Adults**

Intermittent Dosing		
Dosing for Opioid Naïve Patient (patient not on opioid therapy) (For frail, elderly patients, begin at low end of any range)		
Morphine	•	15 mg tablet ½ to 1 tab PO q 3 hours prn <b>OR</b> 5 mg SQ/IV q1H PRN shortness of breath (SQ/IV can be given as frequently as q30min PRN)
Hydromorphone	•	2 mg tablet ½ to 1 tab PO q 3 hours prn <b>OR</b> 0.4-0.8 mg SQ/IV q1H PRN shortness of breath (SQ/IV can be given as frequently as q30min PRN)
	•	If more than 6 PRN doses of opioid in 24 hours: Consider a basal opioid such as MSContin 15 mg PO BID. If patient unable to make needs known, consider SCHEDULED dosing of the immediate release opioid (q4H or 6H for frail elderly) AND continue PRN dose.
TITRATE UP AS NEEDED for relief of dyspnea and/or pain		
Dosing for Patients ALREADY Taking Opioids		
Applies to any opioid	•	Continue previous opioid, consider increasing dose by 25%
	•	To manage breakthrough symptoms: Start PRN opioid at 10% of total daily (24 hour) opioid dose.
	•	PRN q1H for PO and q30mins for SQ/IV
PCA Infusion Dosing: For alert patients who need IV opioids (unable to take PO or with severe symptoms)		
PCA Infusion Pump Dosing for Opioid Naïve Patient NOT Already Taking Opioids		
Opioid	Bolus Dose	Basal Rate (if severe symptoms)
MORPHINE	1.5 mg q10mins	1-2 mg/hour
HYDROMORPHONE	0.2 mg q10mins	0.1 – 0.3 mg/hour
FENTANYL	20 micrograms q10mins	10-25 micrograms/hr

Titrate the basal rate and bolus dose to effect. If using more than 1 rescue dose/hour, increase the basal rate for improved symptom control

**PCA Infusion Pump Strategy for Patient ALREADY Taking Opioids**

- For patients on chronic opioid therapy, rotate their long acting medication into the basal rate of your PCA. Titrate to effect.
- Bolus doses may be given q10 to 15min PRN; if the patient is NOT able to use the button, add a nurse administered bolus order of 5 mg IV q 2 hour prn for morphine PCAs and 0.8 mg IV q 2 hour prn for hydromorphone PCAs.
- Example titration: You start a morphine PCA at 1 mg/hr basal rate with 1 mg q 15 minutes rescue. The patient presses the button every 15 minutes and says he “feels nothing” and continues to be short of breath. Increase the rescue dose to 2 mg and reassess.
- Adjust bolus doses to 50-100% of new continuous infusion rate (e.g. Bolus dose of 2-4 mg q15min PRN for new rate of 4mg/h).
- New rate can be reassessed for adjustment again in 3-4 hours.

**c. Anxiety**

- Patients with dyspnea will often have associated fear and anxiety-- opioids are the first line of treatment. The following adjuncts may be helpful in refractory anxiety:
  - **Lorazepam** 0.5 – 1 mg PO/IV q1-4H PRN, consider scheduling Q4H if goals are for comfort-directed care and the patient is requiring frequent PRN dosing.
- For severe anxiety or shortness of breath in the ICU:
  - **Midazolam** 1 – 4 mg SQ/IV q30min PRN, consider scheduling Q4H if goals are for comfort-directed care and the patient is requiring frequent PRN dosing.



**d. Delirium**

- Delirium, either hypoactive or agitation, is common in hospitalized patients and can be associated with significant distress of family members and bedside staff as well as increased risk of self-harm. Avoid benzos in this setting. Treat underlying causes of delirium if possible: urinary retention, constipation, dehydration, severe infection or pain.
  - **Haloperidol** 0.5 mg PO **OR** 0.5 – 1 mg IV q4H PRN. Consider scheduling the medication Q4H if requiring frequent PRN dosing. Titrate dose in 0.5mg increments.
  - **Olanzapine** 2.5 – 5 mg PO qHS and q8 hr PRN. This comes as a regular or oral dissolving tablet and can be titrated.

**e. Constipation**

- Use of opioids will cause constipation. If the patient has more than 24 hours to live:
  - Start a stimulant laxative, such as Senna 8.6mg PO daily if they are tolerating PO.
  - PRN enema if unable to take PO and patient uncomfortable from distention
  - Escalate bowel regimen as needed, with a goal of one soft bowel movement at minimum every other day.

**Palliative Ventilator De-Escalation**

*(Adapted from "Palliative Ventilator De-escalation Recommendations for COVID-19 Positive or PUI. Developed by Bartlett, Christi for The University of Kansas Health System)*

1. A subset of patients with COVID-19 infection will progress to refractory respiratory failure. Patients expected to die imminently should be transitioned to best supportive care ("comfort measures").
2. Have an open goals of care conversation with the patient, family and/or surrogate decision maker. Explain that despite medical interventions, the patient is nearing end of life. Palliative Medicine services throughout the Department of Defense are available to help guide these discussions if needed.
3. The endotracheal tube will remain in place and the ventilator circuit will remain intact to reduce the risk of COVID-19 exposure to bedside staff at the time of de-escalation. (Nota Bene: You are not "pulling the plug." You are providing comfort during the body's natural death.)
4. Pre-medicate with opioids as listed above in Table 7. Have additional medication ready at bedside should symptoms escalate.

**Pre-Procedure.**

1. Make arrangements with leadership to determine if any family will be allowed on the unit and discuss plan with family.
2. Prepare family that prognosis can be as short as a few minutes but as long as a few days. Patients who are COVID-19 positive with severe ARDS are likely on the shorter range.
3. Deactivate defibrillators first. A magnet can also be placed over the device if needed to deactivate. Consultation or discussion with a cardiology service may be necessary.
4. Ensure no paralytic medications are on board.
5. Code status should be DNR/ comfort measures only for patients at the end of life.
6. Discontinue tube feeds.
7. If patient is on dialysis, disconnect and remove machinery from room.

**Procedure.**

1. Confirm correct patient and plan for de-escalation with appropriate surrogate decision maker.
2. Turn off alarms and change room monitor to comfort care setting or turn off if family is present.
3. If a continuous opioid infusion is in place, continue THE SAME medication. All opioids contribute to relief of pain/dyspnea.
4. If the patient is already on a continuous opioid infusion, double current drip rate and order bolus doses of 100-200% of drip rate to be given q10min PRN. Use bedside infusion to provide boluses whenever possible.
5. If the patient is opioid naïve and not on a continuous infusion, begin with morphine 5mg IV or hydromorphone 0.5 – 1 mg IV q10min PRN. If possible, bring at least four doses into patient room for ventilator de-escalation.
6. Order midazolam 2-4 mg q10min PRN or lorazepam 2 mg q30min PRN for anxiety/breathlessness. If patient is already on a midazolam continuous infusion, double current rate and give boluses of 100-200% of drip rate available q10min PRN. Use bedside infusion to provide boluses PRN.

### ***Clinical Management of COVID-19***

7. Pre-medicate with an opioid bolus as above (100% of drip rate) 10 minutes prior to de-escalation.
8. Pre-medicate with 2 – 4 mg of midazolam 10-15 min or 1 – 2 mg of IV lorazepam or prior to de-escalation.
9. Recommend glycopyrrolate 0.4 mg IV q4H PRN for secretions.
10. If patient requires sedative medication (propofol, precedex, etc) for comfort, continue as ventilator is weaned.
11. Stop vasopressors prior to weaning ventilator.
12. Ensure that patient appears comfortable prior to reducing ventilator settings. Titrate to comfort to palliate signs of discomfort: grimacing, agitations, or labored respirations.
13. For agitation/delirium management, consider Haloperidol 0.5 – 1 mg IV q30mins PRN.
14. If patient is obtunded and expected to die abruptly after ventilator is weaned, recommend immediate reduction in ventilator settings to pressure support 5/5 and room air. Bolus opioid and benzodiazepine aggressively as needed to ensure comfort.
15. If the patient is alert, consider a gradual reduction in ventilator settings. Decrease FiO<sub>2</sub> to 40%, PEEP to 10, RR to 16. Recheck patient comfort and re-bolus opioids as needed to achieve comfort. Reduce to PEEP 5, and FiO<sub>2</sub> to 0.21.
16. Once the ventilator is set at PS 5/5 and FiO<sub>2</sub> of 21%, leave endotracheal tube in place and leave the ventilator circuit intact for the end of life.
17. Continue to re-bolus opioids, benzodiazepines and sedation as needed to ensure comfort.

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## **IMPLICATIONS OF COVID-19 ON SURGICAL CARE**

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### **Key Considerations for Surgical Operations and Personnel**

**Force Protection:** Protection of personnel and patients from disease transmission

**Mission Capability:** Maintaining capability to provide safe and effective surgical care when required

**Mission Support:** Support of the healthcare community response to COVID-19 through preservation of critical resources and re-deployment of personnel

### ***Surgical Decision Making and Triage.***

1. Elective surgical care should be restricted to reduce risks of transmission between patients and healthcare personnel. This includes outpatient clinical encounters, inpatient surgical procedures and all other interactions that can be accomplished through other means (virtual encounters, non-operative techniques) or deferred/delayed without unacceptable morbidity or risk.
2. MTFs should establish a review process to triage surgical care based on health protection conditions, patient factors, local and regional healthcare capacity, and logistic constraints. This process must be informed by day to day assessments of the changing environment, led by a senior surgeon, and include multidisciplinary representation.
  - a. Flexibility should be maintained to provide medically-necessary or time-sensitive surgical treatment such as cancer care, limb salvage, and infectious source control. The associated risk of COVID-19 transmission to patients and staff, availability of hospital resources, and potential increase in morbidity/mortality associated with delayed surgical care should be considered in the adjudication of these cases.
  - b. The time sensitivity, medical necessity, resource utilization, and expected post-operative inpatient care resources should be considered for each case at the local level, preferably the Department/Service Chief or, in the deployed setting, the senior trauma surgeon.
  - c. Given the known presence of asymptomatic viral shedding for COVID-19 infected individuals, MTFs should consider pre-operative screening and testing prior to performing surgery.
3. Additional guidance on surgical decision making and triage has been developed by the American College of Surgeons and can be found at: <https://www.facs.org/covid-19/clinical-guidance>.

### **Perioperative Care of COVID-19 Positive Patients and PUIs**

#### ***Overview.***

1. For purposes of perioperative care, patients should be treated as presumed COVID-19 positive if they have symptoms/exposure history that warrants testing. PUI patients at MTFs *without an urgent indication for surgery* should ideally be tested for COVID-19 before any operative intervention.

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- a. Emergency surgery (i.e. hemorrhage or contamination control) should NEVER be delayed for COVID-19 concerns.
  - b. Any surgical patients considered PUI should be medically managed to the greatest extent possible prior to surgery in order to allow time for confirmatory testing.
  - c. Optimally, an OR or cluster of ORs should be predesignated with a distinct antechamber to maintain separation from non COVID-19 patients. If a negative pressure OR is not available, consult with facilities to ensure air handling is routed through a HEPA filter.
  - d. In the deployed setting, when possible, designate a single OR for PUI/COVID-19 positive surgical care and minimize unnecessary supplies and equipment in that room. This surgical suite should undergo terminal cleaning after each case.
2. All patient interaction with COVID-19 positive or PUI patients will be performed with airborne and contact precautions, including eye protection:
    - a. N95 mask with surgical mask over the N95 mask, consider PAPR for aerosol generating procedures.
    - b. Eye protection consisting of goggles, full face shield/mask worn over N95, or plastic disposable wrap-around glasses. Eyeglasses alone are not adequate.
    - c. Gown, double gloves, hair cover, shoe covers
  3. Remove all PPE except N95 mask before exiting the room. Surgical scrubs should be changed after each case.

### ***Perioperative Care.***

1. Surgeries and procedures on COVID-19 positive patients and PUIs should occur in a negative pressure room or an OR equipped with HEPA-rated filters on all air outflow vents.
2. The anesthesia provider should attempt to remove all necessary medications and equipment from the carts prior to bringing the patient into the room. Avoiding contamination of the carts/machine should be prioritized over wasting consumable supplies.
3. Anesthesia providers should not expect routine breaks during the case. Consider leaving cell phones, smart watches, and other personal devices out of the OR. Ensure there's a way to communicate/call for assistance organic to the OR room.
4. Place a HME/HEPA filter between the Y-piece of the breathing circuit and the patient's mask, endotracheal tube or laryngeal mask airway. The gas sampling line must exit the circuit proximal (closer to the machine) than the filter. The ASA/APSF recommends adding a second HME/HEPA filter on the expiratory limb before entering the anesthesia machine.
5. For sedation cases, a procedural/OR mask should be placed on the patient over the oxygen source. If a gas sampling line is used to monitor end tidal CO<sub>2</sub>, ensure a filter is used prior to gases entering the machine. The filter found in most epidural kits may be placed in-line and provide adequate machine protection. For sedation procedures that instrument the esophagus (TEE, EGDs) and generate high volume aerosolized secretions, intubation may be the best way to limit room exposure. Alternately, a Procedural Oxygen Mask may limit room exposure where intubation is contraindicated.
6. When transporting a ventilated patient, ensure a HEPA filter is placed between the ETT and the Ambu bag. Connect the Ambu bag to the ETT prior to opening the door in the negative pressure room. Likewise, ensure the door is closed when returning the patient before switching to the ventilator. The same filter may also be used on the exhalation loop of the anesthesia machine.
7. For pediatric patients or patients in whom the additional dead space or weight of the filter may be problematic, the HEPA filter can be placed on the expiratory end of the corrugated breathing circuit before expired gas enters the anesthesia machine. Again, ensure the gas sampling line is protected from contaminating the anesthesia machine.
8. When transporting patients to and from the OR, a "clean" person who does not contact the patient should accompany the team to safely interact with the environment (e.g. open doors or elevators).
9. Patients on the ward should be transported directly to the OR by the anesthesia team. If assistance is needed with transport, every attempt should be made to use someone from the care team (nurse, surgeon, technician, etc.) to minimize staff exposure.

### ***Intraoperative Care.***

1. For sedation cases, a procedural/OR mask should be placed on the patient over the oxygen source. If a gas sampling line is used to monitor end tidal CO<sub>2</sub>, ensure a filter is used prior to gases entering the machine. The

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filter found in most epidural kits may be placed in-line and provide adequate machine protection. For sedation procedures that instrument the esophagus (TEE, EGDs) and generate high volume aerosolized secretions, intubation may be the best way to limit room exposure. Alternately, a Procedural Oxygen Mask may limit room exposure where intubation is contraindicated.

2. Use disposable covers whenever possible (e.g., plastic sheets for surfaces, long ultrasound probe sheath covers) to reduce droplet and contact contamination of equipment and other environmental surfaces.
3. When performing ***laryngoscopy and intubation***:
  - a. If a negative pressure OR is unavailable, consider intubating the patient in a negative pressure room and then transporting to the OR after intubation.
  - b. Wear full PPE.
  - c. Ensure all non-essential personnel are given the chance to leave the room if possible before performing the procedure.
  - d. Wear double gloves and shed outer gloves after intubation to minimize subsequent environmental contamination.
  - e. Designate the most experienced anesthesia professional available to perform intubation.
  - f. Consider rapid sequence intubation (RSI)/avoid awake fiberoptic bronchoscope (FOB)/avoid mask ventilation if possible.
  - g. Consider video laryngoscopy to maximize first-attempt intubations.
  - h. Ensure the HME/HEPA filter is attached to the exhalation limb or at the Y-piece of the circuit (sampling line should be post filter).
  - i. Outer gloves may be used to wrap disposable portions of airway equipment after use.
4. Continue to wear full PPE for duration of case.
5. Any external equipment (e.g., ultrasound machine, GlideScope, etc.) needed for the case should be draped to the greatest extent possible and not removed until the room is terminally cleaned.
6. Consider having a runner positioned outside the OR to pass medications and supplies into the room.
7. Routine breaks for OR personnel should be avoided to limit exposure and conserve PPE.
8. Cell phones, pagers, and personal effects should be left outside the OR to decrease cross-contamination. Ensure help can be obtained using the OR phone.

### ***Postoperative Care.***

1. Non-ICU patients should recover in a PACU negative pressure room. If a suitable recovery room isn't available, the OR may substitute until ready for Phase II.
2. Remove all PPE before exiting the room except N95 mask. Avoid touching hair or face & perform hand hygiene.
3. The room should be cleaned in accordance with the designated processes for terminally cleaning rooms for a highly infectious agent.
4. Once the patient has left the operating room, leave as much time as possible prior to subsequent patient care to allow removal of airborne infectious contamination. Consult with physical facilities for the air exchange of each procedural room and the wait time required to provide 99.9% efficiency.

### ***Additional Recommendations and Guidance.***

1. Recommend establishing ***Intubation Teams*** consisting of providers with a high degree of comfort with PPE and airway skills. Teams should bring their own PPE, intubating drugs, and airway equipment to avoid delays while limited or unfamiliar PPE is made available. During the pandemic, any emergency airway should be treated as potentially COVID-19 positive and full PPE worn.
2. Continual updates on the care of surgical patients during the COVID-19 pandemic can be found here: <https://www.asahq.org/in-the-spotlight/coronavirus-covid-19-information>

### ***Surgical Care of COVID-19 Positive Patients and PUIs***

1. Aerosol generating procedures (AGPs) are common to certain surgical specialties and techniques. These high-risk activities include:
  - a. **Laparoscopy** – In the absence of ultrafiltration of aerosolized particles in released CO<sub>2</sub>, laparoscopy carries a risk of spreading COVID-19, and should only be used in selected cases where clinical benefit substantially exceeds the risk of viral transmission (Intercollegiate Surgery Guidelines: <https://www.rcsed.ac.uk/news-public-affairs/news/2020/march/intercollegiate-general-surgery-guidance-on-covid-19-update>)

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- Depending on resources, consider selective initial non-operative management of acute uncomplicated appendicitis and cholecystitis with antibiotics. In evaluating the available resources, recognize that the failure rate of non-operative management of these diseases is not insignificant and may result in prolonged hospitalization. (Intercollegiate Surgery Guidelines: <https://www.rcsed.ac.uk/news-public-affairs/news/2020/march/intercollegiate-general-surgery-guidance-on-covid-19-update>)
  - b. **Endoscopy** – Endoscopic procedures should only be undertaken in an emergency, given the elevated risk of aerosol-based transmission.
  - c. **Head and Neck surgery** – Tracheotomy is a high-risk procedure for transmission of viral particles. Unless there is an emergent need for a surgical airway, elective tracheotomy should be postponed until the patient has stable pulmonary status, (not sooner than 2-3 weeks from intubation), and, preferably, with negative COVID-19 testing.(10)
    - If a tracheotomy is performed on a PUI/COVID-19 patient, routine tracheotomy tube changes should be delayed until after active disease resolves or the patient tests negative.
2. Operative planning
- a. Surgeons and non-essential staff should not be present in the OR for either intubation or extubation unless necessary for patient safety.
  - b. Only essential staff should be present in the OR during surgery, and should all be wearing enhanced droplet PPE at minimum.
  - c. Laparoscopy (SAGES: <https://www.sages.org/recommendations-surgical-response-covid-19/>)
    - CO<sub>2</sub> insufflation should be set to the lowest effective pressure, and a filtration device should be used for CO<sub>2</sub> release if available.
    - Release all pneumoperitoneum via filtration device (if available) prior to specimen removal, port removal, or converting to open surgery.
    - Avoid venting insufflation from the ports during surgery.
  - d. Open surgery
    - Electrocautery should be set to the lowest effective setting and a smoke evacuator used if available.
  - e. All PPE (except N95 mask) should be removed in the OR prior to exiting post-operatively. Surgical scrubs should be changed immediately at the conclusion of the case.
    - Cloth surgical caps should not be worn in PUI cases.
    - Shoes should be disinfected routinely after each case.
  - f. Chest tubes and surgical drains are all potential sources of aerosolized droplets, and enhanced precautions should be taken during placement, manipulation, or removal.

### **Trauma and Surgical Combat Casualty Care Considerations**

- 1. Deployed medical/surgical capability is a limited and mission-critical asset that must be preserved to reduce risk to the force and mission. To that end, all reasonable attempts should be made to preserve medical and surgical capability on the battlefield.
- 2. All trauma/injured patients should be presumed positive/PUI in the downrange setting until they can be ruled out (by testing or risk factor assessment).
  - a. Trauma team members should all wear airborne and contact precautions, including eye protection for PPE until the patient is ruled out for COVID-19.
  - b. Unnecessary individuals in the trauma bay should be minimized.
  - c. Individuals should remove all PPE (except N95 mask) prior to exiting the resuscitation area.
    - Any clothing worn in the resuscitation bay/ATLS area should be removed after PUI patient contact and immediately cleaned
    - Commanders should modify uniform requirements as necessary to allow for multiple rapid clothing changes to avoid cross contamination.
  - d. All equipment in the resuscitation bay and ATLS area (i.e. x-ray, ultrasound, instrument packs, etc.) must be terminally cleaned after every PUI encounter.
  - e. Non-intubated patients who cannot be ruled out for COVID-19 should have a surgical mask applied during transport between the resuscitation bay and CT scanner and during any transit within the facility.



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Patients requiring oxygen should have a non-rebreather mask applied instead of a simple face mask.

- f. All PUIs requiring admission should be kept in isolation rooms (if available) until ruled out or ready for discharge (to quarantine facilities).
3. Staffing risk reduction
  - a. Aerosol producing procedures should have only necessary staff members present in the room (i.e. intubation, chest tube placement, etc.), and all staff must wear enhanced droplet precaution PPE.
  - b. Each facility should consider options to minimize staff members entering the resuscitation area. This could include the use of runners or pass-through windows for deliveries from pharmacy, lab, etc.
  - c. All visitors should be restricted during the initial phase of resuscitation, and based on risk, maybe restricted throughout the entire hospitalization at the discretion of the Commander.
4. Consultations and therapies should be performed as needed and not delayed solely because a casualty is pending COVID-19 rule-out. This includes specialty and subspecialty consultations, routine nursing care (i.e. pressure injury reduction, oral care, etc.), radiology, lab analyses, and physical/occupational/speech therapy.

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## **OPERATIONAL CONSIDERATIONS FOR COVID-19: PLANNING AND PREPARATION**

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Providing safe and effective care in the deployed setting during an infectious disease pandemic is particularly challenging given limited resources, close living conditions, and delays in test results and supply arrival. The DOD GCP PI & ID 3551-13 provide a wealth of information, guidelines, and mitigation strategies for a pandemic, but are not tailored to the risks, needs and nuances of COVID-19. This section focuses on the unique aspects of dealing with the COVID-19 pandemic in the deployed environment. Collaboration between base commanders and medical teams is an essential component of pandemic response to limit infection spread while caring for the ill and injured.

### **Division of Labor for Quarantine and Isolation.**

1. Quarantine: This is a *medically-supported command function* to separate high risk individuals from the general population following a potential exposure. Commanders are responsible for establishing and maintaining quarantine facilities within their area of responsibility (AOR), and each unit is responsible to identify at-risk personnel based on best medical guidance.
2. Isolation: This is a *command-supported medical function* to care for those with infection. These patients are identified by symptoms (i.e. fever, cough, dyspnea, diarrhea, etc.) following an exposure (typically within the past 14 days), and may be identified de novo or from quarantine. The duration of isolation is defined by resolution of symptoms and negative testing. Because service members are not deployed with a family, even mildly symptomatic patients, who would typically be returned to the care of their family in the garrison setting, become the responsibility of the medical team.

### **Physical Requirements and Logistics of Quarantine and Isolation.**

1. Quarantine: Quarters must be provided for persons suspected of having exposure to COVID-19 in an effort to prevent spread of the disease to other service members (SM). These quarters must be separate from the general population and must have their own dedicated toilet and shower facilities. Meals must be provided to quarantined individuals, and they must be checked regularly (i.e. via telephone) to ensure they remain asymptomatic. If symptoms develop, medical personnel should be notified to arrange evaluation and potential transfer to medical isolation. Quarantined individuals should remain in their designated quarters unless directed otherwise. Personnel should be designated to do laundry for quarantined individuals. Dirty laundry should be placed in a sealed disposable plastic bag by the quarantined member and then handled with gloves by laundry personnel. Laundry should be placed in the washing machine without handling the clothes, and the bag discarded in an appropriate receptacle. Asymptomatic PUIs typically should remain quarantined for 14 days. The 14 day quarantine resets if any member of the quarantine group develops symptoms, has a positive test result, or with any new addition to the quarantine group. Any member who develops symptoms or receives a positive test result should be immediately evaluated and moved to medical isolation. To avoid excessively prolonged quarantines, every effort should be made to keep quarantined individuals in the smallest possible groups; individual quarters are the ideal quarantine environment. Any

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personnel interacting with or evaluating quarantined individuals must wear appropriate PPE.

2. **Isolation**: Patients who become symptomatic or test positive should become the primary responsibility of the medical team. Medical teams will need to plan for patient monitoring, treatment, housing, meal, and hygiene facilities. Based on the demand, commanders may need to consider assigning additional non-medical personnel to assist with these tasks. Isolated patients should be classified by symptoms as asymptomatic, mild, moderate, or severe, which will determine the required level of care. Any personnel interacting or evaluating patients in isolation must wear appropriate PPE.
  - a. **Asymptomatic/Mild Symptoms**: In CONUS locations these patients may be sent home for self-care and outpatient follow-up. In the deployed setting family support is absent and self-isolation is not feasible, so medical teams should coordinate with command to establish appropriate isolation housing with routine medical oversight and documentation. Symptom progression should result in medical reevaluation. There must be a clear and universally-accessible communication plan for notifying the duty medical personnel of a change in patient condition.
  - b. **Moderate Symptoms**: These patients require hospital ward admission. These facilities may be located within the MTF or established separately near the MTF; if available, negative pressure facilities should be reserved for aerosol producing procedures. A COVID-19 positive patient should not share a room with a non-COVID-19 patient.
  - c. **Severe Symptoms**: These patients require ICU admission for hemodynamic monitoring/treatment or severe respiratory symptoms. ICU care should be performed where the greatest medical capability exists, but should not result in joint cohorting of COVID-19 positive/negative patients. Negative pressure facilities should be used (if available) during aerosol producing procedures.

### **Unique Limitations in the Austere Environment**

1. **Ventilator**: COVID-19 may result in ARDS which can be challenging to manage even with the best facilities and equipment; in the deployed setting, providers may only have transport ventilators with limited capabilities. It is important to recognize this limitation and prepare accordingly. Medical teams should train and exercise protocols for prone positioning and pharmacologic paralysis which have proven mortality benefit if used early in ARDS.
2. **Medications**: At present, there is no specific treatment for COVID-19. Deployed providers may not have access to compassionate use or trial medications, and should be familiar with the supportive care measures described elsewhere in this document. Additionally, the Society of Critical Care Medicine, ARDSNet, and other professional societies provide continuously updated guidelines on their websites. Providers should work closely with pharmacy and logistics leadership to ensure adequate stocks of all commonly required medications, including antimicrobials, sedation, and paralytics.
3. **PPE**: Supply chain challenges have led to PPE shortages worldwide. Fortunately most units are deployed with CBRNE equipment which can be used for filtration and staff protection. Staff must be proficient at proper donning, doffing, and cleaning techniques.
4. **Hygiene**: The austere environment lends itself to rapid spread of infectious disease. Commands should emphasize the importance of handwashing/sanitizing, cleaning quarters, and appropriate social distancing.
5. **Testing**: Epidemiologic data is critical for command decision making, therefore commanders may need to divert resources to ensure rapid case identification and intervention. MTFs should not use non-DOD laboratories for testing unless approved by their AOR HQ.
6. **Transportation**: Units must coordinate with PMC to ensure safe and efficient movement of patients and/or testing samples around theater. Patients should be treated in place unless their clinical condition necessitates a higher level of care; unnecessary patient movement should be avoided to minimize personnel and resource exposure and transmission risk.
7. **Housekeeping and Cleaning Services**: Cleaning protocols must be established to ensure adequate sanitization occurs in quarantine, isolation, and medical facilities, as well as workspaces and quarters of those moved to quarantine/isolation status. PPE should be worn by cleaning personnel and disposed of in a manner that avoids the potential for cross-contamination.
8. **Mortuary Affairs and Casualty Liaison Teams**: While the COVID-19 mortality rate is expected to be low in the typical deployed population, teams should be prepared for increased demands and requirements.

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## **MENTAL HEALTH AND WELLNESS IN COVID-19 CLINICAL MANAGEMENT**

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### **General Considerations for Healthcare Workers, Support Staff, and other Frontline Workers**

1. Prioritize healthy routines (i.e., nutrition, hydration, sleep, exercise).
2. Social distancing, infection control, and isolation present a significant barrier to our usual approach to care, requiring innovative approaches.
3. Communication – words matter now more than ever. Clear and consistent messaging from leadership, between team members, and to patients and family is vital during this crisis.
4. The psychological consequences of this pandemic will be experienced in the present and will have lingering effects on many in society.
5. Resources for leaders in support of Healthcare Workers can be found at: <https://www.cstsonline.org/covid-19/supporting-healthcare-workers>

### **General Mental Health Care for Patients with known or suspected COVID-19**

1. Use telehealth and virtualization tools as much as possible for mental health assessments and ongoing care of isolated patients. Promptly identify all COVID-19 patients with known mental illness and consult behavioral health to assist with ongoing care.
2. Recognize isolation as a barrier to communication. Patients should be kept informed as to what is happening, what is likely to happen, and next steps in their care.
3. Give patients information and a sense of control in the midst of a stressful and confusing situation. Consider virtual approaches to making regular updates to patients.
4. Anticipate patient concerns and misconceptions. Common themes include “what if I can’t get a ventilator when I need one?”, “what if I infected my family?”, “will I die alone?”, and external stressors such as job loss or housing insecurity.
5. Healthcare systems should establish easily accessible pathways for referrals to mental health for family members of patients admitted for COVID-19.
6. Attend to negative impacts of isolation by facilitating virtual connection with providers, family, and loved ones as much as possible.
7. Resources to help in caring for Patients and Families can be found at: <https://www.cstsonline.org/covid-19/caring-for-patients-and-families>

### **For Medical Providers**

1. Self-care is important for providers, patients, and families. Basic needs such as proper sleep, nutrition and hydration, regular exercise, and regular breaks sustain performance and enhance decision-making.
2. Connect to a sense of unified purpose; foster hope, fortitude, and tolerance in self and others.
3. Amplify positive stories and stories about competent efforts by self and colleagues. Encourage perceptions of competence among staff, especially junior and/or less experienced colleagues.
4. Recognize and attend to signs of burnout in self and others – out of character sadness, frustration, irritability, isolation/disconnectedness, substance use, and lack of self-care.
5. Focus on what can be controlled – checklists, routines, self-care; and accept what cannot be controlled.
6. Promote a climate where it is acceptable for team members to talk about difficult events (death, triage, errors), as avoidance and fear of such thoughts are associated with greater long-term mental health problems.
7. Establish a routine of regular team meetings as an opportunity to pass good information, but also as an opportunity for an emotional check. Maintain a climate where it is okay to not be okay and offer peer support when needed.
8. Identify a team member with the responsibility for communicating with family, particularly sharing bad news or death notification. Consider rotating this responsibility.
9. Resources for Healthcare Worker Self Care can be found at: <https://www.cstsonline.org/covid-19/healthcare-worker-self-care>

### **For Mental Health Providers**

### ***Clinical Management of COVID-19***

1. Provide proactive support to front line workers where possible. Ideally, in the form of a behavioral health outreach team with established relationships to points of contact to facilitate increased utilization of outreach team during times of peak stress. Teams should be organized to ensure rounds occur for every shift every day.
2. Be certain not to overlook groups such as janitorial staff, transport, food service, and others who make the medical system run, and who are likely experiencing significant distress.
3. Behavioral health care teams should be empowered to facilitate additional mental health care for those in need, especially those who have had negative experiences.
4. Tailor resources and support as much as is feasible – and plan on changing/adapting resources with the unfolding realities of the medical mission. Flexibility is important.
5. Supportive care of healthcare workers is different from usual clinical care, and includes:
  - a. Check in with the physicians, nurses, technicians, and support staff.
  - b. Ask questions (examples include: What's working well this week? What are your biggest struggles this week? What would make things better?).
  - c. Link with support services, such as Red Cross, providing food and beverages.
  - d. Provide information on normal distress reactions and adaptive responses.
  - e. Promote positive peer support and facilitate connections.
  - f. Make connections during a calm time. Do not interrupt urgent patient care or sign-out.
  - g. Find a quiet space to talk when things are chaotic.
  - h. Ensure individuals have access to safe spaces and emotional/spiritual support.
6. Unique issues to consider when supporting front line workers:
  - a. Be aware of the potential for moral distress in providers making difficult and potentially life or death triage and management decisions.
  - b. Be aware of potential concerns of individual front line workers including single parents, dual healthcare worker families, families with serious medical issues, workers living separate from their families, and community stigma of being “infected” as examples.
7. Resources for Mental Health Support for Patients can be found at: <https://www.cstsonline.org/covid-19/mental-health-support>

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## **EMERGENCY MANAGEMENT SERVICES AND GROUND TRANSPORT OF PERSONS WITH COVID-19**

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### **Dispatch Screening for COVID-19**

1. Persons assigned to EMS and first responder dispatch function should complete key question interrogation and dispatch resources accordingly. Dispatchers should reference the EMS COVID-19 questionnaire when obtaining information from 911 callers (Table 8). EMS systems may become strained due to an influx of 911 calls regarding known or suspected COVID-19 transmission or infection. In areas where EMS resources are overwhelmed by 911 call volumes, the following should be considered:
  - a. EMS and/or Fire Dispatch should triage 911 calls and prioritize responses accordingly (e.g. if a patient calls reporting signs and symptoms consistent with COVID-19, but denies respiratory distress and other complaints suggestive of a life-threatening condition (i.e. chest pain, etc.), ambulance services should be directed to an alternative, higher-acuity call.
  - b. If EMS arrives on scene and determines that a patient does not have a life-threatening condition relating to the potential exposure to, or signs and symptoms of, COVID-19, EMS crews should contact On-line Medical Control to discuss non-transport and/or alternative transport destinations. If non-transport is approved, EMS Dispatch should direct the EMS crew to a higher-acuity 911 call. Refusal of Transport /Treat and Release should be coordinated with local On-line Medical Control
  - c. Callers using the 911 system for questions or concerns regarding COVID-19 testing (e.g. sites, locations, and decisions regarding testing criteria) should be diverted to established local, county, or state COVID-19 call centers. Installations and facilities should consult with their local EMS Medical Directors regarding protocols and policies pertaining to call diversion for information-only requests from 911 callers.

**Pre-Arrival Screening or Initial Patient Assessment of Suspected COVID-19 Patients.** *(For utilization by EMS/Fire*

## Clinical Management of COVID-19

Department Dispatch OR Responding Crews)

1. If the below information was not obtained by Dispatch, First Responders (EMS/Fire) should begin their initial assessment from at least six feet away if patient presentation allows. If the patient reports symptoms consistent with a respiratory illness, EMS personnel should don appropriate PPE, and place a surgical-type mask on the patient.
2. If the patient's condition allows, to minimize the risk of exposure, one individual should approach the patient, place a surgical-type mask on him/her, and complete the COVID-19 screening questionnaire/ initial assessment. Additional EMS/Fire personnel should be contacted for support only as required.
3. If EMS personnel are first on-scene, and it is determined that the patient has symptoms of a respiratory illness (Box 1) and risk factors for COVID-19 (Box 2), Dispatch should be contacted to minimize response by additional units (Fire and Law Enforcement) to reduce the risk of exposure.

### EMS Refusal of Transport

1. Purpose: Identify patients that do not require EMS transport to a hospital or alternate facility during the COVID-19 pandemic, in order to accomplish the following: 1) Minimize disease transmission to the community and health care system; 2) Protect first responders and health care providers and; 3) Preserve the health care system functionality by not overwhelming emergency resources.
2. Transport decision and final destination versus non-transport with self-care should be considered by EMS Medical Directors, partnering with MTF leadership, to develop local policies. The following are provided as recommendations:
  - a. Careful consideration for EMS Non-Transport should be given for pediatric patients, pregnant females, or patients who are immunocompromised. Discussion with Online Medical Control is advised.
  - b. The below assessment tool is to inform the necessity to transport an adult patient when the patient reports symptoms related to COVID-19.
  - c. If a patient is not transported, he/she should be directed to contact 911 if he/she develops significant shortness of breath, chest pain, the inability to tolerate oral intake, or is unable to schedule follow-up with an appropriate health care provider/facility.

**Table 8. Emergency Medical System Pre-Arrival Screening for COVID-19**

Does the patient have:		
<p><b>BOX 1</b></p> <p><input checked="" type="checkbox"/> Fever (or are they hot to the touch)</p> <p><input checked="" type="checkbox"/> Cough</p> <p><input checked="" type="checkbox"/> Shortness of Breathing or Difficulty Breathing</p> <p><input type="checkbox"/> Other flu-like symptoms (sore throat, runny nose, body aches, chills, or anosmia/dysgeusia)</p>	<p><b>AND</b></p>	<p><b>BOX 2</b></p> <p><input checked="" type="checkbox"/> Has the patient traveled to a CDC Health Advisory Level 2 or Level 3 country in the last 14 days? (<a href="https://wwwnc.cdc.gov/travel/notices">https://wwwnc.cdc.gov/travel/notices</a>)</p> <p><input checked="" type="checkbox"/> Are they currently under investigation or isolation for COVID-19 by public health or other medical professionals?</p> <p><input type="checkbox"/> Have they been in close contact with an individual who is known to be sick with, or under public health/medical professional investigation/isolation for COVID-19?</p>

### If the patient meets at least one criteria item from Box 1 and Box 2, see below:

- Instruct the individual to isolate him/herself from close contact with others until EMS arrives.
- Notify First Responders (to include Fire and Law Enforcement) that the patient meets pre-arrival screening criteria for COVID-19. Advise donning of appropriate PPE prior to patient contact.
- Follow local agency policies to limit multi-unit responses.
- Transport Agencies will contact the receiving facility as soon as possible, preferably prior to transport (See EMS TRANSPORT OF PERSONS UNDER INVESTIGATION OR PATIENTS WITH CONFIRMED COVID-19).

Table adapted from the Southwest Texas Regional Advisory Council (STRAC); EMS Pre-Arrival Screening for Coronavirus 2019-nCoV - V1.2, issued 02/07/2020.

**Table 9. Emergency Management System Patient Considerations for Non-Transport in COVID-19**

### PATIENT CONSIDERATION FOR NON-TRANSPORT:



**INITIAL ASSESSMENT WITH VITAL SIGNS**

*(initial encounter should ideally be by a single provider in appropriate PPE from a distance of 6 feet)*

- Temp < 39.4°C (103°F) • GCS 15, Alert & Oriented • HR < 100 bpm • SpO<sub>2</sub> > 90% • Respiratory Rate 10-30
- Well appearing, speaks in full sentences, ambulatory • Viral sx: cough, sore throat, body aches, nasal/chest congestion

**PATIENT MEDICAL HISTORY & PRESENTATION**

- Age < 50 years • Non-diabetic • Non-Immunocompromised • No known respiratory disease • No known cardiac disease

**LIVING ARRANGEMENTS**

- Has appropriate support system at home • Patient has means for follow-up

**IF THE PATIENT IS IN A PUBLIC LOCATION**

- Place a surgical mask on the patient. • Discourage the use of public transportation.
- Instruct the patient to directly transport themselves home while minimizing exposure to others/the community.

**Personal Protective Equipment (PPE) for Emergency Medical Services Personnel.**

1. EMS personnel providing care for a patient with COVID-19/PUI should utilize the following PPE:
  - a. N-95 or higher level respirator or facemask (if a respirator is not available). N-95 respirators or respirators that offer a higher level of protection should be used when performing an aerosol- generating procedure.
  - b. Eye protection: goggles or a disposable face shield that fully covers the front and sides of the face should be worn. Personal eyeglasses and contact lenses are not adequate eye protection.
  - c. A single pair of disposable patient examination gloves. Gloves should be changed if they tear or become heavily contaminated.
  - d. An isolation gown. If there are shortages of gowns, they should be prioritized for aerosol- generating procedures, and high-contact patient care activities that allow transfer of pathogens (e.g. moving the patient to the stretcher).
2. If providing patient care, drivers should wear all recommended PPE. After completing patient care and before entering an isolated driver's compartment, drivers should remove and dispose of PPE and perform hand hygiene to avoid soiling the compartment. If the transport vehicle does not have an isolated driver's compartment, drivers should remove face shields or goggles, gowns and gloves, and perform hand hygiene. A respirator or facemask should continue to be used during transport.
3. On arrival, after the patient is released to the accepting facility, EMS personnel should remove and discard PPE and perform hand hygiene. Used PPE should be discarded in accordance with routine procedures.

**EMS Transport of PUIs or Patients with Confirmed COVID-19 to a Healthcare Facility.**

1. A facemask should be worn by the patient for source control.
2. EMS personnel should notify the receiving healthcare facility when patient has an exposure history, signs or symptoms suggestive of COVID-19 so appropriate infection control precautions are taken before arrival.
3. Family members and other contacts of patients with possible COVID-19 should not ride in the transport vehicle, if possible. If riding in the transport vehicle, they should wear a facemask. When possible, use vehicles that have isolated driver and patient compartments to provide separate ventilation to each area.
  - e. Close the door/window between these compartments before bringing the patient on board.
  - f. During transport, vehicle ventilation in both compartments should be on non-recirculated mode to maximize air changes that reduce potentially infectious particles in the vehicle.
  - g. If the vehicle is without an isolated driver compartment and ventilation must be used, open the outside air vents in the driver area and turn on the rear exhaust ventilation fans to the highest setting. This will create a negative pressure gradient in the patient compartment.
4. Follow facility procedures for transfer of the patient (e.g. wheel the patient directly into an exam room).

**EMS Transport in Resource-Limited Environments.**

1. During the pandemic, MTFs and civilian EMS services may become inundated with critically ill patients, exceeding MTF treatment and transport capabilities. It is strongly recommended that EMS Medical Directors partner with MTF leadership to discuss disaster response contingency plans relating to inter-facility transports. Nationally Registered Paramedics (NRPs), with approval and guidance from local EMS Medical Directors, are

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authorized to transport critically ill patients via ambulance. The following are ambulance staffing recommendations to be utilized according to staffing capabilities and patient acuity:

<b>GOOD</b>	
<b>If the patient:</b>	<b>Crew (in addition to the EMT/NRP driver):</b>
is not ventilated and has no more than two intravenous (IV) or intraosseous (IO) pump infused medications	Paramedic
is not ventilated and has $\geq 3$ IV/IO pump infused meds	Paramedic <b>AND</b> Critical Care Registered Nurse (CCRN) <b>OR</b> Certified Emergency Nurse (CEN)
is ventilated and has $\leq 2$ IV/IO pump infused meds	Paramedic x 2 <b>OR</b> Paramedic <b>AND</b> Respiratory Therapist (RT)
is ventilated and has $\geq 3$ IV/IO pump infused meds	Paramedic x 2 <b>AND</b> CCRN <b>OR</b> CEN <b>OR</b> Paramedic, RT, <b>AND</b> CCRN <b>OR</b> CEN
is ventilated and has three or more IV/IO pump infused medications	If NRPs are unavailable, consider utilizing MTF CCAT Teams <b>OR</b> hybrid transport teams consisting of a CCRN, Critical Care Technician and a RT. All patient transports should have 2 EMTs on board to assist with ambulance operations.

<b>BETTER</b>		
<b>If the patient:</b>	<b>Crew (in addition to the EMT/NRP driver):</b>	<b>References:</b>
ventilated with IV/IO infusion medication, but no central lines or arterial lines	NRP trained in ventilator management  ABG should be obtained within 30 minutes of transport. If time allows, patient should be placed on transport ventilator for at least 15 minutes prior to transport.	ALS standards Commission on Accreditation of Medical Transport Systems (CAMTS) 11 <sup>th</sup> Edition <a href="https://www.camts.org/standards/">https://www.camts.org/standards/</a> <a href="https://its.amedd.army.mil/assets/docs/cpgs/Prehospital_En_Route_CPGs/Standard_Medical_Operating_Guidelines_(SMOG)_for_Critical_Care_Flight_Paramedics_2020.pdf">https://its.amedd.army.mil/assets/docs/cpgs/Prehospital_En_Route_CPGs/Standard_Medical_Operating_Guidelines_(SMOG)_for_Critical_Care_Flight_Paramedics_2020.pdf</a> Procedure A-XII
is ventilated with central line, or arterial line, or chest tube	At least 2 providers trained at the NRP level or above (physician (MD/DO), physician's assistant (PA), nurse practitioner (NP), or registered nurse (RN))  Primary care provider requirement: > 3 years ED, ICU, or critical care experience.	Emergency Critical Care standards CAMTS 11 <sup>th</sup> Edition <a href="https://www.camts.org/standards/">https://www.camts.org/standards/</a>
Above criteria <b>AND</b> complex ventilator settings <b>OR</b> > 4 IV/IO infusions	Above requirements <b>AND</b> 1 crew member must be an RN with Certified Flight RN, Critical Care RN, or Certified Transport Registered Nurse within 2 years of hire, or equivalent national certification.  At least 1 critical care transport provider shall be licensed as a MD/DO, PA, APRN, or RN with documented competency and experience in the provision of critical care in a tertiary critical care unit, commensurate with the type and acuity of patient requiring transport.	Intensive Care Standards CAMTS 11 <sup>th</sup> Edition <a href="https://www.camts.org/standards/">https://www.camts.org/standards/</a>  Para 1.2.3 Critical Care Transport Team Association of Critical Care Transport-Critical Care Transport Standards-Version 1.0 ©2016 (AACT is a professional organization recommendation but not a certifying organization.)

<b>BEST</b>	
<b>If the patient:</b>	<b>Crew (in addition to the driver):</b>
requires critical care	Military or civilian trained and equipped critical care transport crew (Ground, Rotary, or Fixed Wing)

#### 2. Additional considerations for interfacility transport include:

- On-line Medical Control. On-line Medical Control must be available for the transport of critically ill patients.
- Training. Personnel involved in interfacility transports should be trained on ambulances, facility transport ventilators, infusion pumps and all required equipment. Additionally, NRPs with critical care training: Critical Care Paramedic Program (CCEMT-P), Certified Critical Care Paramedics (C-CCPs), Certified Flight

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Paramedics (FP-Cs), or individuals with previous critical care experience should be tasked as primary transport personnel given their increased education/experience.

- c. Ventilators. NRPs and RNs should be deemed proficient in ventilator operation and management by the local EMS Medical Director prior to performing patient transport. Ventilated patients should be transported with physician documented orders which detail ventilator settings. All patients will be monitored with wave-form capnography. If a BVM is utilized for transport, or if use of the BVM becomes necessary during transport, a positive-end expiratory pressure (PEEP) valve must be applied and dialed to the ventilator PEEP setting. Ventilators and BVMs should be equipped with HEPA filters.
  - d. Intravenous/intraosseous Infusions. Many pre-hospital NRP infusions are currently delivered without the use of an infusion pump (epinephrine, norepinephrine, dopamine, amiodarone, and magnesium sulfate), however any infusion for an interfacility transfer should be on an infusion pump. Medications not detailed in the formulary outlined by EMS protocols are authorized with a written physician order. Orders should specify the name of the medication, the drug concentration, and the infusion rate. Infusions must be initiated by the sending facility. Infusions will be maintained at the physician-prescribed dosing regimen. Alterations to dosing regimens require authorization from a physician, preferably, On-line Medical Control. Rapid deterioration in patient clinical status negates the requirement for physician authorization (e.g. vasopressor titration).
  - e. Prior to placing a transport request, MTF in-patient units should communicate with local EMS Medical Directors or attending Emergency Department physicians to determine transport capabilities. If possible, patient documentation (to include compact discs containing images) should be prepared prior to transport crew arrival.
3. Prior to placing a transport request, MTF in-patient units should communicate with local EMS Medical Directors or attending Emergency Department physicians to determine transport capabilities. If possible, patient documentation (to include compact discs containing images) should be prepared prior to transport crew arrival.
  4. If trained healthcare personnel are severely limited, local Medical Directors should partner with MTF and Logistics leadership to discuss the use of licensed drivers/ government owned vehicles to transport of low acuity patients.

### **EMS Personnel Precautions for Procedures.**

1. Prior to the initiation of any patient care, all crew members must don appropriate PPE as outlined above.
2. If a nasal cannula is in place, or will be used, the surgical mask should be placed over the top of the nasal cannula. An oxygen mask can be used on the patient if clinically indicated.
3. If patient presentation allows, EMS personnel providing care to a patient suspected of having COVID-19 should contact Medical Director before initiating an aerosol-generating procedure. These aerosolized procedures include:
  - a. Bag Valve Mask (BVM) Ventilations
  - b. Endotracheal (ET) Intubation/Supraglottic Airway (SGA)
  - c. Oropharyngeal Suctioning
  - d. Continuous Positive Airway Pressure Ventilations (CPAP)
  - e. Cardiopulmonary Resuscitation (CPR)
4. Nebulized medications for known or suspected COVID-19 patients should be withheld given the risk of virus transmission. It is recommended that local Medical Directors work with MTF leadership to obtain single-use albuterol metered-dose inhalers with spacers for prehospital use. If an aerosol-generating procedure is required/recommended, the doors to the patient compartment of the ambulance should remain open to allow ventilation of the area during these procedures. If the ambulance is equipped with an HVAC system it should remain on during patient transport.
5. If used, BVMs, SGAs, and ET tubes should have a HEPA filter attached. If the EMS agency has access to ventilators, units should contact the specific ventilator manufacturer for additional guidelines and to obtain part numbers for compatible HEPA filters.

**Mechanical CPR.**

1. While mechanical CPR devices have not been approved for routine use in the USAF; the American College of Cardiology's recommendation to use mechanical CPR devices on PUIs or patients with confirmed COVID-19 who arrest (<https://www.acc.org/latest-in-cardiology/articles/2020/03/19/13/14/cvd-in-the-setting-of-covid-19-coronavirus-considerations-to-prepare-patients-providers-health-systems>).
2. Local Medical Directors & EMS/Fire Leadership are responsible for ensuring personnel education of device indications/contraindications, application, and cleaning, which should be documented in training records.
3. Devices should be cleaned according to CDC recommendations for known or suspected COVID-19 patients.
4. Contact the device manufacturer for additional recommendations.

**Cleaning EMS Transport Vehicles After Transporting a PUI or Patient with Confirmed COVID-19.**

1. After transporting the patient, leave the rear doors of the transport vehicle open to allow for sufficient air changes to remove potentially infectious particles. The time to complete transfer of the patient to the receiving facility and complete all documentation should suffice.
2. When cleaning the vehicle, EMS clinicians should wear a disposable gown and gloves. A face shield or facemask and goggles should be worn if splashes or sprays during cleaning are anticipated.
3. Clean and disinfect reusable patient-care equipment before reuse according to manufacturer's instructions.
4. Routine cleaning and disinfection procedures (e.g. use of cleaners and water to pre-clean surfaces prior to applying an EPA-registered, hospital-grade disinfectant for emerging viral pathogens) are appropriate.
5. Ensure disinfection procedures are followed consistently, to include the provision of adequate ventilation when chemicals are in use. Doors should remain open when cleaning the vehicle.

**Follow-up for EMS Personnel after Caring for a PUI or Patient with Confirmed COVID-19.**

1. Local public health and infectious disease authorities should be notified about the patient so that appropriate follow-up monitoring can occur.
2. EMS personnel who have been exposed to a patient with suspected or confirmed COVID-19 should notify their chain of command to ensure appropriate follow-up.
3. EMS agencies should develop local policies for assessing exposure risk and the management of EMS personnel potentially exposed to COVID-19. Decisions for monitoring and quarantine should be made in consultation with public health and infectious disease authorities.
4. EMS personnel should be alert for fever or respiratory symptoms (e.g. cough, shortness of breath, sore throat). If symptoms develop, it is recommended that they self-isolate and notify their public health authority to arrange for evaluation.

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**EN ROUTE CRITICAL CARE CONSIDERATIONS FOR PERSONS WITH COVID-19**

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1. Per TRANSCOM Instruction 41-02, patients with known or suspected exposure to, or an active infection with, a CDC defined High Consequence Infectious Disease or novel or CDC "Category A" disease shall be treated in place unless an exception to policy (ETP) is granted. Relevant authorities that must concur with or approve the ETP are detailed in the TRANSCOM instruction. "Treat in place" is the plan unless otherwise directed.
2. Current CDC guidance for transport is largely based on SARS and MERS and is not yet reflective of the evolving information on COVID-19.(172) While CDC guidance does not advocate for use of biocontainment units for patients, the CDC's recommendation for airborne precautions and selection of aircraft with optimal airflow characteristics to reduce risk to aircrew/front end is challenging in airframes used for AE/CCATT transport. After review of published airflow characteristics for the C-130, C-17, KC-135 and KC-10, CDC and National Strategic Research Institute aerosol scientists recommended against transporting symptomatic patients in an open aircraft. Therefore, AMC recommended to TRANSCOM that any mission generated to transport COVID-19 patients on DoD aircraft use biocontainment, except as a last resort.
3. If an ETP is granted for patient movement, contract civilian air ambulance such as Phoenix Air Group is the

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first choice. They have access to single patient units and also operate the State Department's Portable Bio-Containment Modules (PBCM, formerly known as the CBCS). DoD owns and operates Transport Isolation Units (TIS) for biocontainment. Both the TIS and the PBCM are multi-place units capable of transporting up to 4 litter patients. The PBCM has better engineering controls to manage airborne transmissible pathogens and would be preferred for patient transport. In either case, patients should be moved in biocontainment transport units with specially trained AE and CCAT teams rather than using usual AE mechanisms.

4. Patients with known or suspected exposure to, or an active infection with a pathogen that is not a novel or CDC "Category A" disease may be transported within the PM system, utilizing standard transmission-based precautions in accordance with AFI 48-307, Vol.1, En-Route Care and Aeromedical Evacuation Operations. Movement should be requested when it is essential to provide appropriate care, while seeking to minimize opportunities for transmission of pathogens within and between theaters and countries.

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## **WHOLE OF GOVERNMENT RESPONSE IN COORDINATION OF RESOURCES**

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On 13 Mar 2020, President Trump declared a nationwide emergency under Sec. 501(b) of the Stafford Act, increasing support to HHS in this role as the lead federal agency for the federal government's response to the COVID-19 pandemic. Under this declaration, FEMA, in coordination with HHS, was empowered to assist state, local, tribal, territorial governments and other eligible entities to access resources made available through the Stafford Act.

HHS has many resources to leverage in the federal response to COVID-19, including the Strategic National Stockpile (SNS). The SNS has ventilators, medications, personal protective equipment and other important equipment and supplies that may be requested for COVID-19 response where state and local resources are overwhelmed or anticipated to be overwhelmed. SNS depots are located around the country by region. There is a Defense Coordinator at regional FEMA offices to coordinate requests to/from civilian and military hospitals and other entities for resources. MTFs can identify anticipated shortages and push a request through their local unit Crisis Action Team to the Regional FEMA Defense Coordinator for items in the SNS. It is recommended that facilities leverage available resources before running out of critical items such as PPE.

HHS link to Resources: <https://www.phe.gov/emergency/Tools/Pages/default.aspx>

HHS Regional Emergency Coordinators Contact List: <https://www.phe.gov/Preparedness/responders/rec/Pages/default.aspx>

State FEMA Office contacts: <https://www.fema.gov/emergency-management-agencies>

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## **OTHER CONSIDERATIONS RELATED TO COVID-19**

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### **Facilities.**

#### *Medical Heating, Ventilation and Air Conditioning (HVAC) Systems.*

1. DHA Facilities Enterprise recommends maintaining building ventilation systems in balance and compliant. Attempts to adjust without professional mechanical engineering support may cause harm and rework later.
2. Medical facilities (hospitals/clinics) or administrative facilities are recommended not to alter the HVAC system operations or filtration in any way due to the outbreak of COVID-19.
3. Building maintenance personnel should not be exposed to COVID-19 unless they are physically in the same room as an infected person or come in contact with surfaces that have not been disinfected (such as air filters). No special COVID-19 PPE is required for maintenance personnel unless they are charged with disinfecting surfaces or working where infected persons may have deposited live virus. In those cases, the maintenance personnel should follow CDC guidelines.
4. Although it is not known exactly how long the virus can survive on a surface outside the human carrier, some reports suggest up to 4 days on some materials.
5. If a maintenance worker becomes infected with COVID-19, it is recommended to clean all surfaces the worker may have been in contact with for the past 7 days. A review of all work orders completed by the infected maintenance staff will aid in discovering where and when the employee contacted other surfaces.
6. Altering HVAC systems should not reduce the spread of the virus. DHA Facilities Enterprise does NOT recommend increasing filter media MERV rated filters to HEPA nor installing UV if it is being done purely in



hope of stopping the spread of COVID-19. MTFs should not add higher rated filters to existing HVAC systems without proper engineering management since the HVAC system may become imbalanced which could result in loss of isolation rooms. Care must be taken not to exceed the design performance of the HVAC as it will likely reduce equipment life with little or no positive impact.

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## REFERENCES

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1. TeamNCPERE. Vital surveillances: the epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) – China. *China CDC Weekly*. 2020;2(8):113-22.
2. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med*. 2020.
3. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497-506.
4. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*. 2020.
5. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med*. 2020.
6. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*. 2020.
7. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*. 2020;395(10223):507-13.
8. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, et al. First Case of 2019 Novel Coronavirus in the United States. *N Engl J Med*. 2020;382(10):929-36.
9. Pan L, Mu M, Ren HG, Yang P, Sun Y, Wang R, et al. Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, China: a descriptive, cross-sectional, multicenter study. 2020.
10. American Academy of Otolaryngology-Head and Neck Surgery Coronavirus Disease 2019: Resources 2020 [Available from: <https://www.entnet.org/content/coronavirus-disease-2019-resources>.
11. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N Engl J Med*. 2020.
12. Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease (COVID-19): Center for Disease Control (CDC); 2020 [updated March 7, 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html#foot09>.
13. Breslin N, Baptiste C, Miller R, Fuchs K, Goffman D, Gyamfi-Bannerman C, et al. COVID-19 in pregnancy: early lessons. *Am J Obstet Gynecol MFM*. 2020:100111.
14. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet*. 2020;395(10226):809-15.
15. Di Mascio D, Khalil A, Saccone G, Rizzo G, Buca D, Liberati M, et al. Outcome of Coronavirus spectrum infections (SARS, MERS, COVID 1 -19) during pregnancy: a systematic review and meta-analysis. *Am J Obstet Gynecol MFM*. 2020:100107.
16. Mullins E, Evans D, Viner RM, O'Brien P, Morris E. Coronavirus in pregnancy and delivery: rapid review. *Ultrasound in Obstetrics & Gynecology*. n/a(n/a).
17. Kam KQ, Yung CF, Cui L, Lin Tzer Pin R, Mak TM, Maiwald M, et al. A Well Infant with Coronavirus Disease 2019 (COVID-19) with High Viral Load. *Clin Infect Dis*. 2020.
18. Cai J, Xu J, Lin D, Yang Z, Xu L, Qu Z, et al. A Case Series of children with 2019 novel coronavirus infection: clinical and epidemiological features. *Clin Infect Dis*. 2020.
19. Wei M, Yuan J, Liu Y, Fu T, Yu X, Zhang ZJ. Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China. *JAMA*. 2020.
20. Cui Y, Tian M, Huang D, Wang X, Huang Y, Fan L, et al. A 55-Day-Old Female Infant infected with COVID 19: presenting with pneumonia, liver injury, and heart damage. *J Infect Dis*. 2020.
21. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiological Characteristics of 2143 Pediatric Patients

### *Clinical Management of COVID-19*

With 2019 Coronavirus Disease in China. Pediatrics. 2020.

22. Liu W, Zhang Q, Chen J, Xiang R, Song H, Shu S, et al. Detection of Covid-19 in Children in Early January 2020 in Wuhan, China. N Engl J Med. 2020.
23. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. Lancet Respir Med. 2020.
24. Dichter JR, Kanter RK, Dries D, Luyckx V, Lim ML, Wilgis J, et al. System-level planning, coordination, and communication: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest. 2014;146(4 Suppl):e87S-e102S.
25. Sprung CL, Zimmerman JL, Christian MD, Joynt GM, Hick JL, Taylor B, et al. Recommendations for intensive care unit and hospital preparations for an influenza epidemic or mass disaster: summary report of the European Society of Intensive Care Medicine's Task Force for intensive care unit triage during an influenza epidemic or mass disaster. Intensive Care Med. 2010;36(3):428-43.
26. Stroud C, Altevogt B, Nadig L. Crisis Standards of Care: Summary of a Workshop Series. Washington DC; 2010.
27. Devereaux AV, Tosh PK, Hick JL, Hanfling D, Geiling J, Reed MJ, et al. Engagement and education: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest. 2014;146(4 Suppl):e118S-33S.
28. Ratnapalan S, Martimianakis MA, Cohen-Silver JH, Minnes B, Macgregor D, Allen U, et al. Pandemic management in a pediatric hospital. Clin Pediatr (Phila). 2013;52(4):322-8.
29. Tosh PK, Feldman H, Christian MD, Devereaux AV, Kissoon N, Dichter JR, et al. Business and continuity of operations: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest. 2014;146(4 Suppl):e103S-17S.
30. Hota S, Fried E, Burry L, Stewart TE, Christian MD. Preparing your intensive care unit for the second wave of H1N1 and future surges. Crit Care Med. 2010;38(4 Suppl):e110-9.
31. Einav S, Hick JL, Hanfling D, Erstad BL, Toner ES, Branson RD, et al. Surge capacity logistics: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest. 2014;146(4 Suppl):e17S-43S.
32. Christian MD, Devereaux AV, Dichter JR, Robinson L, Kissoon N, Task Force for Mass Critical C, et al. Introduction and executive summary: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest. 2014;146(4 Suppl):8S-34S.
33. Lowe JJ, Gibbs SG, Schwedhelm SS, Nguyen J, Smith PW. Nebraska Biocontainment Unit perspective on disposal of Ebola medical waste. Am J Infect Control. 2014;42(12):1256-7.
34. World Health Organization. WHO Checklist for Influenza Pandemic Preparedness Planning. Switzerland; 2005.
35. Wise RA. The creation of emergency health care standards for catastrophic events. Acad Emerg Med. 2006;13(11):1150-2.
36. Martland A, Huffines M, Henry K. Surge Priority Planning COVID-19: Critical Care Staffing and Nursing Considerations 2020 [Available from: <https://www.chestnet.org/Guidelines-and-Resources/Resources/Surge-Priority-Planning-COVID-19-Critical-Care-Staffing-and-Nursing-Considerations>.
37. Halpern NA, Tan KS. United States Resource Availability for COVID-19: Society of Critical Care Medicine; 2020 [updated March 19, 2020. Version 2:[Available from: <https://www.sccm.org/Blog/March-2020/United-States-Resource-Availability-for-COVID-19>.
38. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Can J Anaesth. 2020.
39. Tosh PK, Burry L. Essential Institutional Supply Chain Management in the Setting of COVID-19 Pandemic 2020 [Available from: <https://www.chestnet.org/Guidelines-and-Resources/Resources/Essential-Institutional-Supply-Chain-Management-in-the-Setting-of-COVID-19-Pandemic>.
40. Bilben B, Grandal L, Sovik S. National Early Warning Score (NEWS) as an emergency department predictor of disease severity and 90-day survival in the acutely dyspneic patient - a prospective observational study. Scand J Trauma Resusc Emerg Med. 2016;24:80.
41. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. PLoS One. 2012;7(4):e35797.

### *Clinical Management of COVID-19*

42. US FDA Emergency Use Authorization [Available from: <https://www.fda.gov/emergency-preparedness-and-response/mcm-legal-regulatory-and-policy-framework/emergency-use-authorization#covidinvitrodev>
43. Wang W, Xu Y, Gao R, Lu R, Han K, Wu G, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. JAMA. 2020.
44. Kim S, Kim D, Lee B. Insufficient Sensitivity of RNA Dependent RNA Polymerase Gene of SARS-CoV-2 Viral Genome as Confirmatory Test using Korean COVID-19 Cases. Preprints 2020.
45. WHO. Home care for patients with COVID-19 presenting with mild symptoms and management of their contacts: Interim Guidance, 17 Mar 2020. 2020 [Available from: [https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-\(ncov\)-infection-presenting-with-mild-symptoms-and-management-of-contacts](https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts).
46. CDC. Interim Guidance for Implementing Home Care of People Not Requiring Hospitalization for Coronavirus Disease 2019 (COVID-19) 2020 [Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-home-care.html>.
47. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020.
48. Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020: MMWR Morb Mortal Wkly Rep; 2020 [updated 18 March 2020. Available from: <http://dx.doi.org/10.15585/mmwr.mm6912e2>.
49. Chow N, Fleming-Dutra K, Gierke R, Hall A, Hughes M, Pilishvili T, et al. Preliminary Estimates of the Prevalence of Selected Underlying Health Conditions Among Patients with Coronavirus Disease 2019—United States, February 12–Mar 28, 2020. MMWR 31 Mar 20. 2020.
50. CDC. Information for Healthcare Professionals: COVID-19 and Underlying Conditions. 2020 [Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/underlying-conditions.html>.
51. Day M. Covid-19: ibuprofen should not be used for managing symptoms, say doctors and scientists. BMJ. 2020;368:m1086.
52. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? Lancet Respir Med. 2020.
53. Vaduganathan M, Vardeny O, Michel T, McMurray JJV, Pfeffer MA, Solomon SD. Renin-Angiotensin-Aldosterone System Inhibitors in Patients with Covid-19. N Engl J Med. 2020.
54. Bozkurt B, Kovacs R, Harrington B. HFSA/ACC/AHA Statement Addresses Concerns Re: Using RAAS Antagonists in COVID-19. Mar 17, 2020 2020 [Available from: <https://www.acc.org/sitecore/content/Sites/ACC/Home/Latest-in-Cardiology/Articles/2020/03/17/08/59/HFSA-ACC-AHA-Statement-Addresses-Concerns-Re-Using-RAAS-Antagonists-in-COVID-19>
55. FDA advises patients on use of non-steroidal anti-inflammatory drugs (NSAIDs) for COVID-19 2020 [updated March 19, 2020. Available from: <https://www.fda.gov/drugs/drug-safety-and-availability/fda-advises-patients-use-non-steroidal-anti-inflammatory-drugs-nsaids-covid-19>.
56. CDC. Discontinuation of Home Isolation for Persons with COVID-19 (Interim Guidance), updated 16 Mar 20 2020 [Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html>
57. Alhazzani W, Møller MH, Arabi YM, Loeb M, Gong MN, Fan E, et al. Surviving Sepsis Campaign: Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19). Critical Care Medicine. 2020.
58. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected [press release]. World Health Organization 2020.
59. He HW, Liu DW. Permissive hypoxemia/conservative oxygenation strategy: Dr. Jekyll or Mr. Hyde? J Thorac Dis. 2016;8(5):748-50.
60. Ding L, Wang L, Ma W, He H. Efficacy and safety of early prone positioning combined with HFNC or NIV in moderate to severe ARDS: a multi-center prospective cohort study. Crit Care. 2020;24(1):28.
61. Puah SHEa. ATS/APSR Joint Webinar: Global Perspectives of COVID 19. March 30, 2020 2020 [Available from: <https://www.youtube.com/watch?v=fl-Kf3vkCwQ&feature=youtu.be>.
62. Scaravilli V, Grasselli G, Castagna L, Zanella A, Isgro S, Lucchini A, et al. Prone positioning improves oxygenation in spontaneously breathing nonintubated patients with hypoxemic acute respiratory failure: A retrospective study. J Crit Care. 2015;30(6):1390-4.

### *Clinical Management of COVID-19*

63. Enforcement Policy for Ventilators and Accessories and other Respiratory Devices During the Coronavirus Disease 2019 Public Health Emergency. FDA Guidance Article. March 2020 [Available from: <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/enforcement-policy-ventilators-and-accessories-and-other-respiratory-devices-during-coronavirus>].
64. Consensus Statement on Multiple Patients Per Ventilator. American Association for Respiratory Care, American Society of Anesthesiologists, Anesthesia Patient Safety Foundation, American Association of Critical-Care Nurses, and American College of Chest Physicians. 3/26/2020 [Available from: <https://www.sccm.org/Disaster/Joint-Statement-on-Multiple-Patients-Per-Ventilato>].
65. COVID-19 – Ventilators. CDC. [Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/ventilators.html>].
66. Optimizing Ventilator Use during the COVID-19 Pandemic. U.S. Public Health Service Commissioned Corps. 3/31/2020 2020 [Available from: <https://www.hhs.gov/sites/default/files/optimizing-ventilator-use-during-covid19-pandemic.pdf>].
67. Xia W, Shao J, Guo Y, Peng X, Li Z, Hu D. Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults. *Pediatric Pulmonology*. n/a(n/a).
68. Metlay JP, Waterer GW, Long AC, Anzueto A, Brozek J, Crothers K, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. *Am J Respir Crit Care Med*. 2019;200(7):e45-e67.
69. Zuo MZ, Huang YG, Ma WH, Xue ZG, Zhang JQ, Gong YH, et al. Expert Recommendations for Tracheal Intubation in Critically ill Patients with Novel Coronavirus Disease 2019. *Chin Med Sci J*. 2020.
70. Hui DS, Chow BK, Lo T, Tsang OTY, Ko FW, Ng SS, et al. Exhaled air dispersion during high-flow nasal cannula therapy versus CPAP via different masks. *Eur Respir J*. 2019;53(4).
71. Mauri T, Spinelli E, Mariani M, Guzzardella A, Del Prete C, Carlesso E, et al. Nasal High Flow Delivered within the Helmet: A New Noninvasive Respiratory Support. *Am J Respir Crit Care Med*. 2019;199(1):115-7.
72. Patel BK, Wolfe KS, Pohlman AS, Hall JB, Kress JP. Effect of Noninvasive Ventilation Delivered by Helmet vs Face Mask on the Rate of Endotracheal Intubation in Patients With Acute Respiratory Distress Syndrome: A Randomized Clinical Trial. *JAMA*. 2016;315(22):2435-41.
73. Patel BK, Hall JB, Kress JP. Face Mask vs Helmet for Noninvasive Ventilation-Reply. *JAMA*. 2016;316(14):1497.
74. Acute Respiratory Distress Syndrome N, Brower RG, Matthay MA, Morris A, Schoenfeld D, Thompson BT, et al. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *N Engl J Med*. 2000;342(18):1301-8.
75. Guerin C, Reignier J, Richard JC. Prone positioning in the acute respiratory distress syndrome. *N Engl J Med*. 2013;369(10):980-1.
76. Pan C, Zhang W, Du B, Qiu HB, Huang YZ. [Prone ventilation for novel coronavirus pneumonia: no time to delay]. *Zhonghua Nei Ke Za Zhi*. 2020;59(0):E007.
77. Albert RK, Hubmayr RD. The prone position eliminates compression of the lungs by the heart. *Am J Respir Crit Care Med*. 2000;161(5):1660-5.
78. Cornejo RA, Diaz JC, Tobar EA, Bruhn AR, Ramos CA, Gonzalez RA, et al. Effects of prone positioning on lung protection in patients with acute respiratory distress syndrome. *Am J Respir Crit Care Med*. 2013;188(4):440-8.
79. Nyren S, Radell P, Lindahl SG, Mure M, Petersson J, Larsson SA, et al. Lung ventilation and perfusion in prone and supine postures with reference to anesthetized and mechanically ventilated healthy volunteers. *Anesthesiology*. 2010;112(3):682-7.
80. Guerin C, Reignier J, Richard JC, Beuret P, Gacouin A, Boulain T, et al. Prone positioning in severe acute respiratory distress syndrome. *N Engl J Med*. 2013;368(23):2159-68.
81. Samanta S, Samanta S, Wig J, Baronia AK. How safe is the prone position in acute respiratory distress syndrome at late pregnancy? *Am J Emerg Med*. 2014;32(6):687 e1-3.
82. Ruan Q, Yang K, Wang W, Jiang L, Song J. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Med*. 2020.
83. Jannuzzi J. Troponin and BNP Use in COVID-19 2020 [updated March 18, 2020; cited March 22 2020]. Available from: <https://www.acc.org/latest-in-cardiology/articles/2020/03/18/15/25/troponin-and-bnp-use-in-covid19>.



### *Clinical Management of COVID-19*

84. Shi S, Qin M, Shen B, Cai Y, Liu T, Yang F, et al. Association of Cardiac Injury With Mortality in Hospitalized Patients With COVID-19 in Wuhan, China. *JAMA Cardiology*. 2020.
85. Clerkin KJ, Fried JA, Raikhelkar J, Sayer G, Griffin JM, Masoumi A, et al. Coronavirus Disease 2019 (COVID-19) and Cardiovascular Disease. *Circulation*. 0(0).
86. Hu H, Ma F, Wei X, Fang Y. Coronavirus fulminant myocarditis treated with glucocorticoid and human immunoglobulin. *European Heart Journal*. 2020.
87. Welt FGP, Shah PB, Aronow HD, Bortnick AE, Henry TD, Sherwood MW, et al. Catheterization Laboratory Considerations During the Coronavirus (COVID-19) Pandemic: From ACC's Interventional Council and SCAI. *Journal of the American College of Cardiology*. 2020.
88. Zheng YY, Ma YT, Zhang JY, Xie X. COVID-19 and the cardiovascular system. *Nat Rev Cardiol*. 2020.
89. Arentz M, Yim E, Klaff L, Lokhandwala S, Riedo FX, Chong M, et al. Characteristics and Outcomes of 21 Critically Ill Patients With COVID-19 in Washington State. *JAMA*. 2020.
90. Cheng Y, Luo R, Wang K, Zhang M, Wang Z, Dong L, et al. Kidney disease is associated with in-hospital death of patients with COVID-19. *Kidney International*. 2020.
91. Kellum JA, Lameire N, Aspelin P, Barsoum RS, Burdmann EA, Goldstein SL, et al. Improving global outcomes (KDIGO) acute kidney injury work group. KDIGO clinical practice guideline for acute kidney injury. *Kidney International Supplements*. 2012;2:1-138.
92. Bergman P, Lindh AU, Bjorkhem-Bergman L, Lindh JD. Vitamin D and Respiratory Tract Infections: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *PLoS One*. 2013;8(6):e65835.
93. Cannell JJ, Vieth R, Umhau JC, Holick MF, Grant WB, Madronich S, et al. Epidemic influenza and vitamin D. *Epidemiol Infect*. 2006;134(6):1129-40.
94. Holick MF. The vitamin D deficiency pandemic: Approaches for diagnosis, treatment and prevention. *Rev Endocr Metab Disord*. 2017;18(2):153-65.
95. Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. *BMJ*. 2017;356:i6583.
96. McCarthy MS, Elshaw EB, Szekely BM, Raju D. A Prospective Cohort Study of Vitamin D Supplementation in AD Soldiers: Preliminary Findings. *Mil Med*. 2019;184(Suppl 1):498-505.
97. Rondanelli M, Miccono A, Lamburghini S, Avanzato I, Riva A, Allegrini P, et al. Self-Care for Common Colds: The Pivotal Role of Vitamin D, Vitamin C, Zinc, and Echinacea in Three Main Immune Interactive Clusters (Physical Barriers, Innate and Adaptive Immunity) Involved during an Episode of Common Colds-Practical Advice on Dosages and on the Time to Take These Nutrients/Botanicals in order to Prevent or Treat Common Colds. *Evid Based Complement Alternat Med*. 2018;2018:5813095.
98. Dabbagh-Bazarbachi H, Clergeaud G, Quesada IM, Ortiz M, O'Sullivan CK, Fernandez-Larrea JB. Zinc ionophore activity of quercetin and epigallocatechin-gallate: from Hepa 1-6 cells to a liposome model. *J Agric Food Chem*. 2014;62(32):8085-93.
99. Prasad AS. Zinc is an Antioxidant and Anti-Inflammatory Agent: Its Role in Human Health. *Front Nutr*. 2014;1:14.
100. te Velthuis AJW, van den Worm SHE, Sims AC, Baric RS, Snijder EJ, van Hemert MJ. Zn<sup>2+</sup> Inhibits Coronavirus and Arterivirus RNA Polymerase Activity In Vitro and Zinc Ionophores Block the Replication of These Viruses in Cell Culture. *PLOS Pathogens*. 2010;6(11):e1001176.
101. Xue J, Moyer A, Peng B, Wu J, Hannafon BN, Ding W-Q. Chloroquine Is a Zinc Ionophore. *PLOS ONE*. 2014;9(10):e109180.
102. Biesalski HK, Nohr D. Importance of vitamin-A for lung function and development. *Mol Aspects Med*. 2003;24(6):431-40.
103. Higdon J, Drake V, Angelo G, Delage B, Carr A, Michels A. Vitamin C. Linus Pauling Institute. Reviewed December 2018 [Available from: <https://lpi.oregonstate.edu/mic/vitamins/vitamin-C> <<https://lpi.oregonstate.edu/mic/vitamins/vitamin-C>.
104. Rhodes A, Evans LE, Alhazzani W, Levy MM, Antonelli M, Ferrer R, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Med*. 2017;43(3):304-77.
105. Albright CM, Ali TN, Lopes V, Rouse DJ, Anderson BL. The Sepsis in Obstetrics Score: a model to identify risk of morbidity from sepsis in pregnancy. *Am J Obstet Gynecol*. 2014;211(1):39 e1-8.



### *Clinical Management of COVID-19*

106. Chebbo A, Tan S, Kassir C, Tamura L, Carlson RW. Maternal Sepsis and Septic Shock. Crit Care Clin. 2016;32(1):119-35.
107. Weiss SL, Peters MJ, Alhazzani W, Agus MSD, Flori HR, Inwald DP, et al. Surviving Sepsis Campaign International Guidelines for the Management of Septic Shock and Sepsis-Associated Organ Dysfunction in Children. Pediatr Crit Care Med. 2020;21(2):e52-e106.
108. Comparison of Two Fluid-Management Strategies in Acute Lung Injury. New England Journal of Medicine. 2006;354(24):2564-75.
109. American College of Radiology (ACR) COVID-19 Clinical Resources for Radiologists, updated 27 March 2020 [Available from: <https://www.acr.org/Clinical-Resources/COVID-19-Radiology-Resources>.
110. Society of Breast Imaging (SBI) statement on breast imaging during the COVID-19 pandemic, updated 26 March 2020 [Available from: <https://www.sbi-online.org/Portals/0/Position%20Statements/2020/society-of-breast-imaging-statement-on-breast-imaging-during-COVID19-pandemic.pdf>.
111. American Society of Breast Surgeons (ASBrS) and ACR joint statement on breast screening exams during the COVID-19 pandemic, updated 26 March 2020 [Available from: <https://www.breastsurgeons.org/docs/news/2020-03-26-ASBrS-ACR-Joint-Statement.pdf>.
112. Mammography Quality Standards Act (MQSA) inspection information related to COVID-19, updated 27 March 2020 [Available from: <https://www.fda.gov/radiation-emitting-products/mammography-quality-standards-act-and-program/mqsa-inspection-information-related-covid-19>.
113. Coronavirus (COVID-19) update: FDA focuses on safety of regulated products while scaling back domestic inspections, updated 18 March 2020 [Available from: <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-focuses-safety-regulated-products-while-scaling-back-domestic>.
114. ACR recommendations for the use chest radiography and computed tomography (CT) for suspected COVID-19 infection, updated 22 March 2020 [Available from: <https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection>.
115. Mossa-Basha M, Meltzer CC, Kim DC, Tuite MJ, Kolli KP, Tan BS. Radiology Department Preparedness for COVID-19: Radiology Scientific Expert Panel. Radiology. 2020:200988.
116. Ai T, Yang Z, Hou H, Zhan C, Chen C, Lv W, et al. Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases. Radiology. 2020:200642.
117. Bai HX, Hsieh B, Xiong Z, Halsey K, Choi JW, Tran TML, et al. Performance of radiologists in differentiating COVID-19 from viral pneumonia on chest CT. Radiology. 2020:200823.
118. Xie X, Zhong Z, Zhao W, Zheng C, Wang F, Liu J. Chest CT for Typical 2019-nCoV Pneumonia: Relationship to Negative RT-PCR Testing. Radiology. 2020:200343.
119. Society of Interventional Radiology COVID-19 Planning, updated 23 March 2020 [Available from: <https://www.sirweb.org/practice-resources/toolkits/covid-19-toolkit/covid-19-planning/>.
120. Wong HYF, Lam HYS, Fong AH-T, Leung ST, Chin TW-Y, Lo CSY, et al. Frequency and Distribution of Chest Radiographic Findings in COVID-19 Positive Patients. Radiology. 2020:201160.
121. Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, et al. CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV). Radiology. 2020;295(1):202-7.
122. Fang Y, Zhang H, Xu Y, Xie J, Pang P, Ji W. CT Manifestations of Two Cases of 2019 Novel Coronavirus (2019-nCoV) Pneumonia. Radiology. 2020;295(1):208-9.
123. Ng M-Y, Lee EY, Yang J, Yang F, Li X, Wang H, et al. Imaging Profile of the COVID-19 Infection: Radiologic Findings and Literature Review. Radiology: Cardiothoracic Imaging. 2020;2(1):e200034.
124. Song F, Shi N, Shan F, Zhang Z, Shen J, Lu H, et al. Emerging 2019 Novel Coronavirus (2019-nCoV) Pneumonia. Radiology. 2020;295(1):210-7.
125. Pan F, Ye T, Sun P, Gui S, Liang B, Li L, et al. Time Course of Lung Changes On Chest CT During Recovery From 2019 Novel Coronavirus (COVID-19) Pneumonia. Radiology. 2020:200370.
126. Wang Y, Dong C, Hu Y, Li C, Ren Q, Zhang X, et al. Temporal Changes of CT Findings in 90 Patients with COVID-19 Pneumonia: A Longitudinal Study. Radiology. 2020:200843.
127. Simpson S, Kay FU, Abbata S, Bhalla S, Chung JH, Chung M, et al. Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. Radiology: Cardiothoracic Imaging. 2020;2(2):e200152.

### *Clinical Management of COVID-19*

128. National Academies of Sciences, Engineering, and Medicine. Integrating clinical research into epidemic response: The Ebola experience. Washington DC: The National Academies Press; 2017.
129. Lee N, Allen Chan KC, Hui DS, Ng EK, Wu A, Chiu RW, et al. Effects of early corticosteroid treatment on plasma SARS-associated Coronavirus RNA concentrations in adult patients. *J Clin Virol*. 2004;31(4):304-9.
130. Mo P, Xing Y, Xiao Y, Deng L, Zhao Q, Wang H, et al. Clinical characteristics of refractory COVID-19 pneumonia in Wuhan, China. *Clin Infect Dis*. 2020.
131. Mulangu S, Dodd LE, Davey RT, Jr., Tshiani Mbaya O, Proschan M, Mukadi D, et al. A Randomized, Controlled Trial of Ebola Virus Disease Therapeutics. *N Engl J Med*. 2019;381(24):2293-303.
132. de Wit E, Feldmann F, Cronin J, Jordan R, Okumura A, Thomas T, et al. Prophylactic and therapeutic remdesivir (GS-5734) treatment in the rhesus macaque model of MERS-CoV infection. *Proceedings of the National Academy of Sciences*. 2020:201922083.
133. Sheahan TP, Sims AC, Leist SR, Schafer A, Won J, Brown AJ, et al. Comparative therapeutic efficacy of remdesivir and combination lopinavir, ritonavir, and interferon beta against MERS-CoV. *Nat Commun*. 2020;11(1):222.
134. Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. *Cell Res*. 2020;30(3):269-71.
135. Dong L, Hu S, Gao J. Discovering drugs to treat coronavirus disease 2019 (COVID-19). *Drug Discov Ther*. 2020;14(1):58-60.
136. Liu J, Cao R, Xu M, Wang X, Zhang H, Hu H, et al. Hydroxychloroquine, a less toxic derivative of chloroquine, is effective in inhibiting SARS-CoV-2 infection in vitro. *Cell Discov*. 2020;6:16.
137. Yao X, Ye F, Zhang M, Cui C, Huang B, Niu P, et al. In Vitro Antiviral Activity and Projection of Optimized Dosing Design of Hydroxychloroquine for the Treatment of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). *Clin Infect Dis*. 2020.
138. De Lamballerie X, Boisson V, Reynier JC, Enault S, Charrel RN, Flahault A, et al. On chikungunya acute infection and chloroquine treatment. *Vector Borne Zoonotic Dis*. 2008;8(6):837-9.
139. Paton NI, Lee L, Xu Y, Ooi EE, Cheung YB, Archuleta S, et al. Chloroquine for influenza prevention: a randomised, double-blind, placebo controlled trial. *Lancet Infect Dis*. 2011;11(9):677-83.
140. Sperber K, Louie M, Kraus T, Proner J, Sapira E, Lin S, et al. Hydroxychloroquine treatment of patients with human immunodeficiency virus type 1. *Clin Ther*. 1995;17(4):622-36.
141. Tricou V, Minh NN, Van TP, Lee SJ, Farrar J, Wills B, et al. A randomized controlled trial of chloroquine for the treatment of dengue in Vietnamese adults. *PLoS Negl Trop Dis*. 2010;4(8):e785.
142. Roques P, Thiberville SD, Dupuis-Maguiraga L, Lum FM, Labadie K, Martinon F, et al. Paradoxical Effect of Chloroquine Treatment in Enhancing Chikungunya Virus Infection. *Viruses*. 2018;10(5).
143. Gautret P, Lagier J-C, Parola P, Hoang VT, Meddeb L, Mailhe M, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. *International Journal of Antimicrobial Agents*. 2020.
144. Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. *Biosci Trends*. 2020;14(1):72-3.
145. Cao B, Wang Y, Wen D, Liu W, Wang J, Fan G, et al. A Trial of Lopinavir-Ritonavir in Adults Hospitalized with Severe Covid-19. *N Engl J Med*. 2020.
146. Liu F, Xu A, Zhang Y, Xuan W, Yan T, Pan K, et al. Patients of COVID-19 may benefit from sustained lopinavir-combined regimen and the increase of eosinophil may predict the outcome of COVID-19 progression. *Int J Infect Dis*. 2020.
147. Yao TT, Qian JD, Zhu WY, Wang Y, Wang GQ. A systematic review of lopinavir therapy for SARS coronavirus and MERS coronavirus-A possible reference for coronavirus disease-19 treatment option. *J Med Virol*. 2020.
148. Xu X, Han M, Li T, Sun W, Wang D, Fu B, et al. Effective Treatment of Severe COVID-19 Patients with Tocilizumab. 2020.
149. Tiberghien P, de Lamballerie X, Morel P, Gallian P, Lacombe K, Yazdanpanah Y. Collecting and evaluating convalescent plasma for COVID-19 treatment: why and how. *Vox Sang*. 2020.
150. Shen C, Wang Z, Zhao F, Yang Y, Li J, Yuan J, et al. Treatment of 5 Critically Ill Patients With COVID-19 With Convalescent Plasma. *JAMA*. 2020.
151. Tanne JH. Covid-19: FDA approves use of convalescent plasma to treat critically ill patients. *BMJ*.

152. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). 28 February 2020. 2020 [Available from: [https://www.who.int/publications-detail/report-of-the-who-china-joint-mission-on-coronavirus-disease-2019-\(covid-19\)](https://www.who.int/publications-detail/report-of-the-who-china-joint-mission-on-coronavirus-disease-2019-(covid-19))].
153. Boelig RC, Manuck T, Oliver EA, Di Mascio D, Saccone G, Bellussi F, et al. Labor and Delivery Guidance for COVID-19. *Am J Obstet Gynecol MFM*. 2020:100110.
154. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, Jamieson DJ. Coronavirus Disease 2019 (COVID-19) and Pregnancy: What obstetricians need to know. *Am J Obstet Gynecol*. 2020.
155. ReproTox [Available from: [www.reprotox.org](http://www.reprotox.org)].
156. Jeejeebhoy FM, Zelop CM, Lipman S, Carvalho B, Joglar J, Mhyre JM, et al. Cardiac Arrest in Pregnancy: A Scientific Statement From the American Heart Association. *Circulation*. 2015;132(18):1747-73.
157. Fan C, Lei D, Fang C, Li C, Wang M, Liu Y, et al. Perinatal Transmission of COVID-19 Associated SARS-CoV-2: Should We Worry? *Clin Infect Dis*. 2020.
158. Center for Disease Control and Prevention. Pregnancy & Breastfeeding: Information about Coronavirus Disease 2019 2020.
159. CDC. Interim Considerations for Infection Prevention and Control of Coronavirus Disease 2019 (COVID-19) in Inpatient Obstetric Healthcare Settings 2020 [Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcare-guidance.html>].
160. To KK, Tsang OT, Chik-Yan Yip C, Chan KH, Wu TC, Chan JMC, et al. Consistent detection of 2019 novel coronavirus in saliva. *Clin Infect Dis*. 2020.
161. Xu Y, Li X, Zhu B, Liang H, Fang C, Gong Y, et al. Characteristics of pediatric SARS-CoV-2 infection and potential evidence for persistent fecal viral shedding. *Nature Medicine*. 2020.
162. CDC. COVID-19 People Who Need Extra Precautions: Older Adults 2020 [updated 3/21/20. Available from: [https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fhigh-risk-complications%2Folder-adults.html](https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fhigh-risk-complications%2Folder-adults.html)].
163. D'Adamo H, Yoshikawa T, Ouslander JG. Coronavirus Disease 2019 in Geriatrics and Long-term Care: The ABCDs of COVID-19. *J Am Geriatr Soc*. 2020.
164. British Geriatric Society. BGS statement on the COVID-10 pandemic [Available from: <https://www.bgs.org.uk/bgs-statement-on-the-covid-19-pandemic>].
165. Han JH, Wilson A, Vasilevskis EE, Shintani A, Schnelle JF, Dittus RS, et al. Diagnosing delirium in older emergency department patients: validity and reliability of the delirium triage screen and the brief confusion assessment method. *Ann Emerg Med*. 2013;62(5):457-65.
166. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegel AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med*. 1990;113(12):941-8.
167. Lindroth H, Bratzke L, Purvis S, Brown R, Coburn M, Mrkobrada M, et al. Systematic review of prediction models for delirium in the older adult inpatient. *BMJ Open*. 2018;8(4):e019223.
168. Statement from the British Geriatrics Society. Managing delirium in confirmed and suspected cases [Available from: <https://www.bgs.org.uk/resources/coronavirus-managing-delirium-in-confirmed-and-suspected-cases>].
169. Hwang U, Malsch AJ, Biese KJ, Inouye SK. Preventing and Managing Delirium in Older Emergency Department Patients During the COVID-19 Pandemic. *Journal of Geriatric Emergency Medicine*. 2020;1(4):Supplement 1.
170. Neufeld KJ, Yue J, Robinson TN, Inouye SK, Needham DM. Antipsychotic Medication for Prevention and Treatment of Delirium in Hospitalized Adults: A Systematic Review and Meta-Analysis. *J Am Geriatr Soc*. 2016;64(4):705-14.
171. Farah A. Atypicality of atypical antipsychotics. *Prim Care Companion J Clin Psychiatry*. 2005;7(6):268-74.
172. CDC. Guidance on Air Medical Transport for SARS Patients [cited 2020. Available from: <https://www.cdc.gov/sars/travel/airtransport.html>].



## APPENDIX A : MASK GUIDANCE, PRECAUTIONS, &amp; PPE VISUALS FOR USE DURING SHORT SUPPLIES

**Mask Guidance****SURGICAL MASKS****DISCARD MASK IF:**

- Contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.
- Obviously damaged or hard to breathe through.
- At the conclusion of your shift.

**EXTENDED USE:**

- Wear mask for ENTIRE shift unless soiled, damaged, or hard to breathe through.
- Do not touch the mask. If you touch or adjust your mask, you must immediately perform proper hand hygiene.
- Leave the patient care area if you need to remove your mask.
- Consider use of a face shield over mask.

**REUSE:**

- Masks that fasten via ties that are unable to be undone and are torn need to be discarded.
- Masks should be carefully folded so the outer surface is held inward and against itself to reduce contact with the outer surface during storage.
- Keep used masks in a clean, breathable container such as a paper bag between uses. Do not store in a plastic bag. Keep in a clean space outside patient room, such as a wall locker next to patient room or top of the isolation cart. To prevent accidental use of another's mask, label the container:
  - First initial and last name of owner
  - Strap of mask with first initial and last name of owner

**Glossary**

**Extended Use** — The practice of wearing the same mask/respirator for repeated close contact encounters with several patients, without removing the mask/respirator between patient encounters.

**Reuse** — The practice of using the same mask/respirator for multiple encounters with several patients but removing it after each encounter.

**N95 RESPIRATORS**

Extended and limited reuse of respirators were recommended for conserving respirators during previous respiratory pathogen outbreaks and pandemics.

Use face shield over N95 respirator to reduce surface contamination.

Perform hand hygiene with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting respirator.

**DISCARD N95 RESPIRATOR IF:**

- Used for aerosol-generating procedure.
- Contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.
- Obviously damaged or hard to breathe through.
- Reused (donned/doffed) a maximum of five times.

**EXTENDED USE:**

Extended use may be implemented when multiple patients are infected with the same respiratory pathogen and patients are placed together in dedicated waiting rooms or hospital wards.

**REUSE:**

- Keep used respirators in a clean, breathable container such as a paper bag between uses. Do not store in a plastic bag. Keep in a clean space outside patient room such as a wall locker near patient's room or top of the isolation cart. To prevent accidental use of another person's respirator, label the container:
  - First initial and last name of owner
  - Strap of respirator with first initial and last name of owner
- Avoid touching the inside of the respirator. If inadvertent contact with the inside of the respirator, perform hand hygiene as described above.
- Use a pair of clean (non-sterile) gloves when donning a used N95 respirator and performing a user seal check. Discard gloves after the N95 respirator is donned and any adjustments are made to ensure the respirator is sitting comfortably on your face with a good seal.

## **Standard Precautions**

### **FOR THE CARE OF ALL PATIENTS**

Includes Blood, Body Fluids, Secretions, Excretions, and Contaminated Items


Wash hands BEFORE and AFTER patient care regardless of whether gloves are worn. - Wash hands immediately after gloves are removed and between patient contacts.
Wear gloves when touching blood, body fluids, secretions, excretions, and contaminated items. - Put on clean gloves just before touching mucous membranes and non-intact skin.
Wear mask and eye protection or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures and patient care activities that are likely to generate splashes or sprays of blood/body fluids.
Wear gown to protect skin and prevent soiling of clothing during procedures and patient care activities that are likely to generate splashes or sprays of blood & body fluids. Remove soiled gown as promptly as possible and wash hands.
Take care to prevent injuries when using needles, scalpels, and other sharp instruments or devices; when handling sharp instruments after procedures; when cleaning used instruments; and when disposing of used needles.
Use mouthpieces, resuscitation bags, or other ventilation devices as an alternative to mouth-to-mouth resuscitation.
Cover your cough and sneeze with tissues or cough and sneeze into your sleeve.
Avoid touching your face (eyes, nose and mouth) with unclean hands.
Clean and disinfect shared patient equipment.
Use aseptic technique.



## PPE Visuals for Use During Supply Shortages

The following visuals are provided by Emory University, and are available as printable PDFs at the following link: <https://med.emory.edu/departments/medicine/divisions/infectious-diseases/serious-communicable-diseases-program/covid-19-resources/conserving-ppe.html>

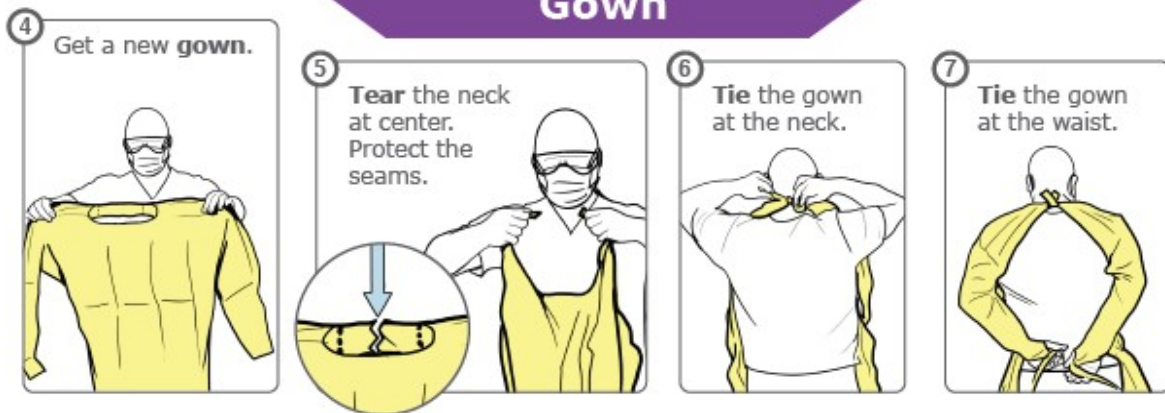
### EXTENDED WEAR

View the PPE video at [med.emory.edu/PPE](https://med.emory.edu/PPE) 

#### Eyes and Mask



#### Gown



#### Entry



# store your N95



## What you need

View the PPE videos at [med.emory.edu/PPE](https://med.emory.edu/PPE)



N95 Respirator



Paper storage bag with handles

## Removal

1

**Sanitize gloves.**



2



**Pinch bottom strap and pull far over head.**

**Do not** let straps touch your face.

3



**Pinch top strap and pull far over head.**

**Do not** let straps touch your face as you **remove** the N95.

4

**Position and hold N95 facedown.**



## Storage

5

**Place storage bag on clean, flat surface.**



6



**Place N95 facedown into the storage bag.**

**Avoid** touching inside or outside of bag.



7

**Sanitize gloves.**



## Retrieval

8

**Sanitize gloves.**



9



**Remove N95 from the storage bag.**

**Avoid** touching inside or outside of bag.

10



**Put on N95, ensuring proper seal. Ensure straps are not crossing.**

11

**Sanitize gloves.**



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EMORY

## CONSERVE PPE

After gown and glove removal...

## Setup

View the PPE videos at [med.emory.edu/PPE](https://med.emory.edu/PPE)

1 **Sanitize hands.**

2 **Put on fresh gloves.**

3 **Place wipe on table.**

5 **Remove eyewear and place on wipe.**

## N95

8 **Sanitize gloves.**

6 **Sanitize gloves.**

7 **Remove procedure mask, lower strap and then upper. Store mask.**

9 **Wipe front and back of shield.**

## Face Shield

14 **Sanitize gloves.**

10 **Wipe elastic band.**

11 **Wipe foam band.**

12 **Wipe table.**

13 **Place shield upside down to dry.**

15 **Remove gloves.**

16 **Wash hands with soap and water.**

9 **Wipe front and back of lens.**

## Goggles

13 **Sanitize gloves.**

10 **Wipe both ear pieces.**

11 **Wipe table.**

12 **Place goggles on clean table to dry.**

14 **Remove gloves.**

15 **Wash hands with soap and water.**

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**EMORY**



putting  
PPE

**ON**

## What You Need

View the PPE video at [med.emory.edu/PPE](https://med.emory.edu/PPE)



(ACE)



Contact gown



N95 Respirator



Face shield or goggles



Gloves

### Gown + Gloves

**1** Remove any personal items and jewelry and put in secure location, not in pockets.



**2** Sanitize hands.



**3** Put on contact gown outside room.

Open-end **faces** your back.

Tie the back of the gown.



**4** Put on gloves over the cuffs of the gown.



### Respirator

**5** Put on N95, ensuring proper seal. Ensure straps are not crossing.



**6** Place hands over the front of the N95. Breathe an easy deep breath in and out.

If you **feel** air escape the edges, **refit** and **repeat**.



NO NO NO NO NO NO

YES

**7** Sanitize gloves.



### Eyes + Entry

**8** Put on face shield.



**9** Sanitize gloves.



**10** **ENTER room**



**DO NOT enter** the room if you do not achieve a proper respirator seal.

**11** Do not touch face or re-adjust N95 or face shield inside room.







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**EMORY**


**Putting PPE ON**



(DICE)




Contact gown



Mask




Face shield or goggles



Gloves

View the PPE video at [med.emory.edu/PPE](https://med.emory.edu/PPE)



**Gown + Gloves**


1

**Remove** any personal items and jewelry and put in secure location, not in pockets.



2

**Sanitize** hands.




3

**Put on** contact gown outside room.

Open-end **faces** your back.

**Tie** the back of the gown.



4


**Put on** gloves over the cuffs of the gown.



**Mask + Eyes**


5

**Put on** mask.




6

**Fit** mask to nose



7

**Put on** face shield or goggles.




**Entry**

8

**Sanitize** gloves.





ENTER  
room



10

**Do not** touch face or re-adjust mask or face shield inside room.





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**EMORY**




# taking PPE OFF

## Gown + Gloves

View the PPE video at [med.emory.edu/PPE](https://med.emory.edu/PPE) 



- 1 **Sanitize gloves.** 
- 2  Cross arms and **grip gown on shoulders.**  
**Pull and break gown in controlled fashion.**
- 3  **Roll the gown towards your hands.**  
**Remove the gloves with the gown.**  
**Dispose of gloves and gown.** 
- 4 **Sanitize hands.** 

**EXIT patient room**



**EXIT patient room**

## Eyes

- 5 **Put on new gloves.** 
- 6 **Sanitize gloves.** 
- 7  **Do not touch face.**
- 8  **Remove face shield by the strap over your head without touching your skin.**

## Mask or Respirator

- 9 **Sanitize gloves.** 
- 10  **Pinch bottom strap and pull far over head.**  
**Do not let straps touch your face.**
- 11  **Pinch top strap and pull far over head.**  
**Do not let straps touch your face as you remove the N95.**

## Wash

- 12  **Remove gloves.**
- 13  **Head immediately to handwashing station.**  
**Wash hands with soap and water.**



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EMORY

## taking PPE OFF

### Gown + Gloves

(DICE)

View the PPE video at [med.emory.edu/PPE](https://med.emory.edu/PPE)

**1** Sanitize gloves.

**2** Cross arms and **grip** gown on shoulders.  
**Pull and break** gown in controlled fashion.

**3** Roll the gown towards your hands.  
**Remove** the gloves with the gown.  
**Dispose** of gloves and gown.

**4** Sanitize hands.

**EXIT patient room** **EXIT patient room**

### Eyes

**5** Put on new gloves.

**6** Sanitize gloves.

**7**   
**Do not** touch face.

**8**   
**Remove** face shield by the **strap** over your head without touching your skin.

### Mask

**9** Sanitize gloves.

**10**   
**Pinch** loops and **pull** them back and off of your ears.  
**Do not** let loops touch your face.

**11**   
**Pull** loops off without touching your face with them or your hands.  
**Remove** the mask.

### Wash

**12**   
**Remove** gloves.

**13**   
**Head immediately** to handwashing station.  
**Wash** hands with soap and water.

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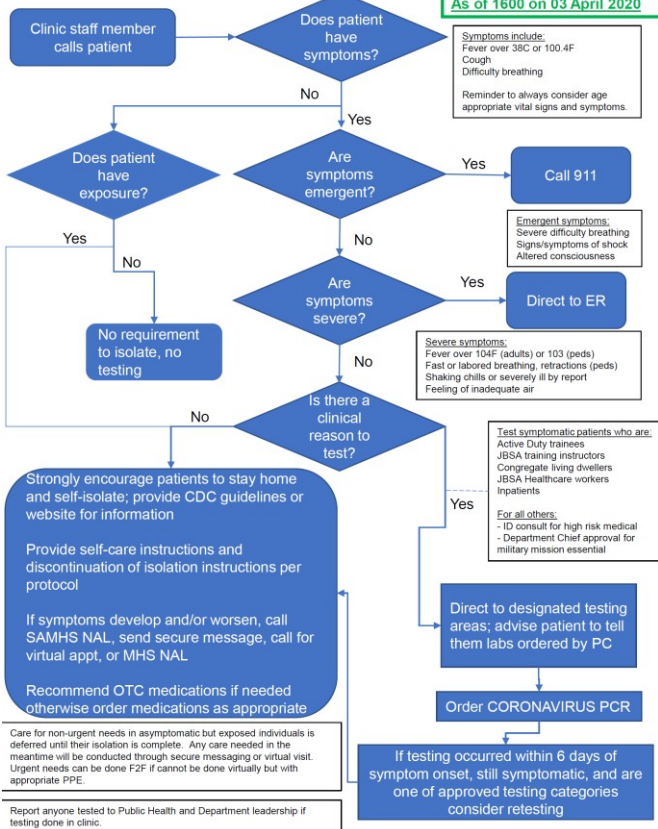
**EMORY**



## APPENDIX B : EXAMPLE TRIAGE PROTOCOLS DURING COVID-19 PANDEMIC

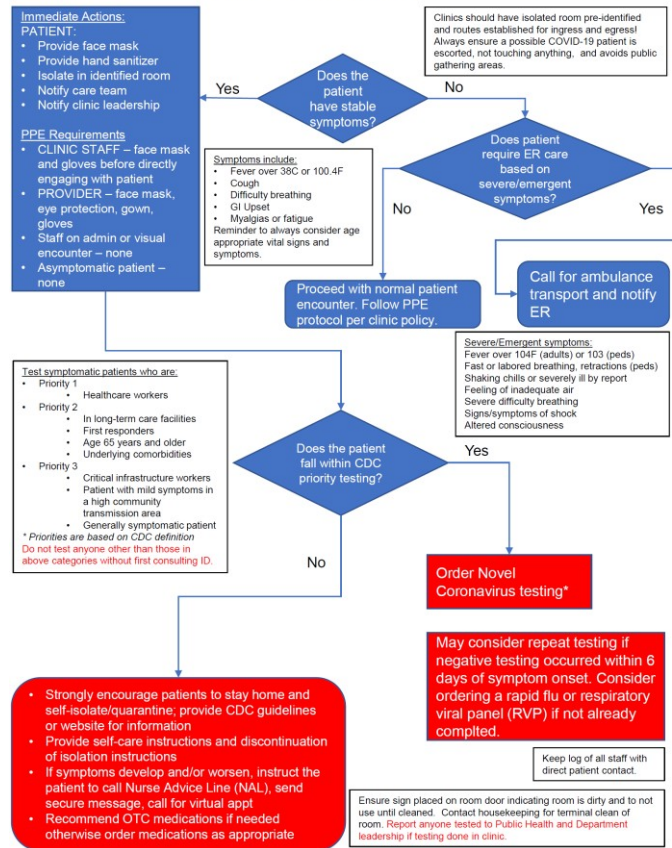
## COVID-19 Telephone Triage Protocol

As of 1600 on 03 April 2020



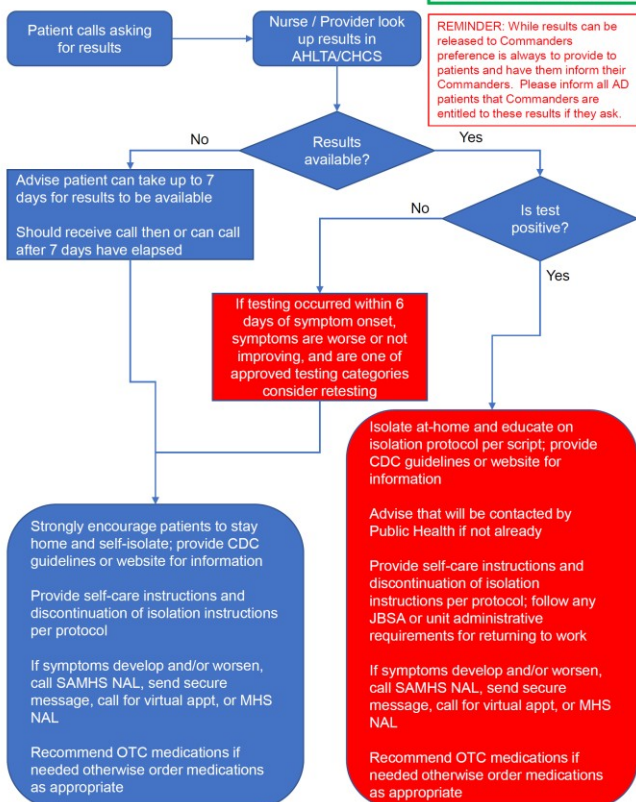
## COVID-19 In-clinic Protocol

Updated 02 April 2020



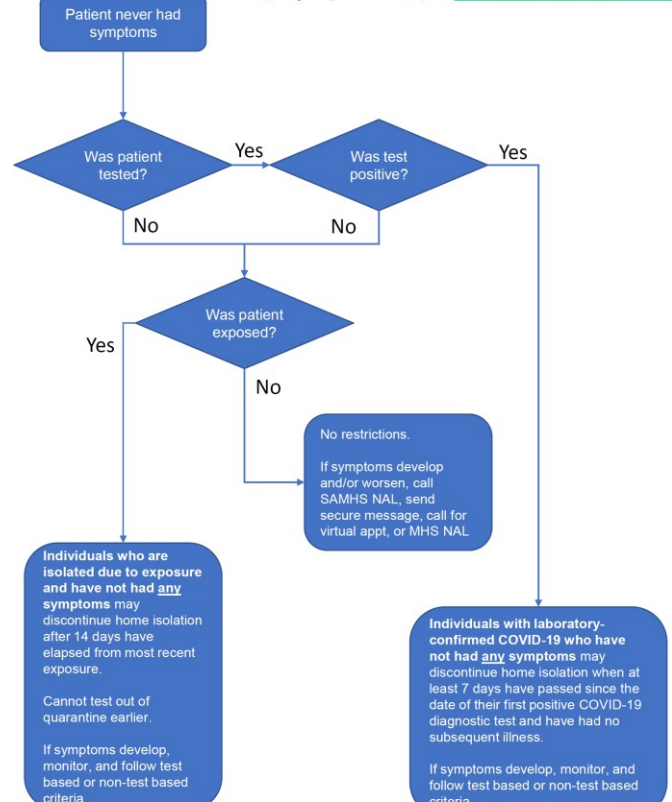
## COVID-19 Test Result Protocol (Patient Calls)

As of 1600 on 03 April 2020



## COVID-19 Home Isolation Discontinuation Protocol (Asymptomatic)

As of 1600 on 03 April 2020

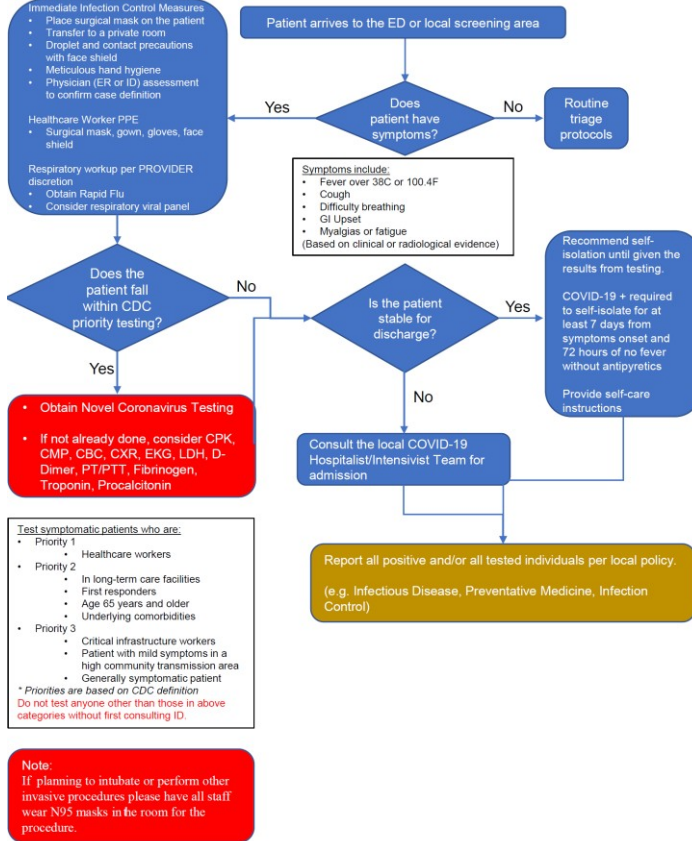




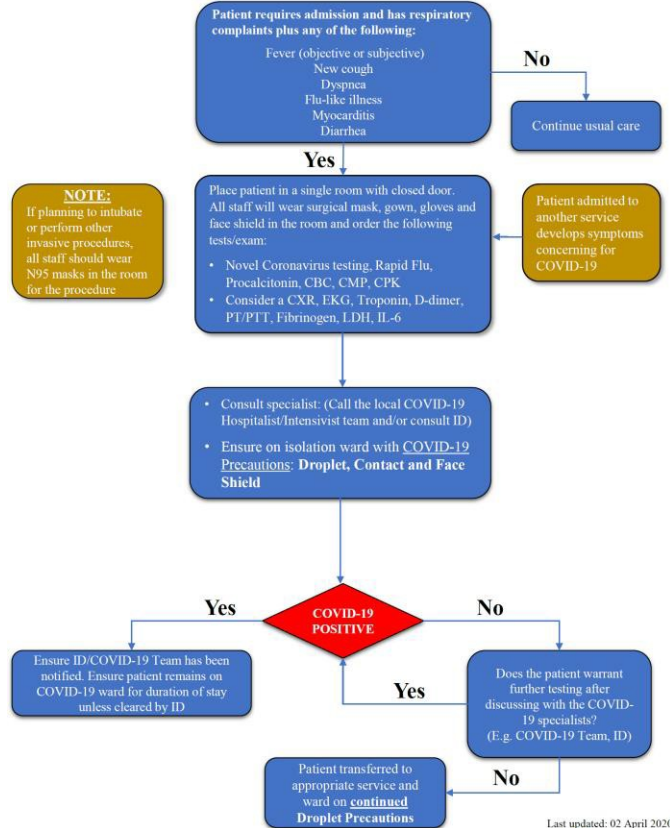
## Clinical Management of COVID-19

Updated 02 April 2020

### COVID-19 ED Protocol



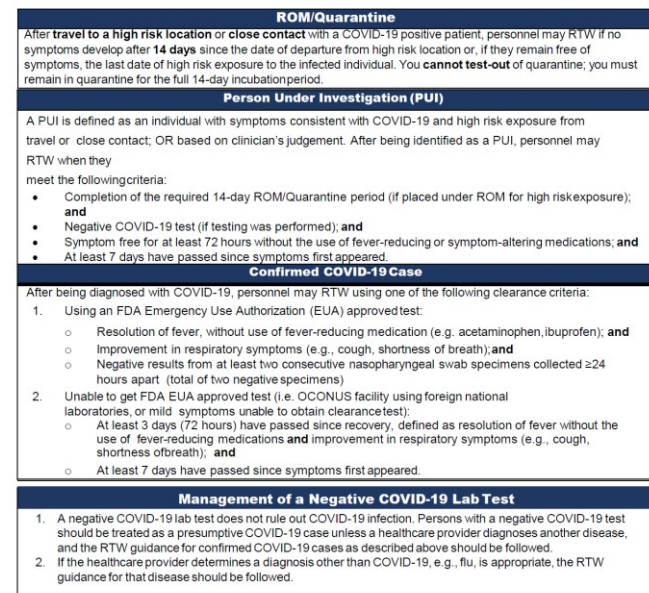
### INPATIENT COVID-19 PROTOCOL



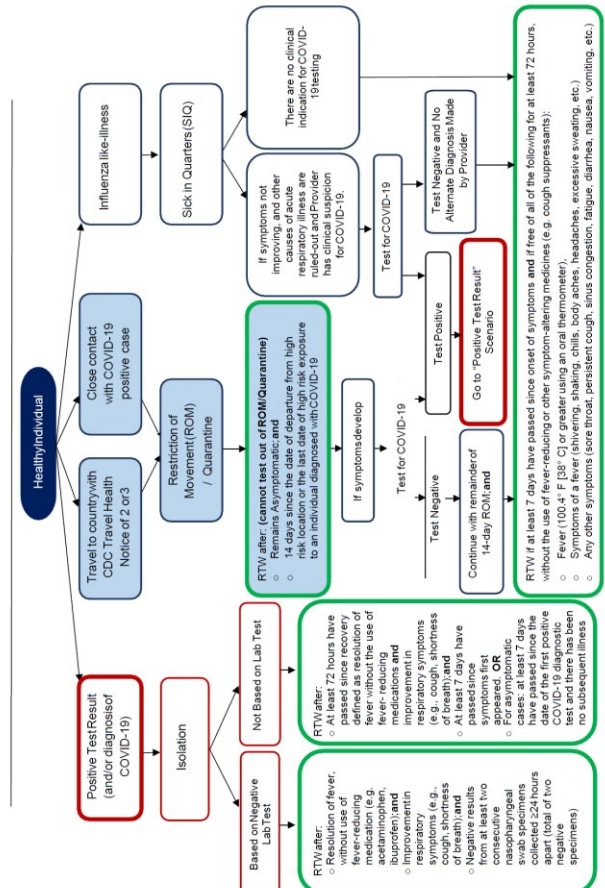
## Return to Work Guidelines for Individuals Diagnosed with Coronavirus Disease (COVID-19)

To help prevent the spread of 2019 coronavirus disease (COVID-19) in the community, Department of Defense (DoD) Commanders in coordination with medical experts have instituted transmission-based precautions. Transmission-based precautions include stay home from work policy, restriction of movement (ROM), quarantine, and isolation. Personnel who have symptoms of acute respiratory illness should notify their supervisor and avoid going to work. Personnel who have a high risk exposure to COVID-19 or who have traveled to high risk locations as defined by the Centers for Disease Control and Prevention (CDC) with ongoing community transmission of COVID-19 (Travel Health Notice Levels 2 or 3) should be placed under ROM or quarantine. Personnel who diagnosed with COVID-19 should be placed under isolation at a healthcare facility, home, or another designated isolation facility.

The decision to discontinue transmission-based precautions and allow personnel to return to work (RTW) is based on weighing the overall risks of severe illness and death; balancing the potential benefits of decreasing transmission through the exclusion of ill persons with minimizing social disruption. This guidance will continue to be updated as more information becomes available.



### Return to Work (RTW) Flowchart Coronavirus Disease (COVID-19)



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**APPENDIX C : COVID-19 INTUBATION PRE-ENTRY CHECKLIST\***

---

**For Providers:**To bring inside room:

Place a priority on rapid airway placement with video laryngoscopy (ie Glidescope) to create distance between operator and patient's airway, avoidance of BVM and NIV due to risk of aerosolization:

☐ Airway Supplies:

- ETT (7, 7.5, 8 for adults, appropriate size for children) with syringe for cuff
- Glidescope or C-MAC (facilitate intubation from a distance)
- Appropriate stylet
- Bougie
- OG tube with syringe, lube and tape
- OP/NP airway
- Colorimetric end-tidal CO<sub>2</sub> detector
- Suction setup

☐ Disposable stethoscope☐ Sani-wipes (should be located inside room)Keep outside room (on standby):☐ Back up Airway Supplies:

- Appropriate size laryngoscope blades (Mac 3 & 4 for adults) and handle (disposable preferred)
- Stylet
- BVM (avoid if possible due to risk of aerosolization of pathogen)

☐ Airway cart (never bring in room)☐ EZ-IO**For Nursing:**☐ RSI meds kit☐ Restraints☐ Foley☐ ABG syringe☐ Post-intubation meds:

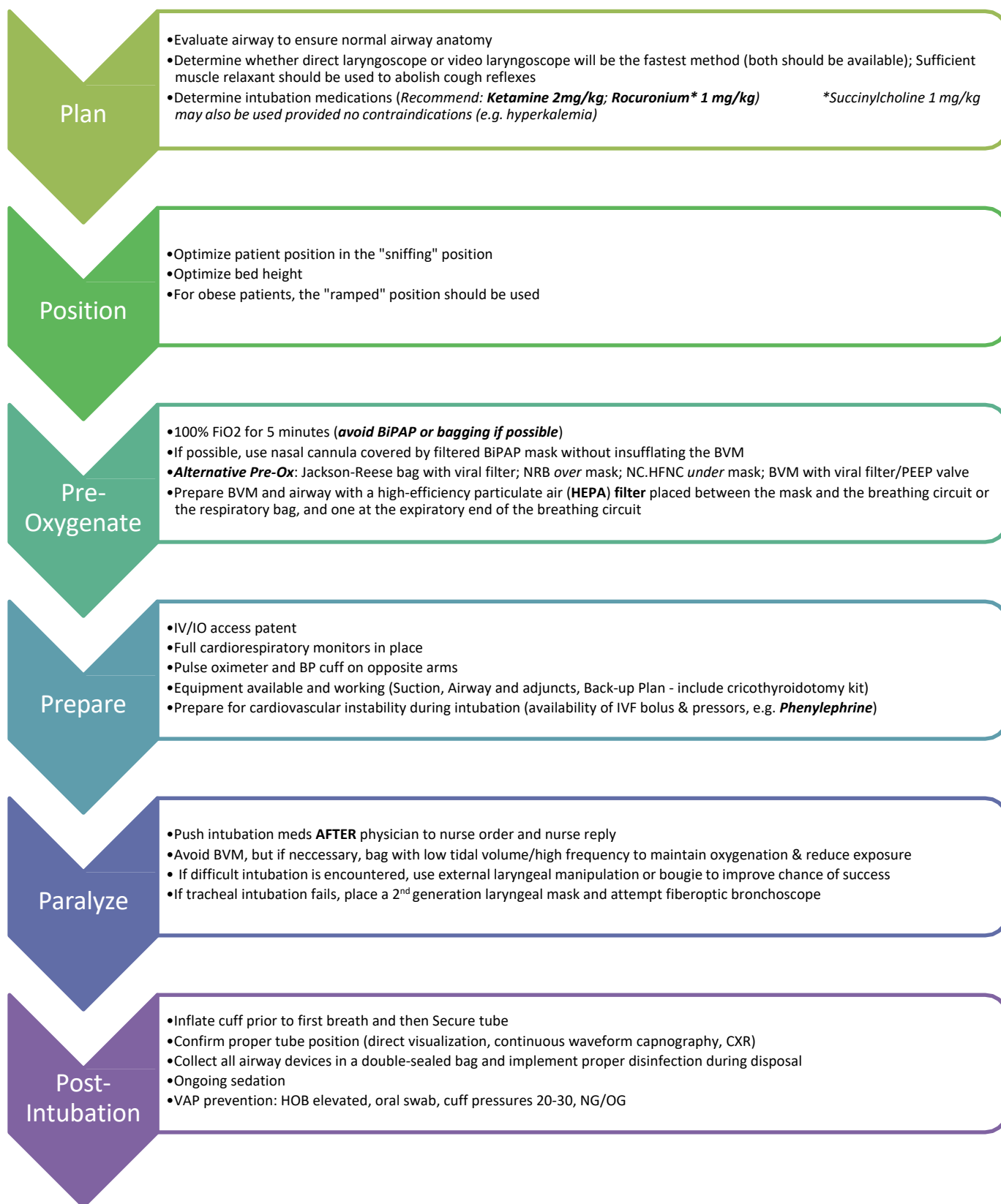
- propofol
- fentanyl
- phenylephrine
- norepinephrine drip

**For Respiratory Therapy:**☐ Ventilator with appropriate filters☐ ET securing device☐ Waveform capnography adapter☐ Viral filter for Ambubag

\*Adapted from University of Washington (<https://covid-19.uwmedicine.org/>)



## APPENDIX D : COVID-19 INTUBATION PROTOCOL



## APPENDIX E : COVID-19 COGNITIVE AIDS FOR INTUBATION

## COVID-19 Emergency Intubation Checklist

## CHECK BEFORE ENTERING ROOM



SAFE AIRWAY SOCIETY

## Team

- ☐ Anaesthesia contacted if difficulty anticipated
- ☐ Team introduced:
  - Airway Operator
  - Airway Assistant
  - Team Leader/Drugs
  - In-room Runner: optional
  - Door Runner
  - Outside room Runner
- ☐ Problems anticipated?

## Patient

- ☐ ECG, BP, Sats
- ☐ Pre-oxygenation
  - FIO<sub>2</sub> 100%
  - Sitting position 45°
- ☐ IV access x 2
  - 1L fluid on pump set
- ☐ Haemodynamics optimised
  - Fluid bolus
  - Pressor

## Drugs

- ☐ RSI drugs drawn up, doses chosen
- ☐ Rescue drugs
  - Metaraminol
- ☐ Post intubation sedation plan
- ☐ Drug C/I or allergies?

## Equipment

- ☐ 2 Laryngoscopes (tested)
- ☐ Tube chosen; cuff tested
- ☐ Bougie/stylet
- ☐ 10ml syringe
- ☐ Tube tie
- ☐ Lubricant
- ☐ Supraglottic airway sized to pt
- ☐ Scalpel + bougie CICO kit
- ☐ Airway trolley/bronchoscope outside room
- ☐ ETCO<sub>2</sub>
- ☐ Viral filter

## FINAL CHECK IN ROOM

- ☐ Patient position optimal
- ☐ Fluid runs easily
- ☐ Suction working
- ☐ Facemask with viral filter connected
- ☐ ETCO<sub>2</sub> trace
- ☐ O<sub>2</sub> running at 15L.min<sup>-1</sup>
- ☐ Oropharyngeal/nasal airways
- ☐ Airway plans:
  - Plan A: Videolaryngoscopy with bougie/stylet
  - Plan B: Supraglottic airway
  - Plan C: Vice grip, 2-person +/- Guedel/NPA
  - Plan D: Scalpel/bougie/tube



SAFE AIRWAY SOCIETY

## COVID-19 AIRWAY MANAGEMENT

1. Intensive training
2. Early intervention
3. Meticulous planning
4. Vigilant infection control
5. Efficient airway management
6. Clear communication

## USE A 'BUDDY CHECK' FOR CORRECT PPE FITTING

## Planning

Intervene early - aim to avoid emergency intubation.  
Negative Pressure room or Normal pressure with strict door policy.  
Senior clinician involvement. Is Anaesthetist needed?  
Early airway assessment documented by senior clinician.

## Prepare

Assemble 5-6 person Airway Team (see reverse).  
Use COVID-19 Intubation Tray (see reverse).  
Ensure Viral Filter and ETCO<sub>2</sub> in ventilation circuit.  
Share Airway Strategy. Use a dedicated COVID intubation checklist.

## PPE

Hand Hygiene (HH).  
Donning: HH > Gown > Mask > Eye-protection > Hat > HH > Gloves.  
Spotter to perform "Buddy Check" to ensure correct PPE fit.  
Airway operator to consider double gloves.

## Pre-Ox

45 degree head up position.  
Pre-oxygenate with Face Mask using 2 hands for full 5 minutes.  
Ensure a square ETCO<sub>2</sub> waveform, to be confident of no leaks.  
Avoid Apnoeic Oxygenation techniques due to aerosolization risk.

## Perform

Use VL; use the screen (indirect view) to maximise operator distance from airway.  
Modified RSI technique (1.5mg/kg IBW Roc OR 1.5mg/kg TBW Sux).  
No ventilation prior to intubation unless for rescue oxygenation.  
Wait 60 seconds for paralysis to take effect - avoid triggering cough.

## Post-ETT

Inflate cuff BEFORE initiating ventilation and monitor cuff pressures to minimise leak.  
Remove outer gloves (if on), dispose of airway equipment in sealed bag.  
Doffing: Gloves > Gown > HH > Hat > Eye Protection > Mask > HH. Use a Spotter.  
Debrief and share lessons.

## Awake Intubation

Risk of aerosolization. Involve Senior Anaesthetist if this airway technique is indicated.

## Connection / Disconnection

Apply the viral filter directly to the ETT.  
Only disconnect the circuit on the ventilator side of the viral filter.

## CICO Rescue

Scalpel-bougie technique to avoid aerosolization.

Collaboration between Safe Airway Society + RNS ASCAR

@SafeAirway + @RnsAscar

v1.2 March 2020

<https://www.safeairwaysociety.org/covid19/>

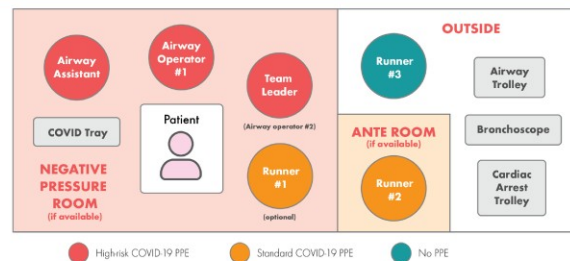
Guideline Only/Not a Substitute for Clinical Judgment



SAFE AIRWAY SOCIETY

## COVID-19 AIRWAY MANAGEMENT

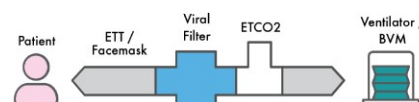
## Team Members



## COVID Intubation Tray

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Macintosh VL blade                     | <input type="checkbox"/> Bougie / Stylet  | <input type="checkbox"/> ETCO <sub>2</sub>         |
| <input type="checkbox"/> Hyperangulated VL blade (if available) | <input type="checkbox"/> 10 mL syringe    | <input type="checkbox"/> NG tube (large bore)      |
| <input type="checkbox"/> Macintosh direct laryngoscope          | <input type="checkbox"/> Tube tie         | <input type="checkbox"/> OPA + NPA                 |
| <input type="checkbox"/> SGA (2nd generation)                   | <input type="checkbox"/> Lubricant sachet | <input type="checkbox"/> Scalpel + bougie CICO kit |
| <input type="checkbox"/> ETT (appropriate size range)           | <input type="checkbox"/> Viral filter     | <input type="checkbox"/> Inline suction            |

## Circuit Setup



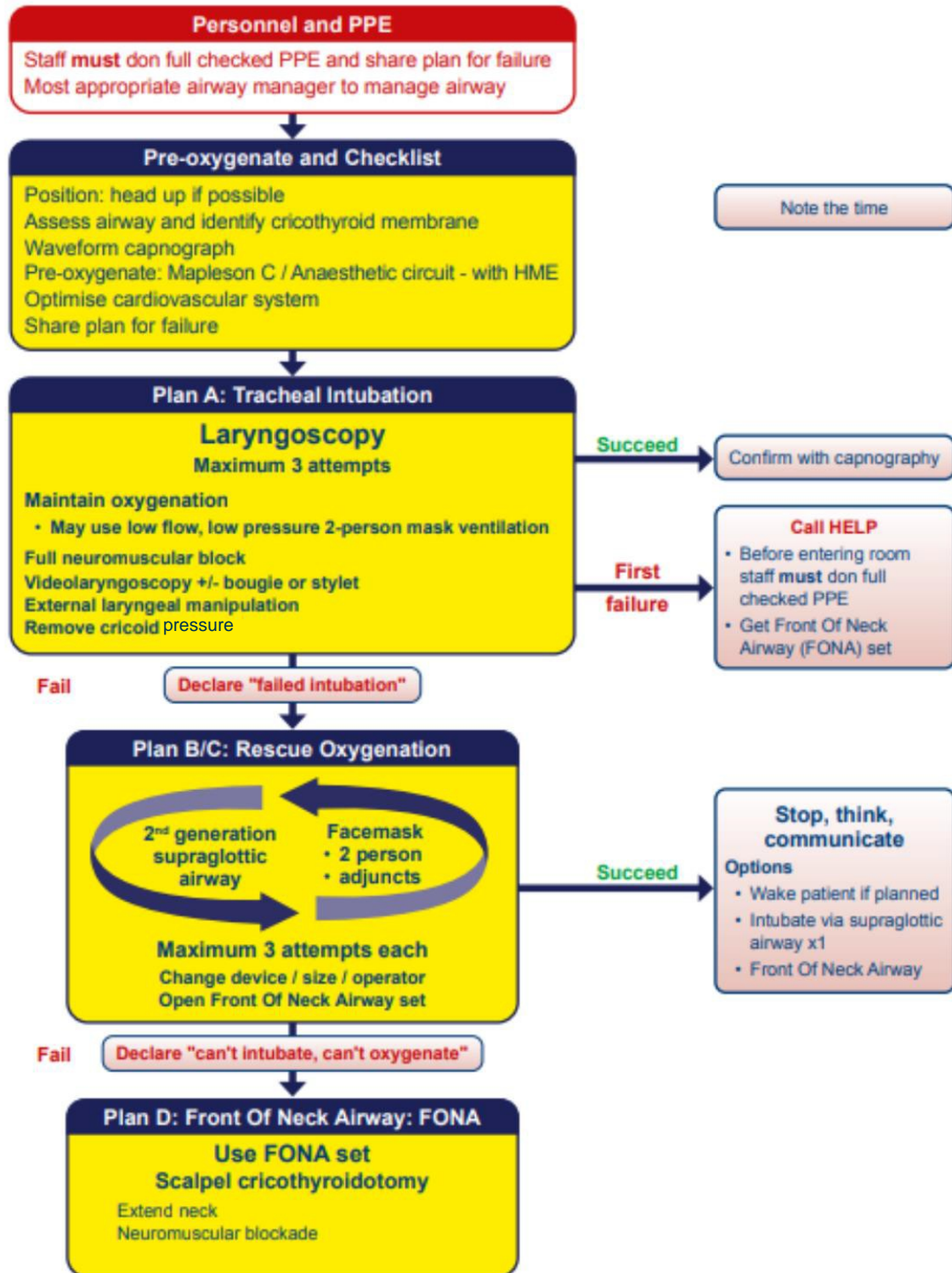
Collaboration between Safe Airway Society + RNS ASCAR

@SafeAirway + @RnsAscar

v1.2 March 2020

# Tracheal intubation of critically ill adults

## Adapted for COVID-19



This flowchart forms part of the 2020 COVID-19 Airway Guideline for tracheal intubation. Refer to the full document for further details.



## Can't Intubate, Can't Oxygenate (CICO) in critically ill adults Adapted for **COVID-19**

**CALL FOR HELP**



**Declare "Can't Intubate, Can't Oxygenate"**

### **Plan D: Front Of Neck Airway: FONA**

Extend neck

Ensure neuromuscular blockade

Exclude oxygen failure and blocked circuit

#### **Personnel and PPE**

New staff **must** don full checked PPE

Most appropriate airway manager to perform FONA

### **Scalpel cricothyroidotomy**

- Equipment:**
1. Scalpel (wide blade e.g. number 10 or 20)
  2. Bougie ( $\leq 14$  French gauge)
  3. Tube (cuffed 5.0–6.0mm ID)

#### **Laryngeal handshake to identify cricothyroid membrane**

##### **Palpable cricothyroid membrane**

- Transverse stab incision through cricothyroid membrane
- Turn blade through 90° (sharp edge towards the feet)
- Slide Coudé tip of bougie along blade into trachea
- Railroad lubricated cuffed tube into trachea
- Inflate cuff, ventilate and confirm position with capnography
- Secure tube

##### **Impalpable cricothyroid membrane**

- Make a large midline vertical incision
- Blunt dissection with fingers to separate tissues
- Identify and stabilise the larynx
- Proceed with technique for palpable cricothyroid membrane as above

#### **Post-FONA care and follow up**

- Closed tracheal suction
- Recruitment manoeuvre (if haemodynamically stable)
- Chest X-ray
- Monitor for complications
- Surgical review of FONA site
- Agree airway plan with senior clinicians
- Document and complete airway alert

This flowchart forms part of the 2020 COVID-19 Airway Guideline for tracheal intubation. Refer to the full document for further details.

---

## APPENDIX F : ADULT PRONE POSITIONING PROTOCOL EXAMPLE\*

---

\*Adapted from University Medical Center (Las Vegas, NV)

### Procedure for patient preparation prior to proning:

1. Obtain an order from the Fellow or Attending physician to place patient in the prone position. The order should include:
  - a. Proper sedation/pain medications and paralytic agents if necessary.
  - b. Length of time for each pronation cycle (patient should be in prone position a minimum of 16 hours, with a return to the supine position at least once a day).
  - c. Prone positioning should be performed within the first 24 hours of the diagnosis of severe hypoxemia.
2. Explain proning procedure and benefits to patient and family members when present.
3. Prior to proning patient, make sure the following criteria have been met and necessary equipment is made available:
  - a. Patient is mechanically ventilated via a secured endotracheal tube (ETT) with inline suction.
  - b. RT is at bedside to evaluate securement of ETT with commercial tape and to place bite block as needed. Twill may be used in addition to the tape if additional securement is needed. Do not secure ETT with a commercial securement device (i.e. Hollister).
  - c. Confirm patient intravenous access including central and arterial lines; verify lines are secure in place.
  - d. Remove ECG leads from anterior of torso; obtain new leads to place posteriorly once patient is prone. Electrocardiogram leads can be placed in the lateral limb position (left and right deltoid midaxillary line and left and right 12th intercostal space at the midaxillary line). The virtual lead (V1 or chest lead) can be placed on the dorsal surface.
  - e. Consider adhesive foam pads (i.e. Mepilex) to apply to bony prominences such as forehead, bilateral shoulders, chest, iliac crests and knees to prevent pressure ulcers.
  - f. Obtain positioning pillows, blanket rolls or foam prone positioning kit from materials management or supply room.
  - g. Continuous SpO2 monitoring.
  - h. Foley catheter and oral gastric tube secured in place.
  - i. Use fecal management system if needed.
  - j. It is reasonable to provide enteral feedings while patient is in prone position. Elevation of head of bed in reverse Trendelenburg position helps reduce the risk of gastric aspiration. Post pyloric tubes are preferred.
  - k. Lubricate patient's eyes prior to proning, then every six hours and as needed (Provider order needed).
  - l. Assess and document pain and provide adequate sedation and pain management throughout the procedure.
  - m. Patients may also require neuromuscular blocking agent during proning.
  - n. Remove head board and ensure bed brake is on.
  - o. RT will perform and document a complete vent check including auscultation of bilateral lung sounds, ventilator settings, ETT positioning/depth, patient tidal volumes and ETT cuff pressures pre and post turn.

### Procedure of manual pronation:

1. Assemble a minimum of a 5-person team consisting of at least one RT and the patient's RN. RT is to manage airway protection at the head of the bed and the other team members are positioned on either side of the bed to manually prone the patient. A fellow or attending physician should be present for the first turn.
2. Correctly position all tubes, taking into account the direction of the turn.
3. Lines inserted in the upper torso are aligned with either shoulder, exception is chest tubes or large bore tubes.
4. Tubes in the lower torso are aligned with either leg and extended off the bed.
5. Always initially turn the patient in the direction of the ventilator.

### Procedure for proper patient positioning (see diagram below):

1. Head and Neck positioning:

Place patient's head on a foam head positioner, which allows for the patient's head in a neutral position. Otherwise, support the patient's head in a rotated position paying attention to avoid pressure to the eyes and ears. Provide range of motion to the patient's head at least every hour, maintaining ETT tube alignment. Reposition head every two hours, head should be turned to the up arm while in swimmer's pose, to avoid traction on the brachial plexus. Coordinate with RT to be present to maintain the airway while repositioning the head every two hours. This may



### **Clinical Management of COVID-19**

require positioning the ventilator at the head of the bed rather than on one side of the bed to allow for the head reposition. Raise the head enough to provide for proper spinal alignment: avoid hyperextension or flexion of the cervical spine. Ensure the eyes have no pressure on the orbits and ears are properly aligned, flat and not folded.

#### **2. Arm positioning:**

If using foam prone positioning kit, place patient's arms in foam positioners. While the patient is in a side lying position, gently position the arms in a swimmer's pose. The swimmer's pose entails the up arm is in a supported, flexed position at the level of the shoulder and the down arm is parallel to the body in a position of comfort. When the arm is in the up position, keep the shoulder in a neutral position, abducted to 90 degrees and the elbow flexed at 90 degrees. Utilize pillows or blanket rolls to prevent hyperextension of the shoulder and to ensure the weight of the arm is supported. Note: Head position should be turned to the up arm while in swimmer's pose, to avoid traction on the brachial plexus.

- a. Alternate the arm and head position every two hours with the patient in a side lying position and provide passive range of motion exercise to all joints of the upper and lower extremities.

#### **3. Patient positioning:**

- a. Manually reposition the patient a minimum of every 2 hours with a slight right lateral-pillow support position (20-30°) to prone (flat) to a slight left lateral-pillow supported position (20-30°) and back to prone position. The use of automatic bed rotation is not a replacement for manual repositioning.

Note: When placing the patient in the lateral-pillow support position, coordinate head and arm in the up position toward the tilted side (Do not use foam wedges for lateral turns).

- b. During lateral turns inspect the skin and positioning of the tubes, lines and catheters (tubing and penis) and reposition accordingly, i.e. Foley catheters, chest tubes, IV lines, etc.

#### **4. Leg positioning:**

While in prone and/or lateral prone position float the knees with a pillow (be careful not to cause hyperextension of the hip), and place a foam roller, pillow or blanket roll under the ankle area to elevate the toes and prevent tension on the tendons in the foot and ankle region.

#### **5. Tilt the patient into reverse Trendelenburg:**

Goal is 30 degrees, as patient tolerates.

#### **6. Alternative position of the arms for comfort or if swimmer's position is contraindicated.**

For example, the patient, family or PT/OT one-time evaluation report history of rotator cuff tear, stroke, nerve damage, osteoarthritis of shoulder complex, history of clavicle fracture, hyper flexible joints.

- a. Arms can be left in the side lying position aligned with the body and repositioned ever two hours to a slightly abducted position.

### **Patient monitoring and care:**

#### **1. Time patient is prone/supine:**

- a. It is recommended in the literature that patient is placed in the prone position for a minimum of 16 hours. The timing for prone cycling requires a physician order and is always situational. Patients should be returned to supine position for up to four hours, once per day preferably early AM to allow the interdisciplinary team time to assess while in supine position. While in supine position, reassessment of oxygenation, skin assessment and other relevant exam elements should occur. If the patient does not tolerate being supine (i.e. requiring increased ventilator settings, decreasing PaO<sub>2</sub>/FiO<sub>2</sub> ration, hemodynamically unstable or decreasing SpO<sub>2</sub>/PaO<sub>2</sub>) return patient to the prone position.
- b. Patients in prone position should receive the same standard of care as a patient that is supine (i.e. oral

### Clinical Management of COVID-19

care, urinary catheter care, skin care, eye care, suctioning, etc.).

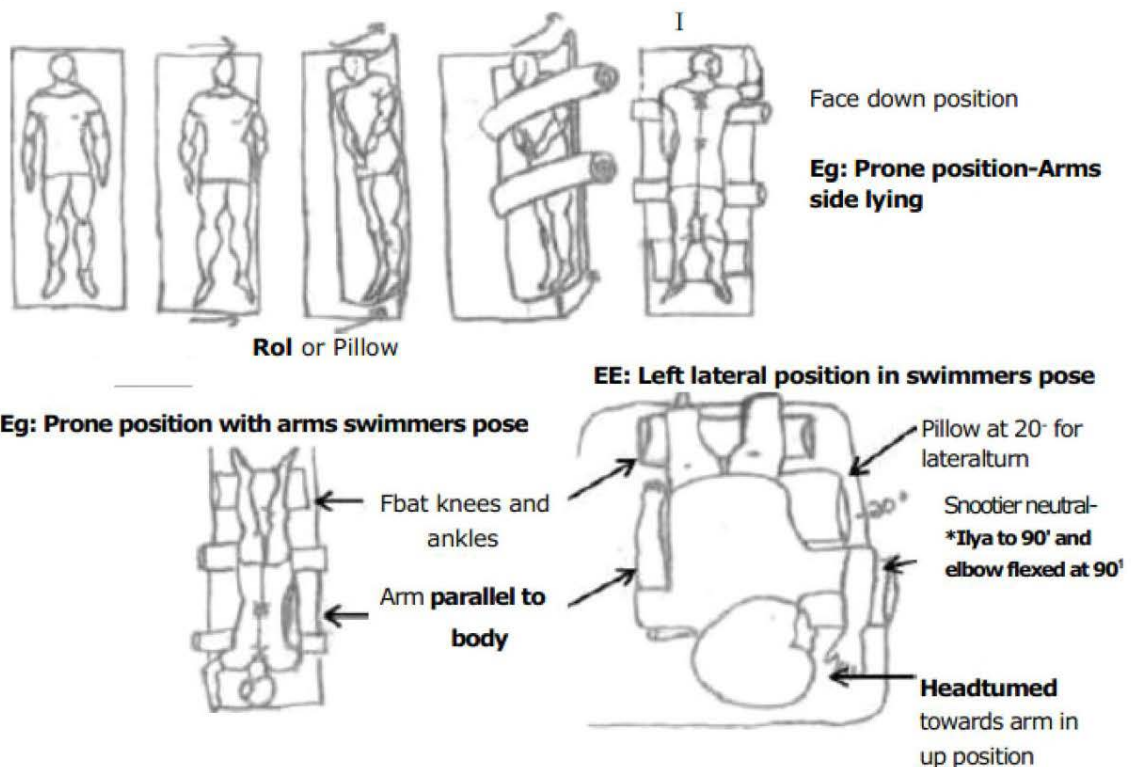
- c. Discuss supine position tolerance and PaO<sub>2</sub>/FiO<sub>2</sub> ratio in bedside report and during interdisciplinary rounds.
- d. Ongoing assessment of how the patient is tolerating prone therapy and repositioning; documentation of all vital signs, capnography, patient and family education, length of time prone, patient's response to turning supine, any adverse events that occur and changes in the patient's condition.
- e. Primary RN will coordinate with RT to re-secure ETT when the patient is supine and assist with turns, checking cuff pressures and tube placement before and after repositioning the patient; coordinate with radiology for chest x-ray when supine.
- f. Monitor all tubes, lines, drains and catheters throughout the repositioning process and continue airway management, suctioning oral and ETT secretions.
- g. Continue to evaluate enteral nutrition tolerance and maintain reverse Trendelenburg to help prevent ventilator associated pneumonia (VAP).
- h. RT to change ETT tape at least once a day or more frequently if necessary due to facial swelling.
- i. PaO<sub>2</sub>/FiO<sub>2</sub> ratios should be calculated every day and when ventilator settings have been changed in order to identify candidates for returning to the supine position early.

#### Consider discontinuation of the prone position if:

1. The patient no longer shows a positive response to the position change or mechanical ventilation support has been optimized.
2. The patient's PaO<sub>2</sub>/FiO<sub>2</sub> ratio is >200 on less than 50% FiO<sub>2</sub> and PEEP ≤10 cm of water.

#### Complications related to prone positioning:

1. Unplanned extubation
  - a. Lines pulled
  - b. Tubes kinked
  - c. Hemodynamic instability
  - d. Facial edema
  - e. Pressure ulcers
  - f. Aspiration
  - g. Corneal abrasions



## APPENDIX G : TRANSPORT VENTILATOR SET UP GUIDE

### Transport Vent Set Up Guide

\*COVID-19\* Considerations – 7 April 2020

- A. A standard HME will not suffice for viral filtration. A HMEF (heat-moisture exchanger – filter) provides sufficient bacterial & viral filtration and can be used in place of an HME. If your patient does not already have an HMEF in place, place one prior to putting them on your transport ventilator. HMEFs are intended for extended use and filtration is not degraded over time. Any increase in resistance of gas flow is negligible. A HMEF that does not become visibly soiled can be used for 2-7 days.
- B. If you need to exchange the HMEF or anytime there is a circuit break without a HMEF in-line, you must clamp the ET tube.
- C. Whenever a circuit break is required all members in the area should be wearing full PPE with N95 mask or greater.

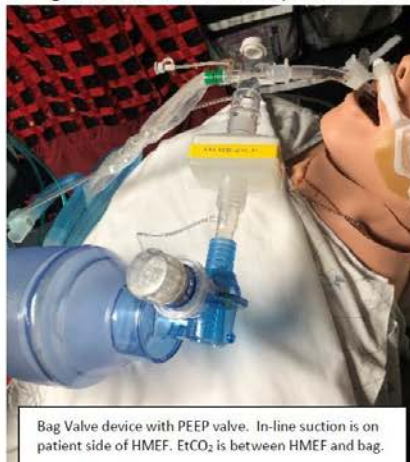
Based on availability, transport ventilators should be used with the follow order of preference:

1. Impact 731
2. Impact 754
3. Lung Transport Ventilator (LTV)
4. LP10 (not shown)
5. Hamilton T1 (only ground evac or *Rotary-wing* transport; Not flight approved for fixed or tilt-wing aircraft)
6. SAVE II

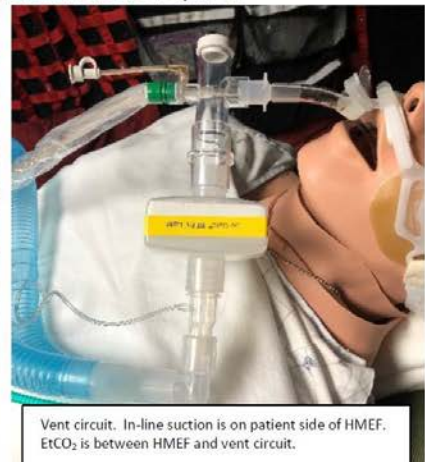
- D. Set up patient side with an HMEF for manual ventilation (below with and without accoutrements), as well as for a transport ventilator. The below three pictures are the “gold standard” for set up and NO additional filters are required.



Bag Valve device with PEEP valve. HMEF is connected between ETT and bag.



Bag Valve device with PEEP valve. In-line suction is on patient side of HMEF. EtCO<sub>2</sub> is between HMEF and bag.



Vent circuit. In-line suction is on patient side of HMEF. EtCO<sub>2</sub> is between HMEF and vent circuit.

- E. **In the event that HMEFs are not available**, the standard bacterial/viral vent filters will be needed. At a minimum, a filter must be placed on the port that entrains room air and the exhalation valve of the circuit. When disconnecting a patient from the ventilator without a HMEF, a standard bacterial/viral filter must be placed between the BVM and ET tube.

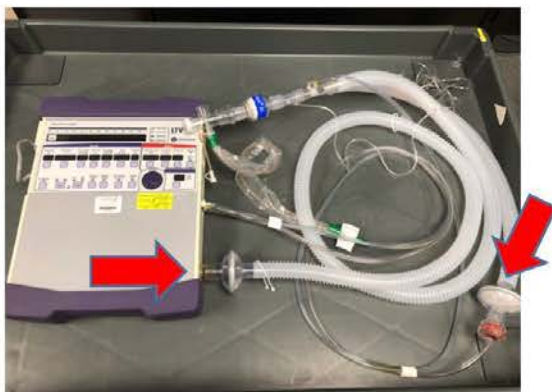
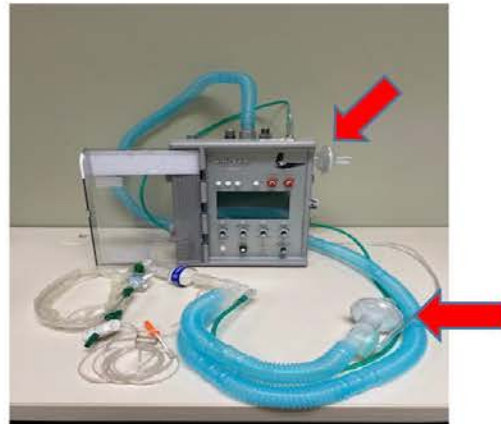
Some examples below:



For the **Impact 731**, place filters on the gas intake and exhalation valve marked by red arrows. It is important to note, that placing a filter on the gas intake (top arrow) will bypass an anti-asphyxiation safety feature. If this filter becomes occluded, a “Fresh Gas Intake Failure” alarm is likely to occur. When this alarm occurs, the patient will no longer be ventilated and will need to be manually ventilated while the vent is reset.

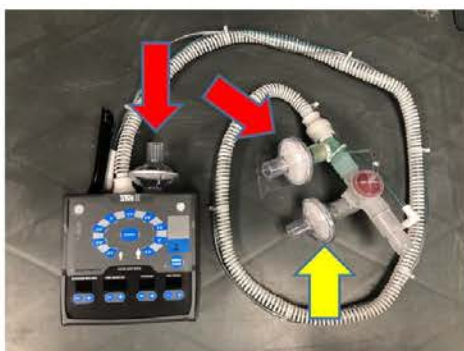


For the **Impact 754 ventilator**, place a filter on the gas intake (top arrow) and at the exhalation valve (bottom arrow). The set up for this ventilator will look identical to that of the Impact 731. The same caution must be taken when placing a filter on the gas intake due to the same risk of blocking gas flow to the ventilator resulting in vent failure.



For the **LTV ventilator**, there are some important considerations. Filters should be placed as marked by the red arrows. It is important to understand that a filter cannot be placed where the vent entrains room air, instead a filter is placed between the vent and the beginning of the circuit (left arrow). Also, to place a filter on the exhalation valve (right arrow), you must remove the exhalation valve and place a filter between the valve on the circuit tubing.

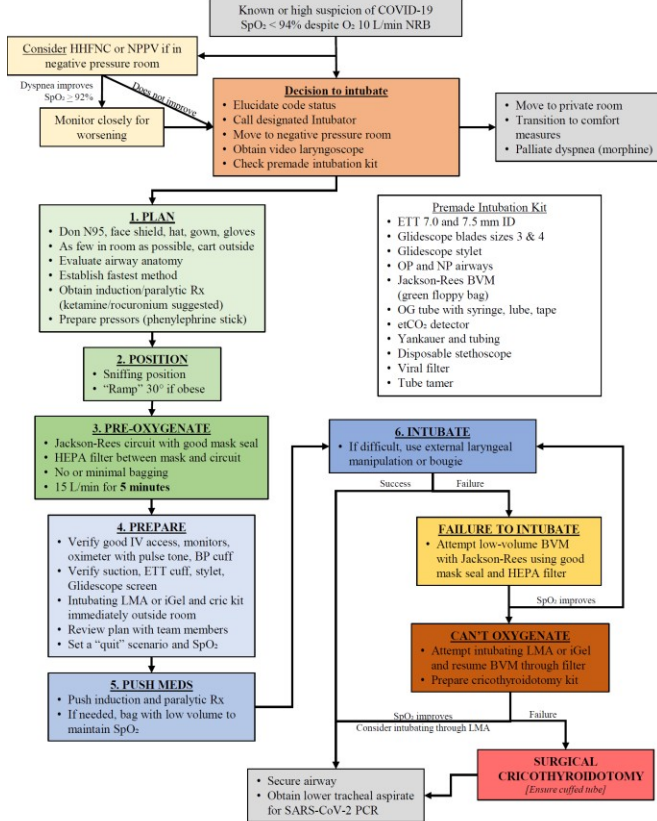
For the **Hamilton T1 ventilator**, filters need to be placed on the inhalation and exhalation ports, conveniently located right next to each other. (Ground or Rotary-wing only)



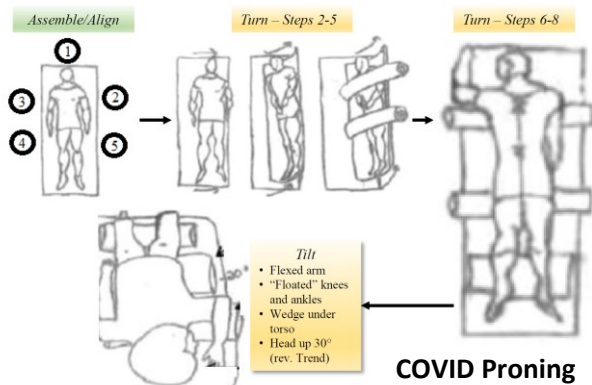
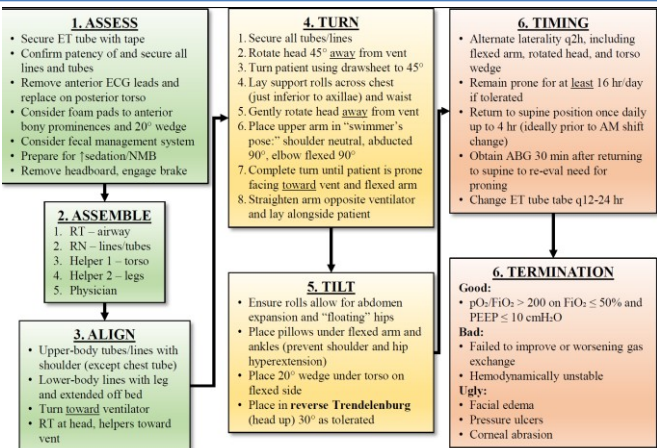
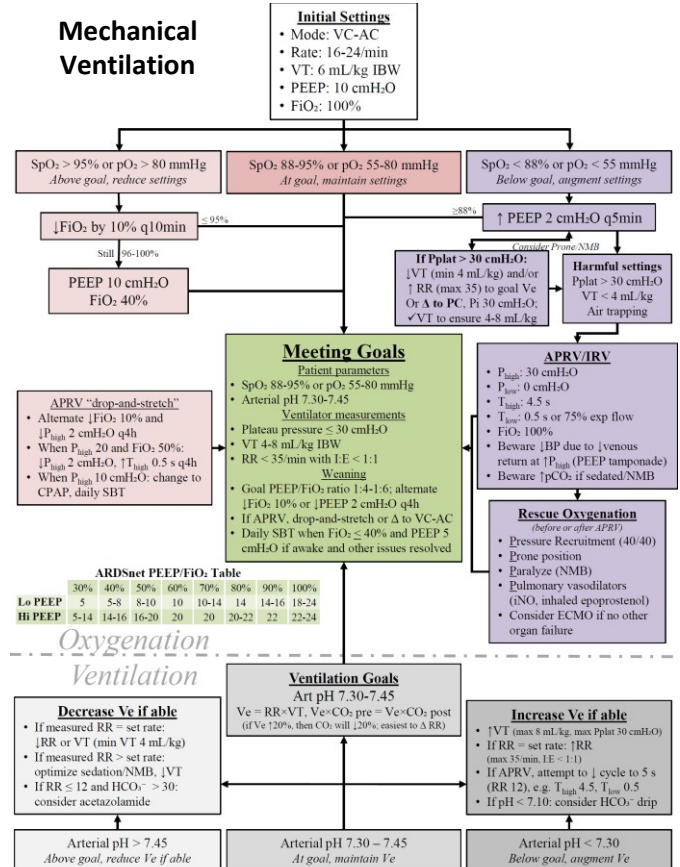
For the **SAVE II ventilator**, 3 filters are necessary. The red arrows mark where room air is entrained into the circuit. The yellow arrow shows the exhalation valve. Not only does using this ventilator require more filters, it is also not ideal for managing mechanically ventilated patients requiring complex ventilator settings.

## APPENDIX H : SAMPLE PROTOCOLS FOR VARIOUS ICU MANAGEMENT

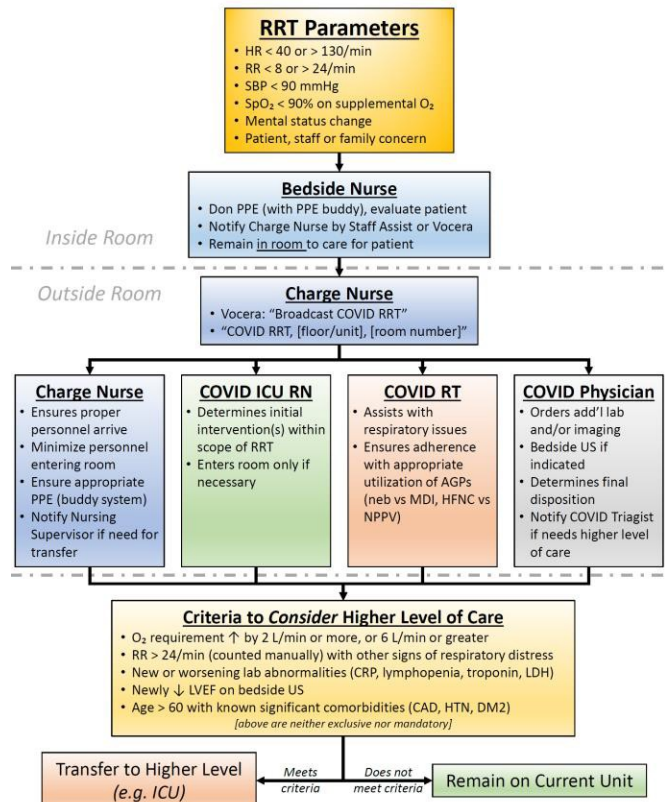
## Intubation



## Mechanical Ventilation

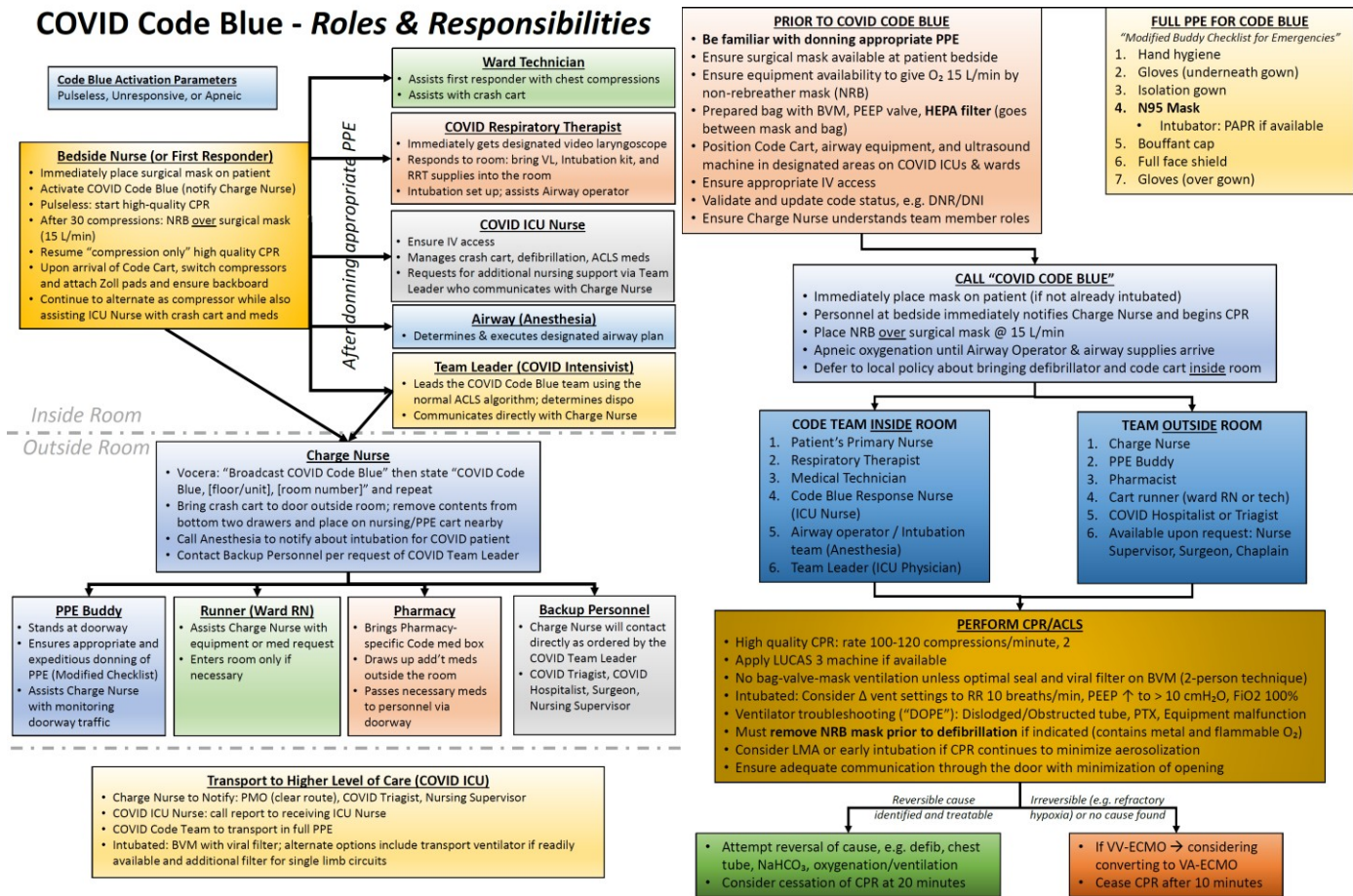


## COVID Rapid Response Team





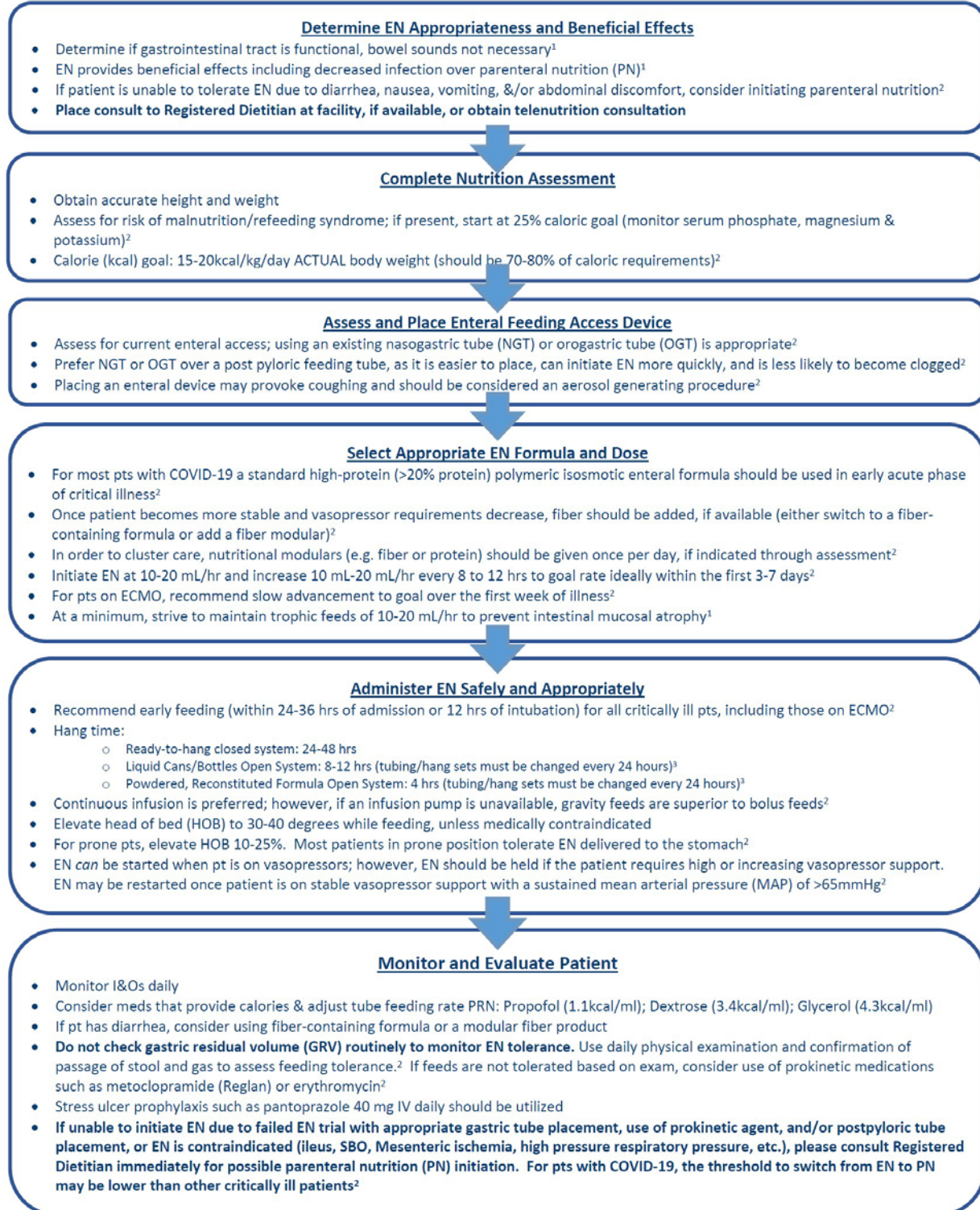
## COVID Code Blue - Roles & Responsibilities



## APPENDIX I : ENTERAL NUTRITION CARE PATHWAY FOR PATIENTS WITH COVID-19

### Enteral Nutrition (tube feeding) Care Pathway for Critically-Ill Adult Patients Diagnosed with COVID-19

This pathway provides steps and resources for managing critically-ill adult patients (pts) requiring enteral nutrition (EN).



**References:**

- McClave, SA, Taylor BE, Martindale RD, et al; Society of Critical Care Medicine; American Society for Parenteral and Enteral Nutrition. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). *JPEN J Parenter Enteral Nutr.* 2016;40:159-211.
- Martindale R, Patel JJ, Taylor B, Warren M, & McClave SA. Nutrition Therapy in the Patient with COVID-19 Disease Requiring ICU Care. Reviewed and approved by ASPEN and Society for Critical-Care Medicine. 1 April 2020. [https://www.nutritioncare.org/Guidelines\\_and\\_Clinical\\_Resources/Resources\\_for\\_Clinicians\\_Caring\\_for\\_Patients\\_with\\_Coronavirus/](https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Resources_for_Clinicians_Caring_for_Patients_with_Coronavirus/)
- Abbott Laboratories. Guideline to Adult Tube Feeding. November 2018. [https://static.abbottnutrition.com/cms-prod/abbottnutrition-2016.com/img/182393-Adult-tube-feeding-home\\_tcm1226-57870.pdf](https://static.abbottnutrition.com/cms-prod/abbottnutrition-2016.com/img/182393-Adult-tube-feeding-home_tcm1226-57870.pdf)



## APPENDIX J : DHA QUICK REFERENCE GUIDE TO VIRTUAL HEALTH AND TELEPHONE ENCOUNTERS

# QUICK REFERENCE GUIDE

## Virtual Health and Telephone Encounters

**Disclaimers:**

1. The **MHS Specific Coding Guidelines** are the source for all DoD specific coding guidance. To ensure coding compliance and standardization across the DHA, all coding training, tools and/or coding manuals must be vetted through **DHA Medical Coding Program Branch** and **DHA Coding Work Group (CWG)** prior to implementation.
2. The codes listed in this document are for Type 1 or 2 Privileged Providers. Refer to the **MHS Specific Coding Guidelines** for codes related to all other provider types.
3. Effective 1 Oct 2018, CMS eliminated the use of modifier GT for reporting Telehealth professional services, however, the MHS will continue to use GT until further notice.
4. Online Secure Messaging Encounters - 2019 CPT code 99444 was deleted and replaced with 3 new codes for 2020: 99421, 99422 and 99423.  
Note: Use 99444 until the 2020 CPT tables are updated at your MTF.
5. VH Functionals have ownership of this VH Coding Cheat Sheet and will update annual code changes in conjunction with the **MHS Coding Guidelines**.
6. VH and Telephone Encounters must meet coding and documentation requirements.

Method	Virtual Health (Privileged Provider to Patient)				Virtual Health (Privileged Provider to Provider)		Audio-Only Encounters			Online Messaging Encounters
Interaction	Virtual Video Visit (V3) DISTANT SITE (where provider is located e.g. MTF)		Virtual Video Visit (V3) ORIGINATING SITE (where patient is located e.g. MTF)		Teleconsultation at distant site (where provider is located at e.g. MTF or on a ship) for professional interpretation	Teleconsultation at distant site (where provider is located at e.g. different MTF or on a ship) for diagnosis and treatment	Clinical Telephone (audio only)	T-CON		Secure Messaging
PHA	✓		✓				✓			
Synchronous	✓		✓				✓	✓	✓	
Asynchronous					✓	✓				✓
Type: Scheduled	✓		✓				✓			
Type: Unscheduled					✓	✓		✓		✓
Appointment	FTR	24HR, FTR, SPEC (provider discretion)	FTR	24HR, FTR, SPEC	SPEC, FTR		24HR, FTR, SPEC	24HR, FTR, SPEC	T-CON	N/A
Detail Code	PHI and TELMED	TELMED	PHI and TELMED	TELMED	N/A	N/A	HC		N/A	N/A
Code	Office Visit Code		99499	99499	99451 ≥5 min consultant time including written report 99452 30 min requesting provider time in referral work	Verbal and Written Report: 99446 5-10 min 99447 11-20 min 99448 21-30 min 99449 +31 min	99499	99441 5-10 min 99442 11-20 min 99443 21-30 min		For 2019: 99444 For 2020: 99421 5-10 min 99422 11-20 min 99423 21+ min
Modifier	GT (patient is present at originating site e.g. clinic to clinic) or 96 (clinic to non-clinic patient location)		N/A	N/A	N/A	GC	N/A	N/A	N/A	96
Code	96160	N/A	G3014 (and any procedures performed at the originating site within presenter's scope of practice)		Procedures per documentation	N/A	96160 + G2012	G2012	N/A	N/A
Modifier	N/A	N/A	N/A	TC (if technical component of procedure/test are completed and no interpretation and report are rendered)	96 (interpretation only; professional component)	N/A	N/A	N/A	N/A	N/A

Effective Date: 03/30/2020

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