

DoD COVID-19 PRACTICE MANAGEMENT GUIDE

Clinical Management of COVID-19

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 or by contacting your regional TRICARE Managed Care Support Contractor.

Leads: Lt Col Renee I. Matos and COL Kevin K. Chung
3-23-2020

DoD COVID-19 PRACTICE MANAGEMENT GUIDE



Clinical Management of COVID-19

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

Contributors

Lt Col Renée I. Matos, MC, USAF COL Kevin K. Chung, MC, USA CDR John Benjamin, MC, USN LTC Matthew A. Borgman, MC, USA Laura R. Brosch, RN, PhD Robert F. Browning, MD CAPT Timothy H. Burgess, MC, USN Col Francis R. Carandang, MC, USAF LTC Jacob Collen, MC, USA LTC Christopher Colombo, MC, USA Ms. Polyxeni Combs, MS CAPT Konrad L. Davis, MC, USN COL Sean N. Dooley, MC, USA COL Jeremy Edwards, MC, USA CAPT Eric Elster, MC, USN MAJ Emilio Fentanes, MC, USA MAJ Brian Foster, MC, USA Dr. James Giordano, PhD Mr. Joshua Girton, JD, LL.M, MBA	Mark Haigney, MD LTC Mitchell Hamele, MC, USA COL Bonnie H. Hartstein, MC, USA Maj Alison Helfrich, MC, USAF COL Mrs. Jennifer Hesch, JD COL Patrick Hickey, MC, USA Col David Hsieh, MC, USAF CDR Ashley E. Humphries, MC, USN Maj John Hunninghake, MC, USAF MAJ Nikhil A. Huprikar, MC, USA CDR Michael J. Kavanaugh, MC, USN Lt Col Jeremy Kilburn, MC, USAF Maj David A. Lindholm, MC, USAF COL COL Frederick Lough, MC, USA LCDR Donovan L Mabe, MC, USN Col Leslie Matesick, MC, USAF CAPT Ryan C. Maves, MC, USN CDR Sean McKay, MC, USN Maj Krista Mehlhaff, MC, USAF	COL Clinton K. Murray, MC, USA Lt Col Jason F. Okulicz, MC, USAF COL Neil Page, MC, USA COL Jeremy C. Pamplin, MC, USA LTC Wylan C. Peterson, MC, USA Mr. Joseph Procaccino, JD, MFS Col James B. Sampson, MC, USAF LCDR David C. Shih, MC, USN Bich-Thuy T. Sim, MD LCDR Scott Snyder, MC, USN Col Barton C. Staat, MC, USAF Mr. Randy W. Stone, JD Col Deena E. Sutter, MC, USAF Lt Col Bryan D. Szalwinski, MC, USAF Maj Robert Walter, MC, USAF Mr. Bryan T. Wheeler, JD Col Leslie Wood, MC, USAF CAPT Luke Zabrocki, MC, USN Mr. Michael J. Zleit, JD
Draft Release Date: 20 March 2020	Publication Date: 23 March 2020	

TABLE OF CONTENTS

Background	2
Clinical Presentation	2
Planning and Preparation	3
Screening and Triage (Early Recognition of Patients with COVID-19).....	7
Immediate Implementation of appropriate of Infection Prevention & Control (IPC) Measures	8
Collection of Specimens for Laboratory Diagnosis	8
Management of Mild COVID-19: Symptomatic Treatment & Monitoring	9
Management of Severe COVID-19: Oxygen Therapy and Monitoring	11
Management of Severe COVID-19: Treatment of Co-Infections.....	12
Management of Critical COVID-19: Acute Respiratory Distress Syndrome (ARDS)	13
Management of Critical Illness and COVID-19: Prevention of Complications.....	15
Management of Critical Illness and COVID-19: Septic Shock and Cardiac Arrest	18
Adjunctive therapies for COVID-19: Treatment Protocols	21
Caring for Special Populations with COVID-19: Pregnancy, Nursing Mothers, Infants, Children and the Elderly.....	23
Surgical Considerations for Persons with COVID-19	27
Telemedicine Support During the COVID-19 Pandemic.....	29
Emergency Medical Services and Ground Transport of Persons with COVID-19.....	32
En Route Critical Care Considerations of Persons with COVID-19	35
Whole of Government Response in Coordination of Resources.....	35
Ethical Considerations When Caring for Persons with COVID-19	36
References	37
Appendix A: COVID-19 Intubation Pre-Entry Checklist	42
Appendix B: COVID-19 Pre-Intubation Pack.....	43
Appendix C: COVID-19 Intubation Protocol	44
Appendix D: COVID-19 Cognitive Aids for Intubation	45
Appendix E: Adult Prone Positioning Protocol Example	48

BACKGROUND

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 (require oxygen) and 5% will require ICU care.(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 most common symptoms include fever, fatigue, dry cough, and shortness of breath.

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

CLINICAL PRESENTATION & CLINICAL COURSE

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, 6-9)
 - Fever (77–98%)
 - Cough (46%–82%)
 - Myalgia or fatigue (11–52%)
 - Shortness of breath (3-31%)
 - GI symptoms, such as diarrhea and nausea (may approach 50%)
3. Among 1,099 hospitalized COVID-19 patients, fever was present in 44% at hospital admission, and developed in 89% during hospitalization.(10)
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.(11)
6. Children: Limited information is available about the clinical presentation, clinical course, and risk factors for severe COVID-19 in children. Of confirmed COVID-19 patients in China as of Feb 11, 2020, only 2.1% were aged <20 years, and no deaths were reported among those <10 years of age. From limited published reports, signs and symptoms among children with COVID-19 may be milder than adults, with most pediatric patients presenting with fever, cough, congestion, and rhinorrhea, and one report of primarily gastrointestinal symptoms (vomiting and diarrhea). Severe complications of acute respiratory distress syndrome and septic shock were reported in a 13-month old with COVID-19 in China and another was reported in a 55 day old.(12-15)
7. Prolonged detection of SARS-CoV RNA has been reported in respiratory specimens (up to 22 days after illness onset) and stool specimens (at least 30 days after illness onset).(12, 13)
8. Clinical presentation among reported cases of COVID-19 varies in severity from asymptomatic infection to mild illness to severe or fatal illness. Several reports suggest the potential for clinical deterioration during the second week of illness. In one report, among patients with confirmed COVID-19 and pneumonia, just over half of patients developed dyspnea a median of 8 days after illness onset (range: 5–13 days). In another report, the mean time from illness onset to hospital admission with pneumonia was 9 days.(3, 8)
9. Acute respiratory distress syndrome (ARDS) developed in 17–29% of hospitalized patients, and secondary infection developed in 10%. In one report, the median time from symptom onset to ARDS was 8 days.(3, 6, 7)

Clinical Management of COVID-19

10. Approximately 20-30% of hospitalized patients with COVID-19 and pneumonia have required intensive care for respiratory support. Compared to patients not admitted to an intensive care unit, critically ill patients were older (median age 66 years versus 51 years), and were more likely to have underlying co-morbid conditions (72% versus 37%). (3, 7)
11. Among critically ill patients admitted to an intensive care unit, 11–64% received high-flow oxygen therapy and 47-71% received mechanical ventilation; some hospitalized patients have required advanced organ support with endotracheal intubation and mechanical ventilation (4–42%).(6, 7, 11)
12. A small proportion (3-12% of ICU patients) have also been supported with extracorporeal membrane oxygenation (ECMO).(6, 7, 11) Other reported complications include cardiac injury, sudden cardiac death, arrhythmia, septic shock, liver dysfunction, acute kidney injury, and multi-organ failure. Post-mortem biopsies in one patient who died of ARDS reported pulmonary findings of diffuse alveolar damage.(16)
13. A case fatality rate of 2.3% has been reported among confirmed cases of COVID-19 in China.(11) 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)

*Adapted from the Center for Disease Control: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html>

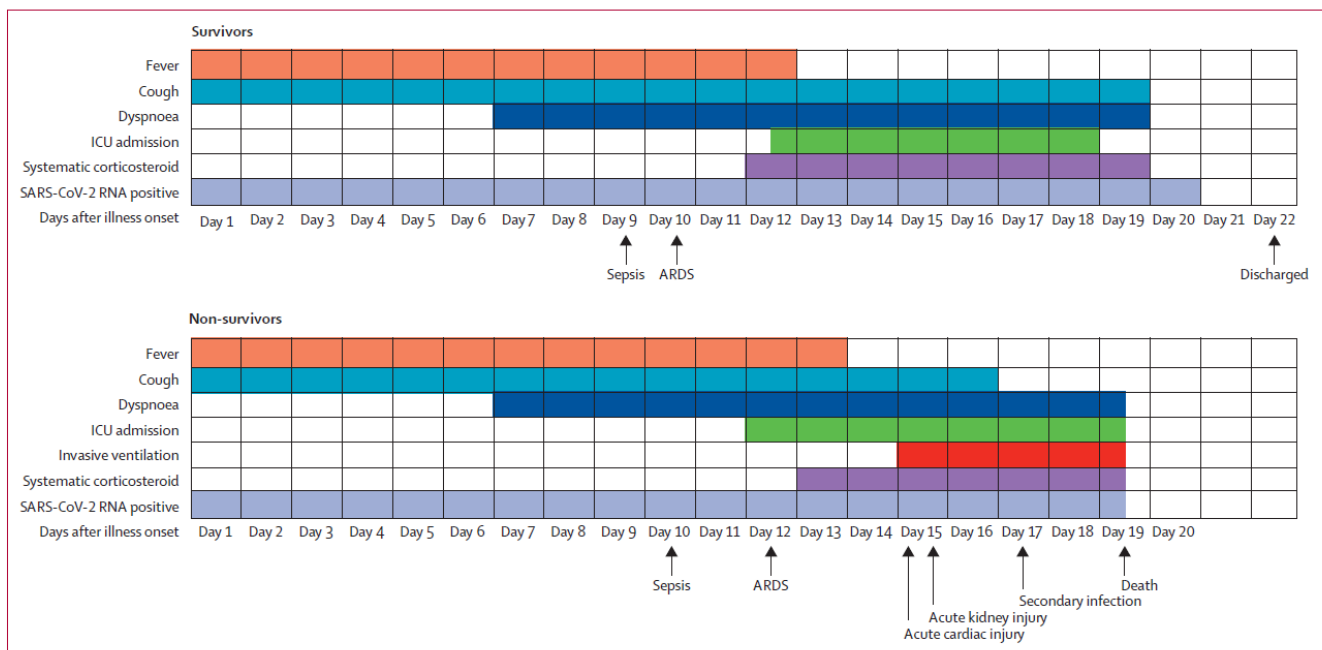


Figure 1: Clinical courses of major symptoms and outcomes and duration of viral shedding from illness onset in patients hospitalised with COVID-19
Figure shows median duration of symptoms and onset of complications and outcomes. ICU=intensive care unit. SARS-CoV-2=severe acute respiratory syndrome coronavirus 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.(17, 18) 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,

Clinical Management of COVID-19

infectious disease, or other specialists), facilitate the flow of critical equipment and patients, and communicate/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
 - 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.”(19)
 - 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 6200.02 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, stuff, and space.
 - d. CSC should be developed by multi-disciplinary groups and collated by the Incident Command Center (ICC) and should in some ways be individualized to a facility. A list of topics that should be included:
 - Authority and triggers for enacting escalating CSC
 - Emergency credentialing and 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

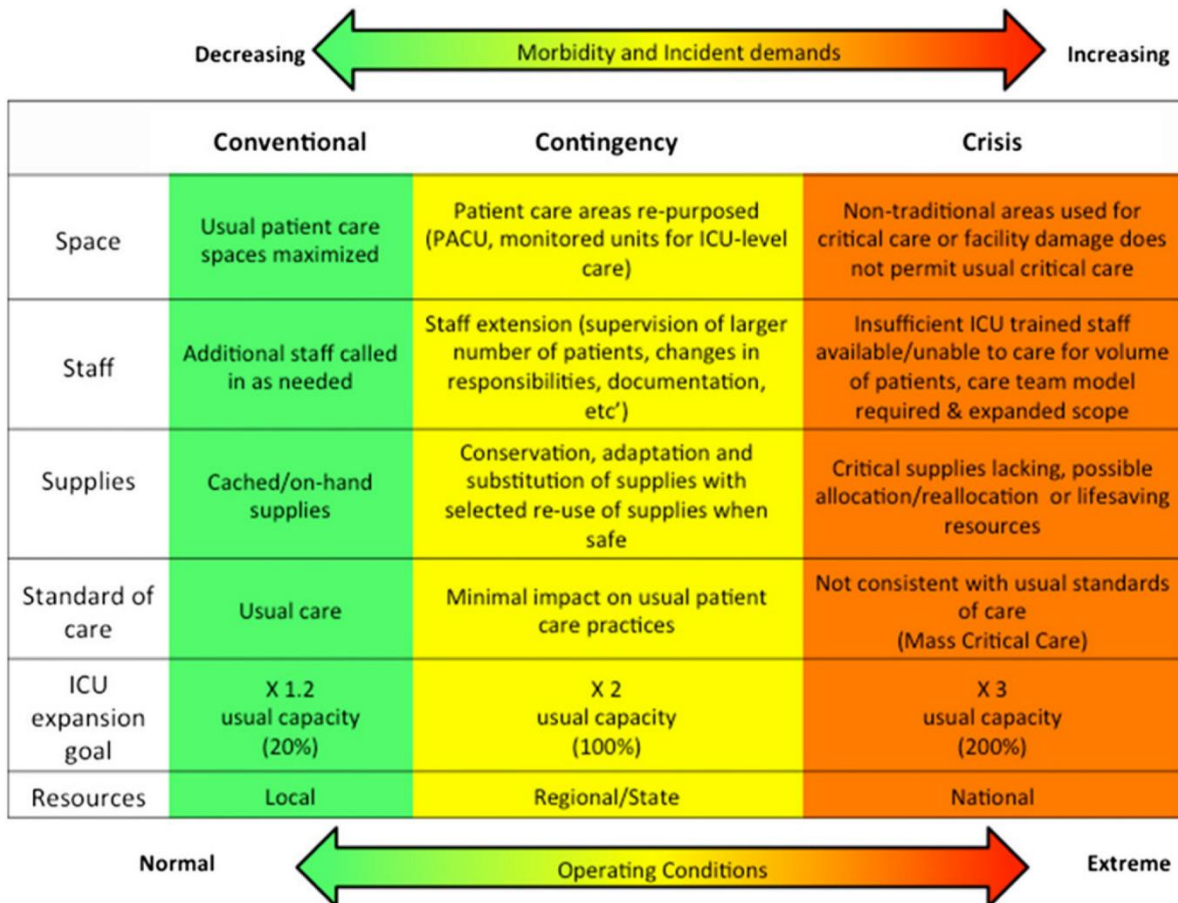


Figure 2. A framework outlining the conventional, contingency, and crisis surge responses. PACU: postanesthesia care unit. [from Christian, et al.; Chest (2014)].(20)

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 the communication be consistent, from designated sources, and the information be trusted by staff.(21-23)
4. Establish Patient Tracking and Re-unification systems:
 - 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.(23)
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.(24)
 - 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.
6. Coordination of re-prioritization of clinical duties:
 - a. Limitation of non-urgent care, well visits, routine visits or imaging
 - b. If prolonged, give consideration to designating satellite sites to continue routine, but necessary care
 - c. Coordinate re-allocation of assets off loaded by limitations to areas of need (Critical Care, Inpatient care, Initial triage, and Urgent/Emergency Care).(25)
 - d. Limit administrative, educational and academic duties to those necessary to directly support patient care
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 PPE and cleaning both “dirty” rooms and shared spaces. These tasks should be prioritized and will be in very high demand.(26)
 - b. Allocation of adequate space for safe, respectful care of the deceased.(27)
 - 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.(24, 25)

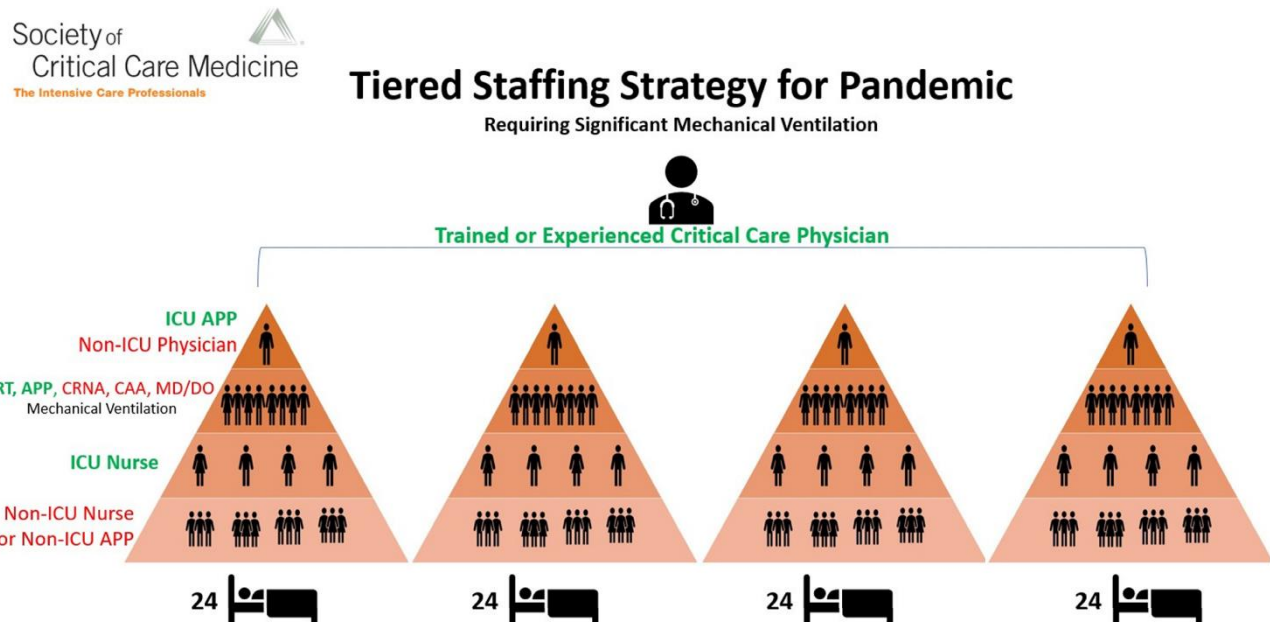
Preparing Critical Care Resources & Teams.

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.(24, 28)
 - ii. Strategies listed above may mitigate (facility based child care, cohort care teams, etc) but planning should consider at least a 25-40% reduction in staff availability. These

Clinical Management of COVID-19

guidelines are currently under review.

- iii. The Society of Critical Care Medicine (SCCM) recommends the following staffing model 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):(29)



Modified from the Ontario Health Plan for an Influenza Pandemic Workgroup. *Critical Care During a Pandemic.*

Figure 3. SCCM Tiered Staffing Strategy for Pandemic. APP: advanced practice provider; RT: respiratory therapist; CRNA: certified registered nurse anesthetist; MD/DO: physician [from SCCM link above].(29)

- b. In accordance with Joint Commission regulations facilities and local leadership may cross-level providers as needed to provide any type of patient care, treatment and services necessary as a life saving measure- or to prevent serious harm, provided the care, treatment, and services provided are within the scope of the individual's license without modification of existing privileges. 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. **Training of Staff.**
 - a. ICU "Just in time training" for augmentees from other areas available at <https://www.sccm.org/covid19> or <https://www.sccm.org/disaster>
 - 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 but should be brief, no more than 4 hrs.
 - b. PPE; Donning and doffing officers should be assigned to train and monitor this.
 - These personnel could/should be pulled from non-clinical roles (administrators, support staff, etc) and could fulfill a vital safety role after being trained. Training video: <https://www.youtube.com/watch?v=bG6zISnenPg> (30)
 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 more information is available.
 - a. Creation of intubation packs consisting of all necessary PPE (N95, hats, eye protection, gowns, shoe covers, disposable stethoscopes) to avoid providers assembling gear outside

Clinical Management of COVID-19

of treatment rooms should be considered and would augment ability to track supplies. This will both avoid delays in care and the potential for entering the room without proper PPE.

- b. Consider alternative options to reduce and re-use critical items such as PPE and ventilator circuits. No current guidance but local policies and solutions should be shared as they become available.
- c. When expanding into OR or PACU, the spaced utilization of anesthesia ventilators should be considered. Some should be held in reserve based on facility needs for acute, non-COVID needs.

4. **Space:**

- a. **ICU Contingency Units.** Most MTFs have cancelled elective surgeries, which means that some operating room capacity, pre- or post-anesthesia recovery, and other monitored, ventilator capable areas may be available to use as alternative ICU rooms.
- b. **Ward Cohorting:** Consideration should be given to establishing COVID wards. This includes regular as well as ICU care areas. Clean barriers on open units similar to chemical “hot lines” could be used. This includes cohorting staff to “COVID-positive” or “COVID-negative” teams based on which cohort they are caring for to reduce transmission. In particular, it is recommended that patients with non-COVID-19 coronavirus be separated from COVID-19 patients because of the risk of homologous recombination.

Establishment of a DoD Case Registry for Clinical Performance Improvement.

1. Systematic collection and iterative analysis of key data on risk factors and outcomes, coupled where possible with collection and repository storage of residual material from pertinent clinical diagnostic specimens, is essential to optimization of care delivery.
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).
2. **Triage:** Triage patients using standardized triage tools and initiate the appropriate disposition decision depending on the clinical setting.
3. **Initial treatment of hospitalized inpatients** consists of optimized supportive care in the ward or intensive care unit. Patients with increased risk of severe disease and mortality include:
 - Age >60
 - Diabetes mellitus
 - Hypertension
 - Immunosuppression
 - Cardiopulmonary disease
4. Patients may present with mild symptoms but have high risk of deterioration and should be admitted to a designated unit for close monitoring.
5. **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.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-\(ncov\)-infectionpresenting-with-mild-symptoms-and-management-of-contacts](https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infectionpresenting-with-mild-symptoms-and-management-of-contacts)).
6. **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 of a plan is

Clinical Management of COVID-19
provided below from the San Antonio VA:

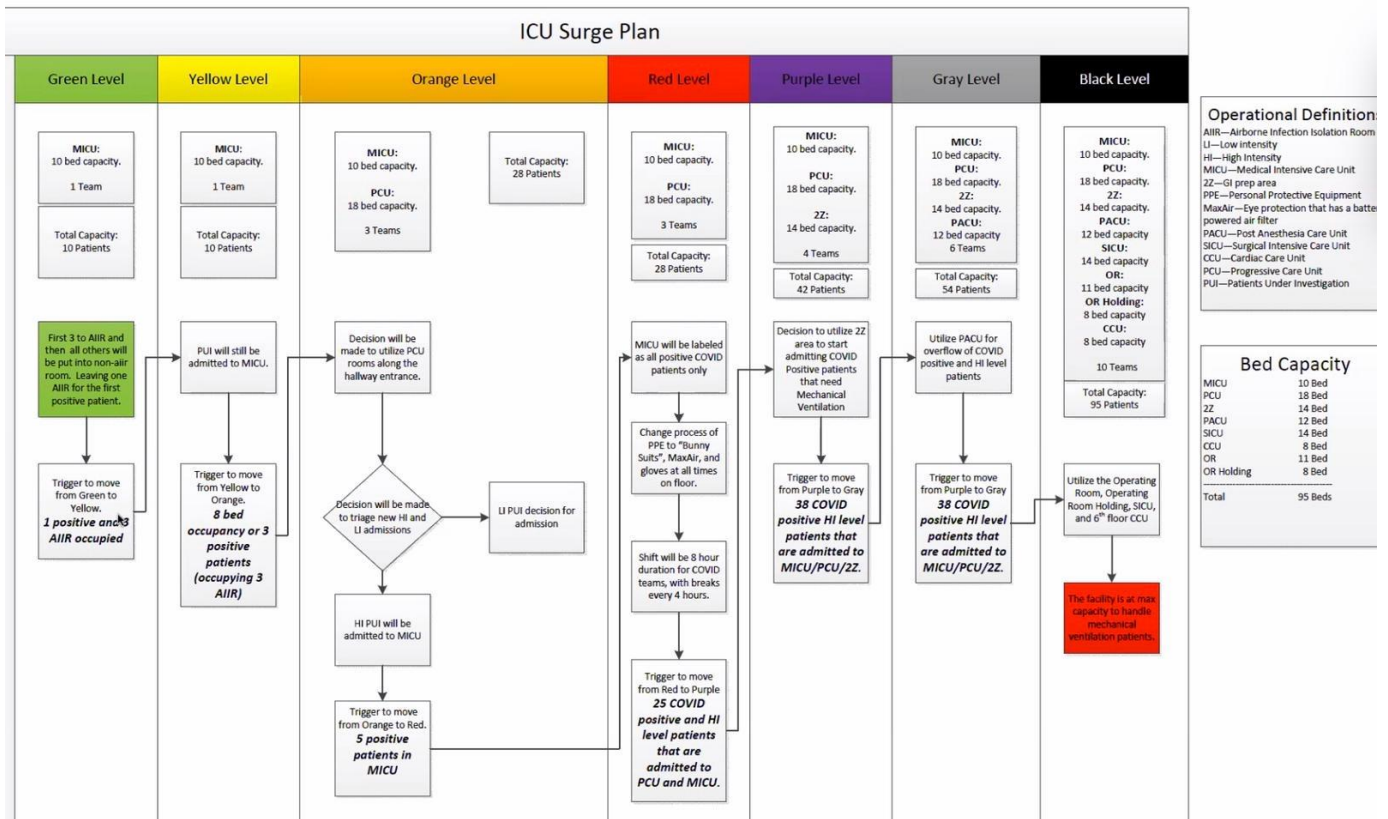


Figure 4. Example of an ICU Surge Plan (from the San Antonio Veteran's Affairs Hospital)

IMMEDIATE IMPLEMENTATION OF APPROPRIATE Infection Prevention Control (IPC) MEASURES

Prior to hospital admission, the patients should be actively separated such as through a tent outside the traditional confines of the hospital for testing purposes or a private room with the door closed within a facility as improved separation is ideal for infection control purposes.

Currently, the infection control guidance is "enhanced droplet" which is mask with face-shield. Recommendation to limit hospital visitors even for non-COVID related patients with the exception of pediatric patients and palliative care/dying patients. Local hospital policies and procedures will apply.

COLLECTION OF SPECIMENS FOR LABORATORY DIAGNOSIS

1. **Triage:** Patients should be triaged according to testing algorithm and initial testing should optimally be performed in a manner separated from the general patient population such as in a tented environment or designated area within a facility. When determined appropriate to test, initial laboratory collection will include nasopharyngeal swab for COVID-19 testing and additional tests as indicated.
2. **Specimen Collection:** Collect specimens from the upper respiratory tract (URT; nasopharyngeal AND, where clinical suspicion remains and URT specimens are negative, collect specimens from the lower respiratory tract when readily available (LRT; expectorated sputum, endotracheal aspirate,) for COVID-19 virus testing by RT-PCR and bacterial strains. Additionally, testing for other viral infections such as influenza should be obtained or if available a respiratory viral panel (i.e. Biofire). Avoid bronchoscopy to minimize aerosolization unless critical therapeutic indication.(31)
3. **Critically Ill Patients:** If admitting critically ill patient, collect blood cultures for bacteria associated with pneumonia and sepsis, ideally before antimicrobial therapy. If bacterial pneumonia is suspected, DO NOT delay antimicrobial therapy to collect blood cultures. If available, procalcitonin may be helpful as COVID-19 has been associated with low procalcitonin levels which can minimize antibiotic overuse.(32)

Clinical Management of COVID-19

4. **Confirming COVID-19:** Positive predicted value (PPV) and Negative predicted value (NPV) of currently available diagnostic tests.
5. **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. For hospital discharge, in a clinically recovered patient, two negative tests, at least 24 hours apart, is recommended.
6. **Personal Protective Equipment (PPE):** Use appropriate PPE for specimen collection (droplet and contact precautions for URT specimens; airborne precautions for LRT specimens). When collecting URT samples, use viral swabs (sterile Dacron or rayon, not cotton) and viral transport media. Do not sample the nostrils or tonsils. In a patient with suspected COVID-19, especially with pneumonia or severe illness, a single URT sample does not exclude the diagnosis, and additional URT and LRT samples are recommended. LRT (vs URT) samples are more likely to be positive and for a longer period. Clinicians may elect to collect only LRT samples when these are readily available (e.g., tracheal aspirates in mechanically ventilated patients). Sputum induction should be avoided owing to increased risk of aerosol transmission.
7. **For pregnant patients:** COVID-19 testing of symptomatic pregnant women may need to be prioritized to enable access to specialized care.
8. **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 microbiologic studies are needed in all suspected cases. Both URT and LRT specimens can be tested for other respiratory viruses, such as influenza A and B, respiratory syncytial virus, parainfluenza viruses, rhinoviruses, adenoviruses, enteroviruses (e.g. EVD68), human metapneumovirus and endemic human coronaviruses (i.e. HKU1, OC43, NL63, and 229E). LRT specimens can also be tested for bacterial pathogens, including Legionella pneumonia.
9. **Malaria-endemic areas:** If in, or returning from malaria-endemic areas, patients with fever should be tested for malaria or other co-infections with validated rapid diagnostic tests (RDTs) or thick and thin blood films and treated as appropriate. In endemic settings arbovirus infection (dengue/chikungunya) should also be considered in the differential diagnosis of undifferentiated febrile illness, particularly when thrombocytopenia is present. Co-infection with COVID-19 virus may also occur and a positive diagnostic test for dengue (e.g. dengue RDTs) does not exclude the testing for COVID-19.

MANAGEMENT OF MILD COVID-19: SYMPTOMATIC TREATMENT AND MONITORING

1. The mainstay of treatment for mild cases of COVID-19 is supportive care.
2. 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 and risks for adverse outcomes (e.g., underlying illness and age), and the patient's social context:
 - Their access to resources such as food and other necessities for daily living
 - Their access to appropriate caregivers or ability to engage in self-care
 - Their ability to engage in symptom and public-health monitoring
 - The transmission risk within the home (e.g., the availability of a separate bedroom to minimize sharing of immediate living spaces with others, their access to appropriate personal protective equipment such as gloves and a facemask, their ability to adhere to home isolation, respiratory and hand hygiene, and environmental cleaning, and the presence of household members at increased risk for COVID-19 complications).(11, 33, 34)
3. 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, 35) Therefore, close monitoring for symptomatic progression through the second week of illness is important for non-hospitalized patients. Close monitoring should be emphasized in patients aged \geq 60 years and/or with underlying medical comorbidities that may increase their risk for disease progression, to include: cardiovascular disease, cerebrovascular disease, chronic respiratory diseases,

Clinical Management of COVID-19

chronic kidney disease, chronic liver disease, diabetes, hypertension, cancer, immunocompromising conditions, and pregnancy.(6, 11, 35, 36)

4. Monitoring for symptomatic improvement may be conducted by healthcare providers or public-health personnel, depending on the local policy and standard of practice.
5. Clinicians should contact local military public health and/or local/state health department regarding criteria for discontinuation of home isolation.(34)
 - Healthcare providers may provide patients or their caregivers access to available CDC guidance on home care: Preventing the Spread of Coronavirus Disease in Homes and Residential Communities (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-prevent-spread.html>)
 - What to Do If You Are Sick (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html>)
 - Caring for Someone at Home (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/care-for-someone.html>)
 - Caring for Yourself at Home (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/caring-for-yourself-at-home.html>)

10 ways to manage respiratory symptoms at home

If you have fever, cough, or shortness of breath, call your healthcare provider. They may tell you to manage your care from home. Follow these tips:

1. **Stay home** from work, school, and away from other public places. If you must go out, avoid using any kind of public transportation, ridesharing, or taxis. 
2. **Monitor your symptoms** carefully. If your symptoms get worse, call your healthcare provider immediately. 
3. **Get rest and stay hydrated.** 
4. If you have a medical appointment, **call the healthcare provider** ahead of time and tell them that you have or may have COVID-19. 
5. For medical emergencies, call 911 and **notify the dispatch personnel** that you have or may have COVID-19. 
6. **Cover your cough and sneezes.** 
7. **Wash your hands often** with soap and water for at least 20 seconds or clean your hands with an alcohol-based hand sanitizer that contains at least 60% alcohol. 
8. As much as possible, **stay** in a specific room and **away from other people** in your home. Also, you should use a separate bathroom, if available. If you need to be around other people in or outside of the home, wear a facemask. 
9. **Avoid sharing personal items** with other people in your household, like dishes, towels, and bedding. 
10. **Clean all surfaces** that are touched often, like counters, tabletops, and doorknobs. Use household cleaning sprays or wipes according to the label instructions. 

 For more information: www.cdc.gov/COVID19

Figure 5. CDC Home Care Management Recommendations for COVID-19 Patients (website above). (34)

Clinical Management of COVID-19

6. Theoretical concern has been raised that the use of non-steroidal anti-inflammatory drugs (NSAIDs) may lead to complications of COVID-19 due to NSAID-induced upregulation of angiotensin-converting enzyme 2 (ACE2), which is the cellular binding target for SARS-CoV-2.(37, 38) Although there is no clinical evidence of association between NSAIDs and outcomes for COVID-19, the French Health Minister cautioned that use of ibuprofen could be an aggravating factor in COVID-19.(39) Acetaminophen is recommended for fever control as an alternative when ibuprofen is not necessary.

MANAGEMENT OF SEVERE COVID-19: OXYGEN THERAPY AND MONITORING

1. Give supplemental oxygen therapy immediately to patients with respiratory distress, hypoxemia, or shock and target SpO₂ 92-96%.(40, 41)
2. Patients that have a persistent requirement for 5-6 L/min to maintain target SpO₂ should be considered for early intubation/mechanical ventilation given risk of deterioration.
3. For adults, initiate oxygen therapy during resuscitation at 5-6 L/min and titrate flows to reach target SpO₂ 92-96% during resuscitation. If persistent requirement for 5-6 L/min and lacking resources for invasive ventilation, consider use high flow nasal oxygen (HFNC) or a face mask with a reservoir bag at 10-15 L/min if the patient is in critical condition.
4. Recommendations are evolving regarding risk: benefit, but favor HFNC over BIPAP/noninvasive ventilation (NIV) if early intubation and mechanical ventilation is not possible. HFNC is a more effective intervention for non-invasive management of ARDS that requires less staff intervention. HFNC is also potentially safer for staff than BIPAP/NIV. Avoid BIPAP, if HFNC is unsuccessful; early intubation is recommended.(31)
5. Recommend rapid sequence intubation (RSI) to minimize bagging for staff safety. Staff should have proper personal protective equipment for intubation including powered air purifying respirator (PAPR) if available or an N95 mask and face shield.
6. For children, use of nasal prongs or nasal cannula may be better tolerated, but the goal is to target SpO₂ >94% during resuscitation, and >90% once stable.
7. Patients may deteriorate rapidly, so continuous monitoring is critical.
8. Aggressive fluid resuscitation may worsen oxygenation and outcomes in both children and adults, so in the absence of shock, fluid boluses should be minimized.
9. Avoid nebulizers, as metered dose inhalers are recommended for staff protection and avoidance of aerosol generation.(31)
10. Avoid routine steroids in patients without acute respiratory distress syndrome (ARDS) except under certain circumstances. However, consider **methylprednisolone** for intubated patients with ARDS.
11. For intubated patients with ARDS and a PaO₂/FiO₂ ratio<150, recommend early proning and consideration for transfer to an extracorporeal membrane oxygenation (ECMO) center. Prone patients may require paralysis with cisatracurium but resources may dictate per individual facility.
12. **Admission studies and labs:** Consider the following labs/studies for diagnosis, prognosis and risk stratification (and/or safety of agents) for all hospitalized patients with confirmed COVID-19/PUI:

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
- 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

Clinical Management of COVID-19

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/>

13. Do not allow ICU visitors for IPC purpose during a pandemic except under exigent circumstances.
14. 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). If there is a risk that the number of patients will overwhelm ventilator capacity then elective surgical cases will be cancelled to divert ventilators to the ICU. In the event of more patients than ventilators, then patients requiring intubation can be intubated and bag valve mask ventilated until a lower acuity patient can be extubated. Splitting ventilators with use of viral filters in patients with similar pulmonary compliance has also been proposed. (<https://emcrit.org/pulmcrit/split-ventilators>)

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

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.
3. Post-mortem results anecdotally 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.(42) However, as a starting point upon intubation, the following table can be used until consultation is available:

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> *	<ul style="list-style-type: none">• Ceftriaxone† 2 g once daily, <u>and</u> Azithromycin† 500 mg once daily
With comorbidities‡	<ul style="list-style-type: none">• Cefepime 1-2 g every 8-12 hours, <u>and</u> Azithromycin† 500 mg once dailyOR• Piperacillin-Tazobactam 4.5 g every 6-8 hours, <u>and</u> 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.

5. Recommend obtaining blood cultures and tracheal aspirate prior to initiation of antibiotics when 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>)

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

Development of Respiratory Failure

1. Recognize severe hypoxemic respiratory failure when a patient with respiratory distress is failing to respond to standard oxygen therapy. Prepare to provide advanced oxygen and ventilatory support.
2. All forms of respiratory therapy have a risk of aerosolization of the virus and risk to others. Comparison of non-invasive respiratory modalities continues to evolve, but presently use of HFNC should be favored over BIPAP. HFNC is more efficacious for non-invasive management of ARDS compared to BIPAP, is generally well tolerated, and requires less staff intervention (coming in and out of room for alarms and trouble-shooting). If this therapy is attempted, it should ideally be confined to negative pressure isolation rooms and healthcare workers should have appropriate PPE, to include N95 masks and PAPR.
3. Avoid use of nebulized medications when possible given the increased risk of aerosolization.
4. Non-invasive ventilation (e.g. CPAP, BiPAP) should in general be avoided given the rapid progression of respiratory failure in patients with ARDS from COVID-19 and the risks to staff. If escalation is required, early intubation should be performed.(41)

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.(31) 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 fit-tested N95 and medical protected head hood or powered air purifying respirator (PAPR) during intubation. If PAPR is unavailable, N95, hair cover, protective coverall, gown, double gloves, face shields, goggles, and shoe covers should be used. Limit the number of staff members during airway manipulation to reduce the risk of unnecessary exposure. (<https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/>)
3. A pre-intubation checklist is strongly encouraged, which should include supplies to be brought inside the room by specific team members and others that should remain outside the room in case they are needed. **Appendix A** provides an example intubation checklist (adapted from University of Washington). *Note: a disposable stethoscope should be used to avoid transferring the virus 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 rapid sequence intubation 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.(43)
5. Some centers have advocated for further reducing exposure during pre-oxygenation and ventilation through preparing an additional COVID Intubation Pack (**Appendix B**), 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 C** 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 D** provides examples.

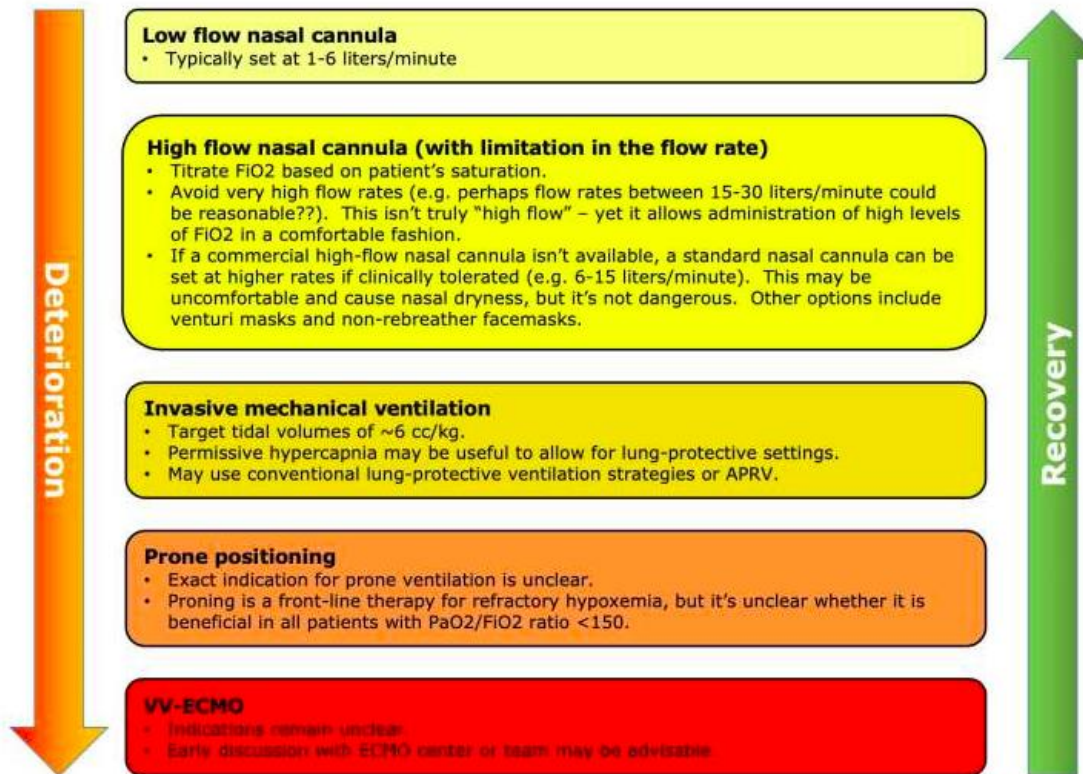
Management of ARDS

1. **Non-invasive ventilation (NIV).** It is recommended to avoid NIV because there is no 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. *Note: V60 ventilators are*

Clinical Management of COVID-19

- also highly aerosolizing and should be discouraged.
2. **High-flow nasal cannula (HFNC).** Although an area of controversy, early expert opinion favors HFNC over other non-invasive modalities (https://emcrit.org/ibcc/COVID-19/#high_flow_nasal_cannula) because it appears to be well tolerated, more efficacious than BIPAP and less provider intensive. There is presently no definitive evidence that HFNC augments transmission of virus.
 3. **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 ARDSnet **high PEEP**, *lung-protective tidal volume (4-8 mL/kg ideal body weight)*, and lower inspiratory pressures (**plateau pressure <30 cm H₂O**). (41, 44)
 - i. Start with 6 mL/kg ideal body weight tidal volume and titrate as needed
 - ii. In patients with moderate to severe ARDS, suggest higher PEEP instead of lower PEEP. PEEP tables are available to guide titration: <http://www.ardsnet.org/tools.shtml>
 - iii. In younger children, maximal PEEP setting is 15 cm H₂O as higher PEEP can result in decreased cardiac output.
 - b. *Permissive hypercapnia* ensuring adequate hemodynamics and a pH >7.15 may be tolerated
 4. **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 (PaO₂), pulmonary mechanics, and arterial blood gases (ABGs). (45-49) Anecdotal reports from Italy have found that patients with COVID-19 usually respond well to early pronation.
 5. Prone positioning requires proper sedation/pain medications and paralytic agents if necessary.
 - a. 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.
 - b. Prone positioning should be performed as clinically indicated within the first 24 hours of the diagnosis of severe hypoxemia.
 - c. Recommend use of a manual proning protocol with coordination if mechanical beds are not available. **Appendix E** provides an example protocol, which was adapted from University Medical Center in Las Vegas, NV. Additional protocols (including videos) are available. (50)
 - d. Pregnancy is *not* a contraindication for proning or neuromuscular blockade. (51)
 6. **Neuromuscular Blockade.** In patients with moderate-severe ARDS (PaO₂/FiO₂<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 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.
 9. **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.
 10. **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>.

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

https://emcrit.org/ibcc/COVID-19/#high_flow_nasal_cannula

<https://i1.wp.com/emcrit.org/wp-content/uploads/2020/03/respsup.jpg?resize=713%2C600&ssl=1>

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, 35, 52)

- 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.(53)
- Electrocardiogram (ECG).** Recommend ECG in suspected or acute coronary syndrome. May consider of obtaining from cardiac tele-monitoring screen.
- 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 as the procedure may be aerosol producing.
- Acute Myocardial Injury.**
 - Definition:** An algorithm for the interpretation of myocardial injury is provided for reference and is based on the 4th Universal Definition of Myocardial Infarction

Clinical Management of COVID-19

(<http://www.onlinejacc.org/content/72/18/2231>).

- b. *Incidence and Prognosis:* Recent reports found that 7-17% of hospitalized patients with COVID-19, have a combination of elevated cardiac biomarkers, in addition to electrocardiographic and echocardiographic abnormalities.(3, 4, 6) This myocardial injury appears to be a late manifestation (up to 14 days from illness onset).(4)
5. **Myocarditis.**
 - a. *Incidence:* In a case series of 150 patients with COVID 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.(52) Currently, pericarditis has not yet been reported.
 - 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.
 - c. *Management:* Once the diagnosis of acute coronary syndrome is made, medical management should be coordinated with cardiology. ST-Elevation Myocardial Infarction (STEMI) Fibrinolytics protocols should be reviewed at each institution with cardiology to discuss care plans in the event of strained resources.
 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.
 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.(52)
 - 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. (54)
 - 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. The American College of Cardiology, Heart failure Society of America, and American Heart association published a joint statement at the time of this writing that recommends continuation of ACE-I/ARB therapy in patients with COVID-19.(55)

Acute Kidney Injury

1. AKI requiring dialysis is reported in a subset of patients admitted to ICU.
2. The exact mechanism is unclear at this point, but AKI is present in ~7% of patients with pathology demonstrating acute tubular necrosis (a reflection of multiorgan failure). AKI correlates with an overall poor prognosis and seems to be the strongest predictor of mortality.

Nutrition

1. Oral and enteral routes of nutrition are preferred.
2. Post-pyloric feeding is preferred for critically ill and mechanically ventilated patients.
3. Energy supply should target. 25-30 kcal per kg body weight, the target protein content is 1.2-2.0 g/kg daily.
4. For elderly patients and/or those at high risk of aspiration or with abdominal distension, may give earlier consideration to parenteral nutrition.

Other

1. Implement the following interventions in Table 1 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.

Table 3. Prevention of Complications

Anticipated outcome	Interventions
Reduce days of invasive mechanical ventilation	<ul style="list-style-type: none"> • Use weaning protocols that include daily assessment for readiness to breathe spontaneously • Minimize continuous or intermittent sedation, targeting specific titration endpoints (light sedation unless contraindicated) or with daily interruption of continuous sedative infusions
Reduce incidence of ventilator-associated pneumonia	<ul style="list-style-type: none"> • Oral intubation is preferable to nasal intubation in adolescents and adults • Keep patient in semi-recumbent position (head of bed elevation 30–45°) • Use a closed suctioning system; periodically drain and discard condensate in tubing • Use a new ventilator circuit for each patient; once patient is ventilated, change circuit if it is soiled or damaged, but not routinely • Change heat moisture exchanger when it malfunctions, when soiled, or every 5–7 days
Reduce incidence of venous thromboembolism	<ul style="list-style-type: none"> • 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)
Reduce incidence of catheter-related bloodstream infection	<ul style="list-style-type: none"> • 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
Reduce incidence of pressure ulcers	<ul style="list-style-type: none"> • Turn patient every 2 hours
Reduce incidence of stress ulcers and gastrointestinal (GI) bleeding	<ul style="list-style-type: none"> • Give early enteral nutrition (within 24–48 hours of admission) • 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
Reduce incidence of ICU-related weakness	<ul style="list-style-type: none"> • Actively mobilize the patient early in the course of illness when safe to do so

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

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 ≥ 2 mmol/L, in absence of hypovolemia.(40, 56)
2. Recognize septic shock in children with any hypotension (systolic blood pressure [SBP] < 5th centile 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.

Septic Shock Resuscitation.

Clinical Management of COVID-19

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.(56)
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 after each bolus.(57)
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).(58) 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. This step is particularly important in patients with hypoxemic respiratory failure.
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**, compression of the inferior vena cava can cause a decrease in venous return and cardiac preload and may result in hypotension. For this reason, pregnant women with sepsis and or septic shock may need to be placed in the left lateral decubitus position at 30 degrees to off-load the inferior vena cava.
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.
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. 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.
12. Angiotensin II (Giapreza) is a vasopressor that may provide benefit in vasodilatory refractory shock as a third-line agent. However, in a resource-constrained environment, this is an unproven costly therapy.
13. In children, epinephrine is considered first-line treatment, while norepinephrine can be added if shock persists despite optimal dose of epinephrine.

Rapid Response or Code Blue.

1. A local Protected Code Blue 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. Staff should be trained appropriately using high-fidelity simulation.
3. Where it is necessary that the Rapid Response or Code Blue team attends, the following is recommended:
 - a. PPE must be available that is equivalent to that used in ICU, therefore airborne precautions including an N95 mask.
 - b. Entry to a patient's room should be limited to vital staff, which may mean a reduction in the Code Blue Team respondents.
 - c. The patient should be assessed by the most senior medical staff available to determine appropriate management and disposition.

Clinical Management of COVID-19

- d. If aerosol generating procedures (AGP) are required, these should ideally be performed in a negative pressure room, however this needs to be balanced with the safety of transporting the patient.
 - e. CPR is an AGP and we recommend all staff should wear airborne PPE including an N95 mask before commencing chest compressions. If available, an automated compressor device should be used to minimize required staff and exposure.
 - f. If the patient is on a ventilator, keep the patient on a ventilator with an adjusted rate of 10 during CPR unless airway obstruction is suspected. If not intubated, consider placing a laryngeal mask airway (LMA) with a self-inflating bag, appropriate viral filter, and PEEP valve as intubation during an arrest will increase aerosolization of viral particles and increase the risk of spread.
 - g. Avoid a prolonged code in patients that experience cardiac arrest who demonstrate signs of progressive cardiogenic shock or hypoxic respiratory failure.
 - h. Focus on potentially reversible conditions (H's and T's): DOPE mnemonic for sudden hypoxia, identification and treatment of shockable rhythm, identification/treatment of tension pneumothorax. Consider use of portable ultrasound and obtain a blood gas.
 - i. Equipment/medications that are needed in the room should be handled with attention to infection control best practices. If a specialized kit is not available, consider placing them through a crack in the door onto a bedside table in the room, but avoid physically handing it to code team personnel.
4. 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 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.

Minimum-Better-Best Paradigm for Limited Code Blue

	Minimum	Better	Best
Advance Directives	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, there are DNRs for those who might code due to refractory cardiogenic shock or respiratory failure
Alert mechanism	Educate current Code Team members about who should respond to “Overhead Code Blue” to COVID patients	Early activation	Directed announcement ONLY to COVID Code Team
PPE / Precautions	Droplet for room; Minimize door opening	Airborne/Negative ISO; Infection Control Gatekeeper; Door remains closed	Use of PPE Checklist; PAPR
Communication (via PAPRs or individuals outside room)	Whiteboard for written instructions; Closed-loop	Speakerphone in room; Vocera; Gatekeeper	Personal communication devices; VA Video Connect (tablets)
CPR	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) (outside room) for high risk patients
IV access	Two standard functioning PIVs for all COVID patients	Tibial IO (if needed)	Early placement of central access before potential arrest
ACLS Equipment	Dedicated Code Cart for COVID 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 ward: US, EKG machine, portable CXR
Airway	Non-rebreather mask immediately <u>over</u> patient mask OR BVM with viral filter and ETCO2	Place LMA for non-intubated patients. For intubated patients, either leave on vent (if good chest rise, +ETCO2) or	Early intubation BEFORE arrest occurs

Clinical Management of COVID-19

		troubleshoot with DOPE pneumonic	
Simulation/Practice	Ongoing review and regular familiarization with Protected Code Blue policy; Development of “Mock COVID Code Blue”	One-time practice with all members of the COVID response teams	Regular practice and policy updates to all members of the COVID 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 15 L/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.

ADJUNCTIVE THERAPIES FOR COVID-19: TREATMENT PROTOCOLS

Note: *All therapies are investigational and none are proven as the literature is evolving quickly. There are no specific therapeutics approved by the FDA to treat people with COVID-19.* None can 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.

Ethics of Clinical Research during a Pandemic: There are no US Food and Drug Administration (FDA)-approved drugs specifically for the treatment of patients with COVID-19. 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.” (59)

Steroids.

1. There is a strong consideration to avoid routine steroids based on early data out of China as well as

Clinical Management of COVID-19

other studies related to Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) which have shown that steroids actually delay viral clearance.(60)

2. However, new consensus guidelines recommend considering **methylprednisolone** for intubated COVID-19 patients with ARDS.(40)
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.

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 Ebolavirus disease, where it was not found to be superior to other therapies in the PALM RCT.(61) It has shown promise in vitro and in animal models for coronavirus infection.(62-64)
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 D, 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 (eGFR) <30]. (<https://clinicaltrials.gov/ct2/show/NCT04280705>)
3. Gilead has two Phase 3 randomized open-label trials of remdesivir (5-days versus 10-days versus 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 use from Gilead for patients with clinical pneumonia: 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.”
5. USAMMDA Force Health Protection Division has established an expanded access treatment IND with a limited number of treatment courses of Remdesivir for Active Duty Service Members CONUS/OCONUS (and Federal civilian and contract employees deployed OCONUS 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. These drugs have been widely used as anti-malarial treatment and prophylaxis and to treat autoimmune conditions.
2. BLUF: No high-quality evidence exists to support use at present. *Potential toxicities include QTc prolongation and risk for arrhythmias.*
3. 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

Clinical Management of COVID-19

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.(64-67) 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.(67) Despite showing in vitro antiviral activity, prior clinical trials demonstrated 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.(68-71) In a non-human primate study, hydroxychloroquine appeared to paradoxically enhance chikungunya infection.(72)

4. 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.(73) 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.(74) 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.
5. Several clinical trials have been initiated or are planned to study CQ and HCQ for treating and preventing COVID-19. Significant off-label use is occurring overseas and in some US hospitals.
6. 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 COVID19.
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.(75-77)
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 COVID19 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

Clinical Management of COVID-19

tocilizumab 400 mg IV x1 and reported improvement in respiratory parameters.(38, 78)

4. Manufacturer-supported US randomized controlled trials of tocilizumab and sarilumab are set to launch as of 20 March 2020.

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. The American Society of Health-System Pharmacists last updated their Assessment of Evidence for COVID-19-Related Treatments on 21 March 2020, which can be found here:

<https://www.ashp.org/-/media/assets/pharmacy-practice/resource-centers/Coronavirus/docs/ASHP-COVID-19-Evidence-Table.ashx?la=en&hash=B414CC64FD64E1AE8CA47AD753BA744EDF4FFB8C>.

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

Caring for Pregnant Women with COVID-19

1. Limited information on the effects of COVID-19 for pregnant women exist in the current literature and limited to 2 case series including 18 pregnant women. This small series showed severe respiratory morbidity in 1/18 cases. Clinical findings were similar in cases of non-pregnant adults. Pregnant women experience immunologic and physiologic changes that make them more susceptible to viral respiratory infections. Pregnant women might be at greater risk for severe illness, morbidity, or mortality compared with the general population, as is observed with other related coronavirus infections. Pregnant women should receive the same care as those who are not pregnant in regards to screening, radiology studies, laboratory evaluations and critical care.
2. 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=2D9E7F62C97F8231561616FFDCA3B1A6>
3. Case series suggest no evidence of vertical transmission, similar to other viral respiratory illnesses, such as influenza.(79)
4. Preterm delivery has been reported. Some cases were iatrogenic and not due to spontaneous preterm labor. No neonatal deaths have been reported.(79)
5. 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. **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.
7. **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, early mechanical ventilation for progressive respiratory failure, individualized delivery planning, Maternal Fetal Medicine consultation, Pulmonology, Critical Care and Infectious disease involvement as indicated. Team based management is recommended. Consider early transfer of care to higher level facility if unable to provide services at MTF.(80) If a pregnant patient is admitted to an ICU for worsening pulmonary status, a Maternal Fetal Medicine consultation should be made.
8. **Imaging:** With few exceptions, radiation exposure through radiography, computed tomography (CT) scan, or nuclear medicine imaging techniques is at a dose much lower than the exposure associated with fetal harm. If these techniques are necessary in addition to ultrasonography or MRI or are more readily available for the diagnosis in question, they should not be withheld from a pregnant patient. The use of gadolinium contrast with MRI should be limited; it may be used as a contrast agent in a pregnant woman only if it significantly improves diagnostic performance and is expected to improve

Clinical Management of COVID-19

fetal or maternal outcome.(81)

9. **Delivery:** Delivery should be reserved for maternal and fetal indications. Recommend health care team wear appropriate PPE during delivery and delivery should be in a negative pressure room. For women infected in the third trimester who recover, attempts to postpone delivery until a negative test result or quarantine status is lifted. This will minimize risk of transmission to the neonate.
10. **Cesarean section:** Cesarean section should be reserved for maternal and fetal indications. Recommend operating room with negative pressure isolation.
11. **Antenatal surveillance:** Gestational age appropriate fetal monitoring should be part of the initial assessment of any women with respiratory symptoms and continuous fetal monitoring should be provided for any critically ill pregnant woman.
12. **Ultrasound:** Given how little is known about the natural history of COVID-19, mid-trimester ultrasound assessment may be considered following first or second trimester infection exposure. Third trimester growth assessment is reasonable to consider for later second trimester and third trimester infections.
13. **Follow up after diagnosis of COVID-19:** Patients should be treated according to symptom severity and admitted to the hospital if vital signs are abnormal or symptomatic support is indicated. When patient is discharged from the hospital a plan for follow up should be established. In non-pregnant patients with COVID-19 pneumonia there is evidence that respiratory status can worsen up to a week after symptoms initially presented. For that reason close follow up with patients via phone triage should be performed. If patients symptoms worsen arrangements should be made for patient to be seen by a health care provider to assess clinical status.
14. **Postpartum care:** Postpartum patients with COVID-19 should be isolated from other patients in a postpartum isolation room. Breastfeeding is encouraged. CDC recommends that temporary separation of mother and newborn to avoid exposure of the newborn to COVID-19. (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcareguidance.html>). Women who intend to breastfeed should be provided a dedicated breast pump to express breast milk. There is no evidence of virus transmission in breastmilk.(79) Discussions prior to delivery surrounding the possibility of early separation of mother and infant to avoid post-partum transmission. Considerations can be made to delay delivery to prevent unnecessary exposure to neonate but ultimately delivery timing should be made based on maternal and fetal indications.
15. Hospitals should develop a local plan for appropriate locations where COVID-19 positive patients can come to receive care to assure appropriate prenatal care is delivered to the patient and to minimize risk of exposure to the virus of other patients and health care workers. Pregnancy care should be considered non-elective.

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

1. 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.(82)
2. In addition to face mask and hand hygiene, consider temporarily separating a symptomatic PUI or COVID-19 mothers from her baby (e.g. separate rooms) depending on clinician judgement and individual circumstances. This carries risks as well (e.g. delayed maternal-child bonding, poor breastfeeding relationship, etc.).
3. COVID-19 positive postpartum mothers as well as postpartum PUIs will be counseled about the risks and benefits of colocation vs. separation.
4. Postpartum patients who elect to co-locate (also referred to as 'rooming in') with their infants will be encouraged to wear a facemask and gloves and to practice hand hygiene before each feeding. 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

Clinical Management of COVID-19

should be kept greater than 6 feet away from the mother within the room, per CDC guidance.

Pumping / Expressed Breast Milk (83)

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 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 be bathed immediately following delivery.
3. These infants should be tested for COVID-19 before hospital discharge. Prior to discharge, inpatient providers will directly discuss care of the infant with the follow-up provider.

Neonatal Intensive Care Unit (84)

1. COVID-19 positive postpartum mothers and their household contacts should not be allowed to visit in the NICU.
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. COVID-19 positive postpartum mothers and their household contacts will not be allowed to visit in the NICU.
4. 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.
5. 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 food 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.

Visitation

1. No visitors experiencing cough, fever, or shortness of breath should be allowed in any care setting.
2. For NICU: no COVID-19 positive person or their household contacts should be allowed to enter the NICU. Entrance to other family support personnel will be determined on a case-by-case basis.
3. For Labor and Delivery: each laboring COVID-19 positive or PUI mother will be allowed to have one support person with her who must remain with her throughout her admission (to include in post-partum recovery). This support person will not be out and about within the hospital.
4. For 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

Clinical Management of COVID-19

person should be isolated to the post-partum room and not be traveling elsewhere within the hospital.

- a. If the mother chooses to co-locate with the infant, the support person will be encouraged to help with the infant's 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. Newborns who are PUIs are not eligible for elective circumcision.

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

University of Washington Handling of Breast Milk of COVID-19 Mothers

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: one study out of China reported only one death in 2,143 pediatrics patients.(85)
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.
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. (13, 85)
 - Fever 80-95% – majority <24hr duration
 - (Dry) cough 45-80%
 - Myalgias or fatigue 10-45%
 - Pharyngitis 10-40%
 - Rhinorrhea and/or congestion 10-30%
 - Diarrhea 10-20%
 - Dyspnea or hypoxemia 5-10%
6. Most labs are normal to include inflammatory markers (ESR, CRP, procalcitonin), chemistries, kidney and hepatic function. White blood cell count is typically normal but may be low.
7. If abnormal imaging, CXR will have non-specific increased lung markings or patchy infiltrates. Chest CT shows ground glass opacities.
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. Children appear to be efficiently shed the virus, even if asymptomatic. Viral load is detectable in respiratory secretions for up to 2 weeks and in stool for up to 4 weeks.(86, 87)
10. 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. Early data from China suggest that a majority of deaths have occurred among adults aged ≥60 years especially those with underlying health conditions. In the United States, mortality rates in patients above age 85 have ranged 10-27%, and 3-11% among patients 65-84 years.(36)

Clinical Management of COVID-19

2. 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.
3. Conversations regarding goals of care should continue to be part of routine care.
4. Patients should be informed about their condition, and, if desired, their prognosis, in a way that is easy to understand.
5. 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.
6. Symptom management: Aggressive control of symptoms such as pain, dyspnea or other bothersome symptoms relieves unnecessary suffering and is therefore 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, start an opiate (drug, dose, route, and frequency should be individualized and based on symptom severity, kidney/liver function and prior opiate exposure). Consider local supply in drug selection to mitigate risk of drug shortage.
 - Start a stimulant laxative, if prescribing an opiate to prevent constipation.
 - b. Dyspnea
 - If providing supportive care and supplemental oxygen is ineffective for management of severe dyspnea, a low-dose opiate may be used to help alleviate symptoms.
 - c. All providers should be able to provide basic symptom management, routine discussions about code status and goals of care in patients that are seriously ill.
 - d. If complex symptom management, difficult discussions about code status, and care goals arise, consider consultation from a palliative medicine subspecialist if available at your institution.
7. Compassionate extubation in the setting of comfort oriented care or the actively dying patient should be considered a medical procedure similar to ventilator initiation and follow a specific plan as removal of the ventilator can cause discomfort.
8. When resources become scarce:
 - a. Decisions regarding allocation of resources should be made at local, regional, state or federal levels.
 - b. Providers should avoid discussing rationing care at the bedside and should continue to provide compassionate care for the individual patient.
 - c. Age and comorbidities should not be a factor for provision of care for older adults.
 - d. Individual decisions and institutional policy regarding allocation of resources should be discussed in an interdisciplinary fashion and include input from stakeholders such as palliative medicine and healthcare ethics experts.
 - e. Institutional policy should be frequently reevaluated given the rapidly evolving nature of this crisis.
 - f. Institutional Clinical Ethics Committees should work closely with palliative medicine services to review process and decision making in resource scarce environments.(88)

SURGICAL CONSIDERATIONS FOR PERSONS WITH COVID-19

Perioperative Care of COVID-19+ Patients and PUIs

Overview.

1. For purposes of surgical care, patients will be treated as presumed COVID-19 positive if they have symptoms/exposure history that warrants testing or are unable to provide information (obtunded or unable to communicate for any reason, poor historians, etc). Any surgical patients that fall into the PUI category should be medically managed to the greatest extent before proceeding with surgery in an attempt to delay until confirmatory testing. Optimally, an OR or cluster of ORs should be predesignated with a distinct antechamber to maintain separation from non COVID patients. If negative pressure ORs aren't available, consult with facilities to ensure air handling is routed through HEPA filters.
2. All patient interaction will be performed with enhanced droplet precautions:

Clinical Management of COVID-19

- N95 respirator or PAPR
 - Eye protection- goggles, face mask (OR face shields/masks worn over N95), or plastic disposable wrap-around glasses. Eyeglasses are not adequate.
 - Gown, gloves, hair cover, shoe covers
3. Remove all PPE and place in a biohazard bag before exiting the room EXCEPT N95 mask.
 4. Patients on the ward should be transported directly to the OR by the anesthesia team, similarly to an ICU patient. If assistance is needed with transport, every attempt should be made to use someone from the care team (nurse, surgeon, tech) to minimize exposure.
 5. When transporting a ventilated patient, ensure an HME/HEPA filter is placed between the endotracheal tube and the Ambu bag. Hook the Ambu bag up prior to opening the door in the negative pressure room and ensure the door is closed when returning the patient and switching to the ventilator. The same filter may also be used on the exhalation loop of the anesthesia machine- do not throw it away.

In the OR.

1. Make every attempt to take out all necessary meds and equipment from the carts prior to bringing patient into the room. It's better to waste a few meds and equipment instead of contaminating the cart.
2. Routine breaks for anesthesia providers should be avoided to limit exposure and conserve supplies. Cell phones should be left outside the OR to eliminate accidental contamination. Ensure help may be obtained using the OR phone.
3. Continue to wear full PPE for the duration of the case.

Intubation.

1. If a negative pressure OR is unavailable, consider intubating the patient in a negative pressure room and transporting to the OR after intubation.
2. Consider video laryngoscopy.
3. Rapid Sequence Intubation should be performed when at all possible to avoid mask ventilation due to increased aerosolization of secretions.
4. Ensure HME/HEPA filter is on the exhalation limb or at the Y-piece (sampling line should be post filter).
5. Double glove and immediately remove outer glove after the airway is confirmed secure. Outer gloves may be used to wrap disposable portions of airway equipment after use. Consider, at a minimum, using hand sanitizer on inner gloves or exchange with new gloves.
6. Intubation and extubation generate a transient, significant droplet load for the room. Ensure all non-essential personnel are given the chance to leave the room if possible before performing the procedures.
7. Any external equipment (US machine, GlideScope, etc) needed for the case should be draped to the greatest extent possible and NOT REMOVED until the room is terminally cleaned.
8. ICU patients will recover in the ICU and floor patients should be taken to a negative pressure room in the PACU. If a negative pressure PACU room isn't available, use the ICU as a recovery room if bed space allows. Extubating in a PACU negative pressure or ICU room if necessary. If extubating in the OR, place a regular OR mask on the patient prior to transport to the PACU or ICU. If you elect to extubate a patient in the ICU rather than the OR, the anesthesia team should maintain responsibility for the patient until stable for routine handoff.
9. The ASA continues to update its website and has relevant links: <https://www.asahq.org/in-the-spotlight/coronavirus-covid-19-information>

Surgical Considerations for Care of COVID-19+ Patients and PUIs

1. The primary role of surgeons is delivering outstanding surgical care. Military surgeons also bring the expeditionary "mindset" that is adaptable to extraordinary circumstances.
2. Additionally, surgeons have a role to play above and beyond their typical surgical practice to include, providing critical care by General Surgeons, assisting in triage, learned from combat, and assisting in difficult resource distribution decisions, should circumstances dictate.

Surge Capacity, Staffing, and 'Elective Surgery'

1. Military surgeons are well versed in addressing surge capacity both when deployed, and in MTFs. Surgeons should adopt a similar approach when dealing with the potential for large numbers of non-

Clinical Management of COVID-19

combat ‘casualties’ while maintaining the ability to remain a combat casualty care receiving platform when applicable. General guidelines to manage capacity, case mix, and staffing during a prolonged COVID response follow:

- a. Maintain the flexibility to continue medically necessary, time sensitive cases as needed and follow patterns seen across the civilian sector as well as published guidelines from the American College of Surgeons and local health authorities. In this period, patients needing cancer care, facing loss of function, treating infections and other procedures, in which progressive medical conditions cannot tolerate delays of several weeks, should be considered for operations. Adjudicate both COVID associated risks to patients, resources, faculty and staff alongside the potential increased mortality and morbidity associated with delays of care.
 - b. When there are questions or controversies whether or not a surgical procedure is elective, the time sensitivity and/or medical necessity should be determined at the local level, preferably the Department or Service Chief.
 - c. ICU, inpatient ward, PACU and ambulatory capacity, staff availability, and OR supply chain capacity, need to be continuously assessed by perioperative leaders with the site-specific command. Classification of cases should be based on operative capacity (available, constrained, or none) as well as patient needs and adjusted based on the above assessment.
 - d. For emergency operation on a COVID-19 positive patients, treat these as aerosol generating procedures throughout the operative period (including intubation). Such cases should be performed with airborne precautions (N95 with face shield or PAPR) and preferably in a negative pressure room.
2. Overall members of the surgical community should recognize that such circumstances are both an extraordinary challenge and also a great opportunity. The challenge may be severe, but as a key component of the team, surgeons will rise to that challenge and deal with extraordinary events. Lessons learned from combat casualty care can be applied to this resource-constrained pandemic.

TELEMEDICINE SUPPORT DURING THE COVID-19 PANDEMIC

1. Telemedicine, also referred to as virtual health (VH), encompasses a set of tools that leverage information and communication technologies to most commonly extend medical care across geographic distances and boundaries. These same tools have a significant and unique potential to support care delivery during an infectious pandemic in order to decrease healthcare worker exposure to contagion (i.e. “clinical distancing”), reduce the usage of consumable PPE, while also enabling continued medical care delivery for non-infected patients while in their home. Accordingly, the CDC now recommends the liberal use of telehealth during the COVID19 Pandemic (<https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/guidance-hcf.html>).
2. Telemedicine can be done through two primary mechanisms
 - a. Direct-to-patient VH. Services delivered in this manner require credentialing and privileging IAW DHA PM 6025.13. Direct-to-Patient VH is most appropriate when a provider is directly evaluating a patient, and typically requires documentation of the encounter in the EHR.
 - b. Tele-Consultation. Services delivered in this manner may occur without separate privileging at the patient’s location, and typically are performed from healthcare professional to healthcare professional (i.e. trained clinician to trained clinician like medic to remote physician or nurse to physician or physician to physician).
3. Telemedicine technology: clinicians who engage in telemedicine (especially forms that utilize video with the patient) must appreciate the burden it places upon valuable network resources. The solution that achieves clinical needs and uses the *minimal* network resources should be utilized whenever possible.
4. There are several use-cases for telemedicine during the COVID-19 Pandemic. Each require planning and practice to be successful. Locally grown solutions may become necessary if enterprise solutions

Clinical Management of COVID-19

are overcome by demand (see below).

5. Successful telemedicine requires clinicians to establish a well-defined use case for the technology that will be used. Use cases for which currently available MHS approved solutions exist include:
 - a. Screening and Initial Evaluation (e.g. Virtual Clinics)
 - 1) Web-portal based screening tools suggest need for patients to engage with their healthcare system (reduces overall burden on the system if patients are screened as low risk). Search online for “Free Online COVID-19 Screening.”
 - 2) Asynchronous solutions including web-portal based messaging (e.g. Relay Health and MHS GENESIS patient portal) and e-mail allow engagement with the healthcare system with minimal network resource use.
 - 3) Where available, portable telemedicine units can be employed by triage and Emergency Department personnel to evaluate patients to reduce clinician exposure to potentially sick patients; Telehealth in a Bag (THIAB), Transportable Exam Station (TES), and Video Teleconferencing (VTC) Carts with/without virtual exam equipment.
 - 4) Mobile or web-based applications like DoD approved Adobe Acrobat and Cisco Meeting server can be used to set-up kiosks or for VH to patient location (see below).
 - 5) These systems can connect a patient (within an isolation setting) to a provider (within a “clean” setting) by use of either portable data networks (PDN’s), WiFi routers, cellular service, or hospital WiFi networks.
 - b. Inpatient Wards (non-ICU)
 - 1) Where available, portable telemedicine units can be employed by triage and Emergency Department personnel to evaluate patients; Telehealth in a Bag (THIAB), Transportable Exam Station (TES), and Video Teleconferencing (VTC) Carts.
 - 2) These systems can connect a patient (within an isolation setting) to a provider (within a “clean” setting) by use of either portable data networks (PDN’s), WiFi routers, cellular service, or hospital WiFi networks.
 - c. Tele-Critical Care
 - 1) Sites that are currently enrolled in the Joint Tele-Critical Care Network, should use this existing resource to support care of critically ill patients with or without suspected / confirmed COVID-19 infection.
 - 2) Sites that are not currently enrolled in JTCCN, should attempt triage and management of patients as outlined in this document and per usual standards of care. For hospitals that typically do not care for critically ill patients, this may involve transfer of the patient to a local civilian hospital.
 - 3) MTF’s that are not enrolled in the JTCCN and which (1) do not have sufficient critical care expertise, and (2) which cannot transfer critically ill patients, may be forced to care for these patients. In this situation, tele-consultation is available to support care of these patients.
 - 4) Tele-consultation can be obtained through either:
 - i. The ADVISOR program.
 - Although the ADVISOR program is designed for operational VH support, critical care support during the COVID pandemic can be obtained using this call system.
 - The caller needs to identify that they are requesting support for critically ill patients located in an MTF.
 - Information on ADVISOR (including the contact number) can be obtained by emailing dod.advisor_office@mail.mil.
 - ADVISOR is only available for MHS providers.
 - ii. Contact the following MTF’s and ask for the on-call critical care staff
 - Walter Reed National Military Medical Center, MD. (301) 295-4611, option 4 Command Duty, Quarterdeck or (301) 295-4810, Emergency Room.

Clinical Management of COVID-19

- Madigan Army Medical Center, WA. (253) 968-1110 Information Desk.
 - Brooke Army Medical Center, TX. (210) 916-0808 Emergency Room.
 - Naval Medical Center Portsmouth, VA. (757) 592-5473 Critical Care, (757) 953-1365 Emergency Room
 - Eisenhower Army Medical Center, GA. (706) 787-6938/6019 AOD or (706) 787-6039 Emergency Room.
 - Travis Air Force Base Medical Center, CA. (707) 423-3040 ICU, or (707) 423-3825 Emergency Room.
 - Tripler Army Medical Center, HI. (808) 433-6661 Information Desk, (808) 433-4032 ICU, (808) 433-3707 Emergency Room
 - Darnall Army Community Hospital, TX. (254) 553-0270 ICU
 - William Beaumont Army Medical Center, TX. (915) 892-6880 House Supervisor, (915) 742-2139 ICU
 - Keesler Air Force Base Medical Center, MS. (228) 376-0500 Emergency Room.
- d. Virtual Health to Patient Location (e.g. home)
- 1) The CDC recommends providing outpatient care where/when possible through telemedicine in order to minimize infectious exposure in MTF's for other at risk patients and clinical staff.
 - 2) Virtual health to patient location can be established with the same technical solutions identified under screening.
 - i. Secure Messaging (e.g. Relay Health, MHS GENESIS Patient Portal).
 - ii. Establishing a clinic cell phone with texting services and publishing the number
 - iii. Using phone calls to discuss patient problems/symptoms as indicated.
 - iv. Conducting Synchronous Video Visits using DoD approved Solutions:
 - Adobe Connect. Accounts can be requested from the VMC Front Office.
 - Cisco Meeting Server (CMS).
- e. OCONUS MTF's may also utilize existing asynchronous virtual health platforms (PATH for INDOPACOM, HELP for EUCOM, AFRICOM, and CENTCOM) to obtain teleconsultation subspecialty consultation.
6. Non-DoD approved solutions and additional use cases. Non-DoD Approved solutions may become necessary if demand for telehealth outpaces approved telehealth capacity. Consider the following if this option becomes necessary to pursue:
- a. Always be conscious of the need to maintain patient privacy and data security and clearly delineate risks to the patient or healthcare professionals using the system.
 - b. Do NOT use photos, video, geospatial positions when you are in an operationally sensitive area: ALWAYS CONSIDER OPSEC!
 - c. Before pursuing this option, CLEARLY DEFINE YOUR USE CASE, then consider technology resources (hardware, software, and network combinations) that can be used for your use case. Most importantly, consider HOW you will use the technology and practice this workflow before implementing it broadly at your location. Consider the following:
 - Who will use your solution?
 - Why would they use your solution?
 - When would they use this solution?
 - Where will they use the solution (in a patient room, at a nursing station, from a home/office, to a home/office, etc.)?
 - What combination of hardware, software, and network will be used?
 - How will they use it (training, how-to guides, etc.)
 - How will they document care?
 - How will you maintain patient regulation (admission/discharge/transfer)?
 - How will you maintain team-based care as necessary?
 - d. Potential ad hoc mobile technologies solutions that could be considered (mobile chosen

Clinical Management of COVID-19

because it is the easiest to establish; fixed solutions like VTC and Cisco Jabber solutions are also possible).

- 1) Non-Approved VH solutions that might be adapted to the above use cases or others include
- 2) Free options like Skype, Google Hangouts, FaceTime on clinic phone, text messaging, etc.
- e. PRACTICE your solution on a small scale before deploying more broadly.
- f. Establish routine communication with leadership regarding current capabilities and your telehealth solution’s potential to off-load aspects of bedside care to telemedicine support. Use telemedicine to triage bedside clinician time and activities. Necessary to do this is good communication and trust between the bedside clinical team and the remote clinical team. One way to facilitate this is to rotate teams from bedside duties to telemedicine duties or to shift infected caregivers toward telemedicine and recovered caregivers towards the bedside. Importantly, asking/having all clinicians participate in telemedicine increases their awareness and understanding of telemedicine capabilities and limitations.
7. Questions regarding MTF and Market telemedicine capabilities should be directed to MTF and Market virtual health leads. Questions that cannot be answered by the MTF/Market VH lead, or questions pertains to an enterprise VH service, should be directed to the regional VMC hub site.
 - a. CONUS: VMC-C located in San Antonio
 - b. INDOPACOM: VMC-IP located in San Diego, CA
 - c. EUROPE: VMC-E located in Landstuhl, Germany

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

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

Does the patient have:

<u>BOX 1</u>		<u>BOX 2</u>
Fever (or are they hot to the touch)	AND	Has the patient traveled to a CDC Health Advisory Level 2 or Level 3 country in the last 14 days? https://wwwnc.cdc.gov/travel/notices
Cough		Are they currently under investigation or isolation for COVID-19 by public health or other medical professionals?
Shortness of Breathing or Difficulty Breathing		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?
Other flu-like symptoms (sore throat, runny nose, body aches or chills)		

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

- Instruct the individual to quarantine themselves, if able, from close contact with others until EMS arrival.
- Notify responding EMS or First Responder Crews (to include Law Enforcement, Fire and EMS) that the patient meets pre-arrival screening criteria for COVID-19. Isolation and PPE measures should be taken prior to contact.
- Follow local agency policies to limit multi-unit responses or to limit the number of First Responders that are exposed to the patient if possible.
- 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).

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

Strained EMS Response due to Increased 911 Calls/Requests.

1. EMS systems may be stressed due to an influx of 911 calls due to known or suspected COVID-19 transmission or infection. In areas with limited EMS resources 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 complaint (relating to the potential exposure or signs and symptoms of COVID-19), and other 911 calls are pending a response, EMS crews should contact On-line Medical Control to discuss refusal of transport. Refusal of transport is not appropriate when call volumes are low.

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

1. EMS personnel providing care for a patient with possible COVID-19 infection should utilize the following recommended 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.

Clinical Management of COVID-19

2. EMS personnel should notify the receiving healthcare facility that the patient has an exposure history and signs and symptoms suggestive of COVID-19 so that appropriate infection control precautions may be taken prior to 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 that can provide separate ventilation to each area.
 - a. Close the door/window between these compartments before bringing the patient on board.
 - b. 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.
 - c. 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 examination room).

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 Direction before initiating an aerosol-generating procedure. These aerosolized procedures include:
 - a. Nebulizer Treatments
 - b. Bag Valve Mask (BVM) Ventilations
 - c. Endotracheal Intubation
 - d. Oropharyngeal Suctioning
 - e. Continuous Positive Airway Pressure Ventilations (CPAP)
 - f. Cardiopulmonary Resuscitation (CPR)
4. 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 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.

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 use on another patient, 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 for COVID-19.
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.

Guideline Only/Not a Substitute for Clinical Judgment

Clinical Management of 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.

EN ROUTE CRITICAL CARE CONSIDERATIONS FOR PERSONS WITH COVID-19

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.(89) 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 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.

WHOLE OF GOVERNMENT RESPONSE IN COORDINATION OF RESOURCES

On March 13, 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.

Clinical Management of COVID-19

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. Military treatment facilities 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>

ETHICAL CONSIDERATIONS WHEN CARING FOR PERSONS WITH COVID-19

The COVID-19 pandemic outbreak is a global phenomenon that has impacted all countries and citizens, while straining public health systems to an unprecedented level in recent times. Some of the more challenging dilemmas encountered in the treatment of the disease center around the appropriate response procedures in triaging patients presenting with COVID-19 like symptoms, and the just and equitable distribution of scarce medical resources for those patients requiring more acute medical interventions in an inpatient hospital setting. Many of these challenges fall within the general considerations of justice as applied to medicine in regards to the process by which medical leaders decide to create and implement these treatment and allocation parameters.

Conceding at the outset that no static guidance can anticipate all the myriad factors that might arise as crucial variables in the clinical environment to influence the final decisions of those medical professionals on the frontlines in caring for these afflicted patients, the intent of this section is to provide references and resources from highly reputable and thought-leading organizations who have published comprehensive guidance on the ethical considerations at the bedside.

To that end, listed below is the recently published Ethical Framework Guidance by The Hastings Center which identifies critical bioethical issues for consideration in the development of both institutional response policies and individual treatment decisions. The Ethical Framework Guidance also contains numerous collateral references to previous works on the subject, which have been informed by best practices and past lessons learned during the MERS, SARS, H1N1, and Ebola outbreaks.

The Hastings Center COVID-19 Ethical Framework Materials (88)

<https://www.thehastingscenter.org/ethicalframeworkcovid19/>

In addition, The Society of Critical Care Medicine (SCCM) has also published various COVID-19 Emergency Resources to assist frontline health care providers in establishing appropriate care and checklist procedures in their clinical treatment methods. Those materials have also been listed below for reference going forward, and the website link will be continuously updated as new guidance is created for distribution, including a forthcoming ethical framework to be published in the near future.

The Society of Critical Care Medicine (SCCM) COVID-19 Emergency Resources

<https://www.sccm.org/disaster>

Clinical Management of COVID-19

The COVID-19 pandemic is, and continues to be, an incredibly dynamic, fluid, and evolving global health emergency. Issues and procedures will evolve and require refinement as more information becomes available about the nature and breadth of the disease. However, being familiar with the most recent counsel and guidance from the experts in the field will assist all medical leaders in implementing the best possible policies and treatment decisions for both individual patients and society at large.

REFERENCES

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. 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.
11. 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>.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. Stroud C, Altevoigt B, Nadig L. Crisis Standards of Care: Summary of a Workshop Series. Washington DC; 2010.

Clinical Management of COVID-19

20. Christian MD, Devereaux AV, Dichter JR, Rubinson 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.
21. 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.
22. 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.
23. 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.
24. 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.
25. 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.
26. 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.
27. World Health Organization. WHO Checklist for Influenza Pandemic Preparedness Planning. Switzerland; 2005.
28. Wise RA. The creation of emergency health care standards for catastrophic events. *Acad Emerg Med*. 2006;13(11):1150-2.
29. 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>.
30. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. *Can J Anaesth*. 2020.
31. 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.
32. Lippi G, Plebani M. Procalcitonin in patients with severe coronavirus disease 2019 (COVID-19): A meta-analysis. *Clin Chim Acta*. 2020;505:190-1.
33. 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).
34. 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>.
35. 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.
36. 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>.
37. Day M. Covid-19: ibuprofen should not be used for managing symptoms, say doctors and scientists. *BMJ*. 2020;368:m1086.
38. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? *Lancet Respir Med*. 2020.
39. Véran O. 2020 [updated March 17, 2020. Available from: <https://twitter.com/olivierveran/status/1239931737549033472>.
40. Alhazzani W, Møller MH, Arabi YM, Loeb M, Gong MN, Fan E, et al. Surviving Sepsis Campaign: Guidelines *Guideline Only/Not a Substitute for Clinical Judgment*

Clinical Management of COVID-19

on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19). Critical Care Medicine. 2020.

41. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected [press release]. World Health Organization 2020.
42. 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.
43. 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.
44. 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.
45. Guerin C, Reignier J, Richard JC. Prone positioning in the acute respiratory distress syndrome. N Engl J Med. 2013;369(10):980-1.
46. 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.
47. 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.
48. 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.
49. 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.
50. 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.
51. 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.
52. 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.
53. 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>.
54. Zheng YY, Ma YT, Zhang JY, Xie X. COVID-19 and the cardiovascular system. Nat Rev Cardiol. 2020.
55. 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>]
56. 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.
57. 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.
58. Comparison of Two Fluid-Management Strategies in Acute Lung Injury. New England Journal of Medicine. 2006;354(24):2564-75.
59. National Academies of Sciences, Engineering, and Medicine. Integrating clinical research into epidemic response: The Ebola experience. Washington DC: The National Academies Press; 2017.
60. 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.
61. 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.
62. de Wit E, Feldmann F, Cronin J, Jordan R, Okumura A, Thomas T, et al. Prophylactic and therapeutic

Clinical Management of COVID-19

- remdesivir (GS-5734) treatment in the rhesus macaque model of MERS-CoV infection. Proceedings of the National Academy of Sciences. 2020:201922083.
63. 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.
64. 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.
65. Dong L, Hu S, Gao J. Discovering drugs to treat coronavirus disease 2019 (COVID-19). Drug Discov Ther. 2020;14(1):58-60.
66. 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.
67. 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.
68. 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.
69. 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.
70. 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.
71. 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.
72. 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).
73. 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.
74. 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.
75. 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.
76. 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.
77. 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.
78. Xu X, Han M, Li T, Sun W, Wang D, Fu B, et al. Effective Treatment of Severe COVID-19 Patients with Tocilizumab. 2020.
79. 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.
80. 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.
81. Committee on Obstetric P. Committee Opinion No. 723: Guidelines for Diagnostic Imaging During Pregnancy and Lactation. Obstet Gynecol. 2017;130(4):e210-e6.
82. 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.
83. Center for Disease Control and Prevention. Pregnancy & Breastfeeding: Information about Coronavirus Disease 2019 2020.
84. 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>].

Clinical Management of COVID-19

85. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China. *Pediatrics*. 2020.
86. 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.
87. 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.
88. Berlinger N, Wynia M, Powell T, Hester M, Milliken A, Fabi R, et al. Ethical Framework for Health Care Institutions Responding to Novel Coronavirus SARS-CoV-2 (COVID-19) Guidelines for Institutional Ethics Services Responding to COVID-19. 2020 March 16, 2020.
89. CDC. Guidance on Air Medical Transport for SARS Patients [cited 2020. Available from: <https://www.cdc.gov/sars/travel/airtransport.html>].

APPENDIX A : 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 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 CO₂ 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/>)

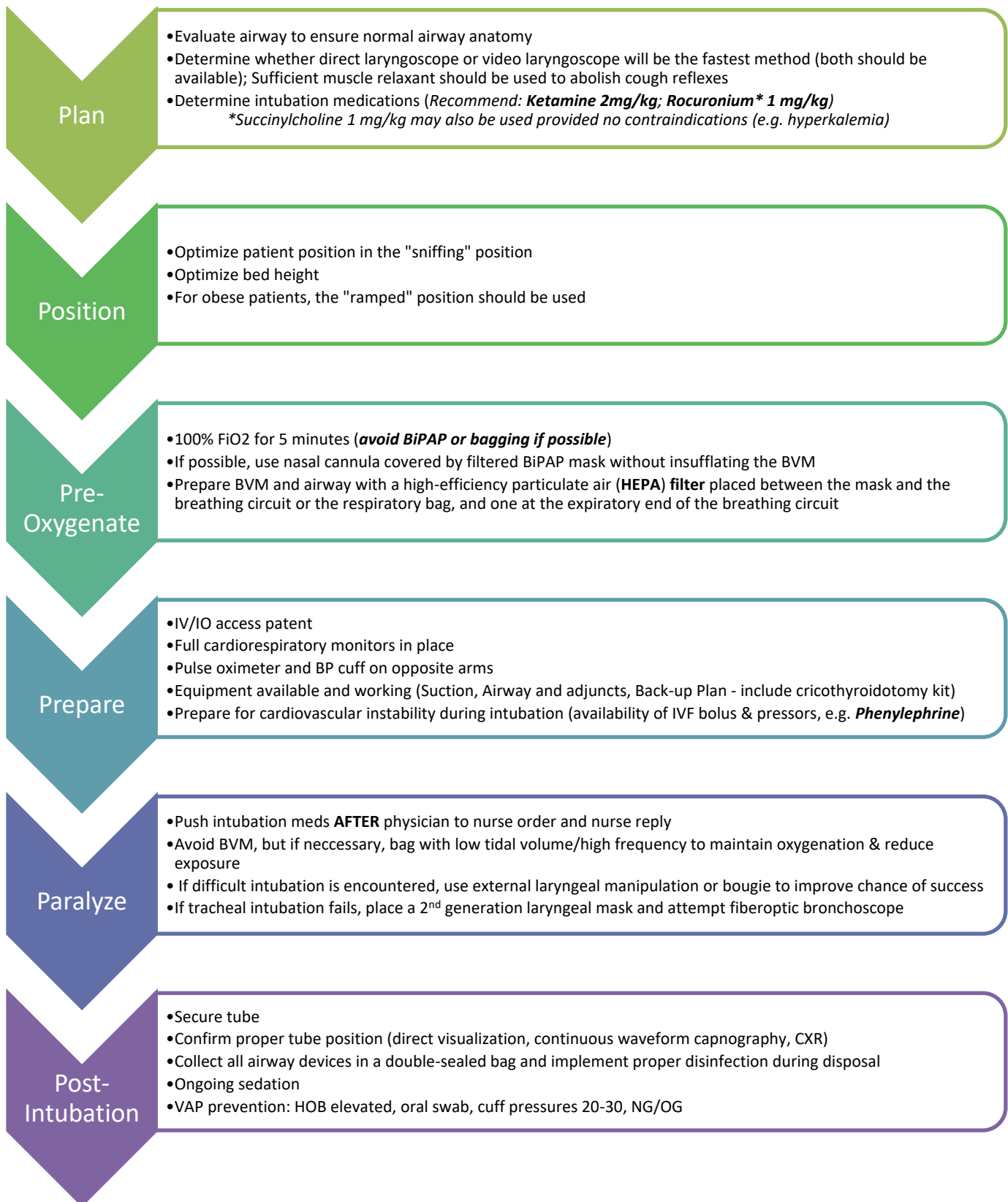
APPENDIX B: COVID-19 PRE-INTUBATION PACK*

1. Adult BVM **
2. Nasal Cannula
3. Face Shield or Joint replacement Hood
4. End-tidal CO2 ETT Adaptor
5. End-tidal CO2 Tubing
6. Yellow Viral Filter
7. ETT Securement device
8. New, flexible tip bougie
9. PEEP Valve

*From: <https://emcrit.org/emcrit/COVID-19-intubation-packs-and-preoxygenation-for-intubation/>

** if possible, avoiding use of BVM is preferred to avoid spread of pathogen to providers performing airway interventions

APPENDIX C : COVID-19 INTUBATION PROTOCOL

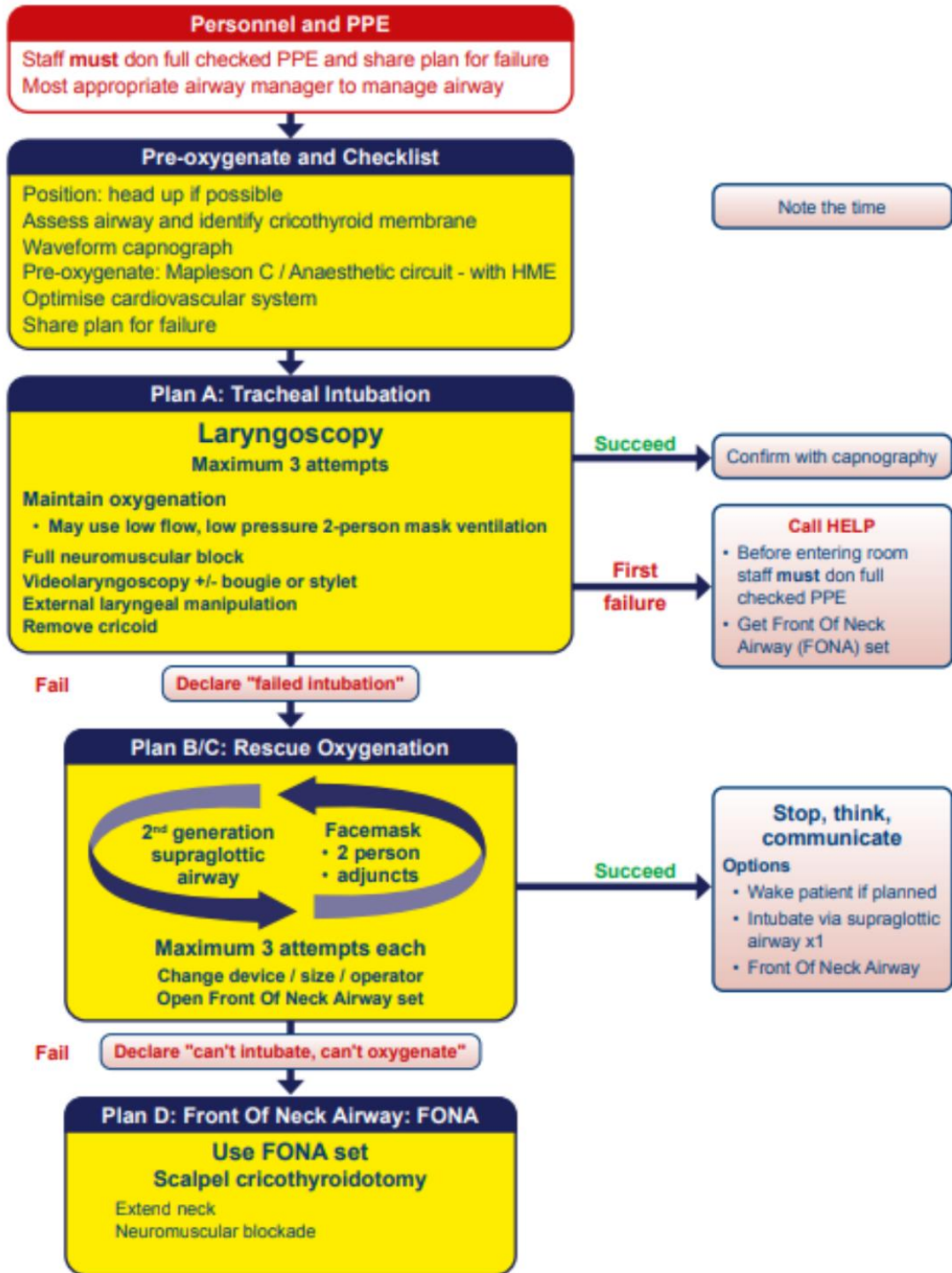


APPENDIX D : COVID-19 COGNITIVE AIDS FOR INTUBATION

Emergency tracheal intubation checklist COVID-19

Personal Protective Equipment	Prepare Equipment	Prepare for Difficulty	In the Room	Post-procedure and Safety
<p>OUTSIDE ROOM</p> <ul style="list-style-type: none"> <input type="checkbox"/> PPE – be thorough, don't rush <input type="checkbox"/> Wash hands <input type="checkbox"/> Put on PPE <input type="checkbox"/> Long sleeved gown <input type="checkbox"/> FFP3 mask <input type="checkbox"/> Gloves <input type="checkbox"/> Eyewear <input type="checkbox"/> Wipeable shoes <input type="checkbox"/> ± Headwear <input type="checkbox"/> Check fully by buddy with checklist! <input type="checkbox"/> Names on visors 	<ul style="list-style-type: none"> <input type="checkbox"/> Check kit attached <input type="checkbox"/> BMV or Mapleson C with HME <input type="checkbox"/> Guudel <input type="checkbox"/> Working suction <input type="checkbox"/> Videolaryngoscope <input type="checkbox"/> Bougie/Stylet <input type="checkbox"/> Two tracheal tubes, ties and syringe <input type="checkbox"/> 2nd generation SGA <input type="checkbox"/> eFC/NA set <input type="checkbox"/> Do you have all the drugs required? <ul style="list-style-type: none"> <input type="checkbox"/> Ketamine <input type="checkbox"/> Relaxant <input type="checkbox"/> Vasopressor <input type="checkbox"/> Maintenance sedation <input type="checkbox"/> Weight? <input type="checkbox"/> Allergies? 	<ul style="list-style-type: none"> <input type="checkbox"/> If the airway is difficult, could we wake the patient up? <input type="checkbox"/> What is the plan for a difficult intubation? <ul style="list-style-type: none"> <input type="checkbox"/> Plan A: RSI <input type="checkbox"/> Plan B/C: 2-handed 2-person BMV & 2nd generation SGA <div style="text-align: center; margin: 10px 0;"> <p>The diagram shows a circular flow between two airway management techniques. On the left, a box labeled '2nd generation supraglottic airway' has an arrow pointing to a box on the right labeled '2-person BMV'. From the '2-person BMV' box, an arrow points back to the '2nd generation supraglottic airway' box, with the word 'adjusts' written below the arrow.</p> </div>	<p>INSIDE ROOM</p> <ul style="list-style-type: none"> <input type="checkbox"/> Airway assessment <ul style="list-style-type: none"> <input type="checkbox"/> Identify CTM <input type="checkbox"/> IMAC/COCHA <input type="checkbox"/> Apply monitors <ul style="list-style-type: none"> <input type="checkbox"/> Invasive capnography <input type="checkbox"/> SpO₂ probe <input type="checkbox"/> ECG <input type="checkbox"/> Blood pressure <input type="checkbox"/> Checked IV access (x2) <input type="checkbox"/> Optimise position <ul style="list-style-type: none"> <input type="checkbox"/> Consider ramping or reverse Trendelenburg <input type="checkbox"/> Optimal preoxygenation <ul style="list-style-type: none"> <input type="checkbox"/> U3 mins <input type="checkbox"/> DETC₂ > 85% <input type="checkbox"/> Low flow nasal O₂ <input type="checkbox"/> Optimise patient condition be optimised any further before intubation? <ul style="list-style-type: none"> <input type="checkbox"/> Fluid/pressor/ intropie <input type="checkbox"/> Asypate NGT <input type="checkbox"/> Delayed sequence induction? 	<p>AFTER AND LEAVING</p> <ul style="list-style-type: none"> <input type="checkbox"/> Airway management <ul style="list-style-type: none"> <input type="checkbox"/> Establish ventilation after cuff inflation <input type="checkbox"/> Check waveform capnography <input type="checkbox"/> Clamp tracheal tube before each disconnection <input type="checkbox"/> Avoid unnecessary disconnections <input type="checkbox"/> Other <ul style="list-style-type: none"> <input type="checkbox"/> Insert NGT <input type="checkbox"/> Consider deep tracheal viral sample <input type="checkbox"/> Careful equipment disposal <input type="checkbox"/> Decontamination of reusable <input type="checkbox"/> Remove PPE <ul style="list-style-type: none"> <input type="checkbox"/> Observed by buddy <input type="checkbox"/> Use checklist <input type="checkbox"/> Meticulous disposal <input type="checkbox"/> Wash hands
<ul style="list-style-type: none"> <input type="checkbox"/> Allocate roles: <ul style="list-style-type: none"> <input type="checkbox"/> Team leader and intubator <input type="checkbox"/> Chief force and intubator's assistant <input type="checkbox"/> Drugs, monitor, timer <input type="checkbox"/> Runner (outside) <input type="checkbox"/> FONA <input type="checkbox"/> How do we contact further help if required? 				

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 E : 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 on 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 are 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 require

Clinical Management of COVID-19

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 that 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 every 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 PaO₂/FiO₂ ration, hemodynamically unstable or decreasing SpO₂/PaO₂) 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 care,

Clinical Management of COVID-19

- urinary catheter care, skin care, eye care, suctioning, etc.).
- c. Discuss supine position tolerance and PaO₂/FiO₂ 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. PaO₂/FiO₂ 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 PaO₂/FiO₂ ratio is >200 on less than 50% FiO₂ 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

