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 Renée I. Matos and COL Kevin K. Chung
5-14-2020

DoD COVID-19 Practice Management Guide v3.0 Summary of Changes

New Sections:

- *Outpatient Management (replaced Treatment of Mild Infections)*
- *Removed Oxygen Therapy and Monitoring and combined it with the ARDS Section*
- *Rehabilitation Section*
- *Telemedicine Section put back in*
- *Public Health Section*
- *Ethics Section is back, but shorter*

Updated throughout with new literature, studies, and society guidelines across disciplines
Major Updates and Changes by Section:

Planning & Preparation: paragraph on "returning to the new normal"

Infection Prevention & Control: updated with new CDC guidance. Emory visuals on PPE removed from the Appendices and included as a link. New Appendices for this section.

Collection of Specimens: updated with IDSA recommendations from late April advising against use of serologic testing for patient screening due to high false positive rate. Two negative tests are no longer recommended by the CDC to document clearance of infection in hospitalized patients.

Co-infections Section: mentions risk of Aspergillus

ARDS Section: more liberal criteria for intubation; no longer recommending early intubation, but using criteria of progressive hypoxia, worsening chest infiltrates, hypercarbia, decreased mental status, or worsening dyspnea. Added section on Extubation, including an Extubation protocol in the Appendices. Discussed hypothesis of two types of COVID-19 ARDS: Light "L" type and heavy "H" type with the potential for different management strategies for PEEP based on physiologic differences. This is not an evidence-based discussion, but merely a hypothesis mentioned for completeness.

Prevention of Complications: Hematology section is completely rewritten

Code Blue: updated to reflect newly released AHA guidelines with ACLS/PALS algorithms included in the Appendices. Focus is on protecting healthcare personnel (HCP).

Imaging: Includes Fleischner Society recommendations for chest imaging (CXR, CT). Also discusses increased risk of thromboembolic complications and related imaging to address this.

Adjunctive Therapies: Updated with new data, literature and includes a summary statement

at the top of the section regarding the need for RCT results and that there is no data to support use outside of a clinical trial. Remdesivir preliminary results from SIMPLE and ACTT trials included, although these are not published or peer-reviewed at this time. The FDA cautions use of hydroxychloroquine and chloroquine outside of a clinical trial due to the risk of heart problems associated with these medications. Convalescent plasma is moving through approval for DoD FHP IND, although there is not yet data from controlled trials to suggest benefit.

Special Populations: Several updates to the Pregnancy section, including new guidance on ultrasound cleaning in the Appendix and the section is now organized by stage of labor with a new table on common OB medications. The neonatal and pediatric sections were updated to reflect new AAP guidance. The Pediatric section has several changes, including movement of all pediatric-related topics to this section. It also discusses new reports of children presenting with a multisystem inflammatory syndrome similar to Kawasaki disease, toxic shock syndrome, and myocarditis. Peds ID dosing recommendations were also included for some of the adjunctive therapies.

Surgical Implications: Significant updates to reflect new publications from multiple societies.

Operational: Significant updates, including new TRANSCOM guidance for transport.

Behavioral Health: Changed from Mental Health with several updates throughout the section.

En Route Critical Care: Completely updated.

Facilities: Now includes discussion on HEPA filters and UV (bullets 6-9 are new).

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.

First Publication Date: 23 March 2020 | Publication Date: XX May 2020 | Supersedes PMG Dated 13 April 2020

TABLE OF CONTENTS

Background 4
Clinical Presentation 4
Planning and Preparation 6
Screening and Triage (Early Recognition of Patients with COVID-19) 11
Immediate Implementation of Infection Prevention & Control (IPC) Measures and Personal Protective Equipment (PPE) 13
Collection of Specimens for Laboratory Diagnosis 14
Management of COVID-19 Based on Illness Category 15
Outpatient Management COVID-19: Symptomatic Treatment & Monitoring 15
Management of Severe COVID-19: Treatment of Co-Infections 16
Management of Critical COVID-19: Oxygen and Acute Respiratory Distress Syndrome (ARDS) 17
Management of Critical Illness and COVID-19: Prevention of Complications 21
Management of Critical Illness and COVID-19: Septic Shock and Cardiac Arrest 26
Imaging of COVID-19: Radiology Department Guidance and Imaging Findings 29
Adjunctive therapies for COVID-19: Treatment Protocols 32
Caring for Special Populations with COVID-19: Pregnancy and Lactation, Infants, Children and the Elderly 35
Palliative Medicine During the COVID-19 Pandemic 47
Implications of COVID-19 on Surgical Care 50
Operational Considerations for COVID-19: Planning and Preparation 54
Behavioral Health and Wellness in COVID-19 Clinical Management 56
Rehabilitation Considerations for Persons with COVID-19 58
Telemedicine Support During the COVID-19 Pandemic 59
Emergency Medical Services (EMS) and Ground Transport of Persons with COVID-19 63
En Route Critical Care Considerations of Persons with COVID-19 67
Public Health Considerations and Response 69
Whole of Government Response in Coordination of Resources 72
Ethical Considerations During the COVID-19 Pandemic 73
Other Considerations Related to COVID-19 74
References 75
Appendix A: Mask Guidance, Precautions, and Use of PPE 85
Appendix B: Example Triage Protocols during COVID-19 Pandemic 96
Appendix C: Adult Prone Positioning Protocol Example 98
Appendix D: COVID-19 Intubation Pre-Entry Checklist 101
Appendix E: COVID-19 Intubation Protocol 102
Appendix F: COVID-19 Cognitive Aids for Intubation 103
Appendix G: Sample Protocol for Extubation of COVID-19 Patients 106
Appendix H: Transport Ventilator Set Up Guide 107
Appendix I: Weight-Based Heparin Dosing Algorithm for Venous Thromboembolism 109
Appendix J: Sample Protocols for Various Intensive Care Unit (ICU) Management 110
Appendix K: Enteral Nutrition Care Pathway for Patients with COVID-19 111
Appendix L: American Heart Association (AHA) ACLS and PALS Algorithms for COVID-19 Patients 113
Appendix M: Preparation and Cleaning of Ultrasound Rooms in the Context of COVID-19 115
Appendix N: DHA Quick Reference Guide to Virtual Health and Telephone Encounters 118
Appendix O: Example Triage Protocol for Resource Allocations in Times of Crisis 119
Appendix P: List of Contributors 123

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 (most often some degree of hypoxemic respiratory failure) and 5% will require critical care interventions.(1) Of those who are critically ill, most require early intubation and mechanical ventilation. Other complications include septic shock and multi-organ failure, including acute kidney injury and cardiac injury.(2) Older age and comorbid conditions, including hypertension, diabetes, and coronary artery disease increase risk of death.(3-5) The virus is highly contagious and spread via respiratory droplets, direct contact, and if aerosolized, airborne routes.

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

CLINICAL PRESENTATION & CLINICAL COURSE

1. Incubation period: ~4-5 days (interquartile range: 2 to 7 days).(6, 7) 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; a study of 181 COVID-19 patients supported these initial estimates and found that 97.5% of symptomatic patients develop symptoms within 11.5 days of infection.(8)
2. Frequently reported symptoms of patients admitted to the hospital: (3, 9-14)
    - Fever (77–98%)
    - Cough (46%–82%)
    - Myalgia or fatigue (11–52%)
    - Shortness of breath (SOB) (3-31%)
    - GI symptoms, e.g., anorexia, diarrhea, nausea (pooled prevalence 17.6% in meta-analysis of 60 studies, may precede respiratory symptoms)
    - Anosmia, hyposmia, or dysgeusia (30-88%)
3. Among 1,099 hospitalized COVID-19 patients, fever was present in 44% at hospital admission, and developed in 89% during hospitalization.(7)
4. Less commonly reported symptoms: sore throat, headache, cough with sputum production and/or hemoptysis, and lower respiratory tract signs and symptoms.(3, 4, 7)
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.(3, 15)
6. Pregnant women: Based on limited data, pregnant women do not appear to be at higher risk for severe disease. Emerging reports from the United States suggest that pregnant women may be at higher risk of atypical presentation with severe disease and caesarean delivery. Additionally, women who develop pneumonia appear to have increased risk of preterm labor.(16-20)
7. Children: Limited information is available about the clinical presentation, clinical course, and risk factors for severe COVID-19 in children with approximately 5-6% presenting with severe illness. In China, COVID-19 made up between 1.5-2% of acute respiratory admissions, with a median age of 7 years. In the US, the median age reported thus far was 11 years. Along with the typical symptoms described, emesis and diarrhea appear to be prominent with the virus found in stool samples suggesting fecal-oral transmission. Critically ill children have presented with ARDS, septic shock, encephalopathy and myocarditis. Co-infections with other respiratory viruses or bacteria are common. The MMWR study reported that hospitalized children were more commonly <1 yr and had underlying conditions, e.g., asthma.(6, 21-27)
8. Prolonged detection of SARS-CoV-2 RNA has been reported and appears to be related to severity of illness; in respiratory specimens (up to 6 weeks) and stool specimens (>30 days).(21, 22, 28)
9. Clinical presentation among cases of COVID-19 varies in severity from asymptomatic to fatal illness. Several reports suggest clinical deterioration can occur during the 2nd week of illness (range: 5 – 13 days).(3, 11)

10. Acute hypoxemic respiratory failure developed in 17–29% of hospitalized patients. Secondary infection developed in 10%, with a median time from symptom onset to of respiratory failure of 8 days.(3, 9, 10)
11. Approximately 20-30% of hospitalized patients with COVID-19 and pneumonia have required critical care. Compared to patients not admitted to an intensive care unit (ICU), critically ill patients were older (median age 66 years vs. 51 years), and were more likely to have underlying co-morbid conditions (72% vs 37%).(3, 10)
12. Among critically ill patients admitted to an ICU, 11–64% received high-flow oxygen therapy and 47-71% received mechanical ventilation. A small proportion (3-12% of ICU patients) have also been supported with extracorporeal membrane oxygenation (ECMO).(9, 10, 15)
13. Other reported complications include cardiac injury, sudden cardiac death, arrhythmia, septic shock, liver dysfunction, acute kidney injury, venous and arterial thrombosis despite chemoprophylaxis, and multi-organ failure.(29) A Dutch review of COVID-19 positive patients admitted to an ICU the pneumonia revealed 31% had a thrombotic complication with the majority of these being pulmonary emboli.(30) Viral inclusion bodies have been seen in endothelium of kidneys, small bowel, and heart suggesting that endotheliopathy could be contributing to thrombotic complications.(31)
14. Case fatality rates (CFR) appear to vary by location and related to demographics, e.g., median age, of the population. A CFR of 2.3% has been reported among confirmed cases of COVID-19 in China.(15) 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, 9, 10) In a report from one Chinese hospital, 61.5% of critically ill patients with COVID-19 had died by day 28 of ICU admission. Among all critically ill COVID-19 patients in China, the reported case fatality proportion was 49%.(2)
15. As of 11 May 20, the Italian government COVID-19 surveillance group reported 28,903 deaths associated with COVID-19, of which 84.8% >70 yr, 10.5% 60-69 yr, 3.6% 50-59 yr, 0.9% 40-49 yr, 0.2% 30-39 yr, 0.04% <30 yr. Of the 2,621 patients for whom data on pre-existing co-morbidities are available, approximately 60% had >3 pre-existing co-morbidities (e.g., hypertension, type 2 diabetes, ischemic heart disease, atrial fibrillation). The CFR for Italy was estimated at 13.2%. https://www.epicentro.iss.it/en/coronavirus/
16. In the US, as of 11 May 20, the Centers for Disease Control and Prevention (CDC) reports 79,756 COVID-19-related deaths. (https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html) CFR increases with age (highest in ≥85 yr). As of 2 May, the overall cumulative hospitalization rate is 50.3 per 100,000, with highest rates in people ≥65 yr (162.2 per 100,000) and 50-64 yr (79.0 per 100,000). (https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html)

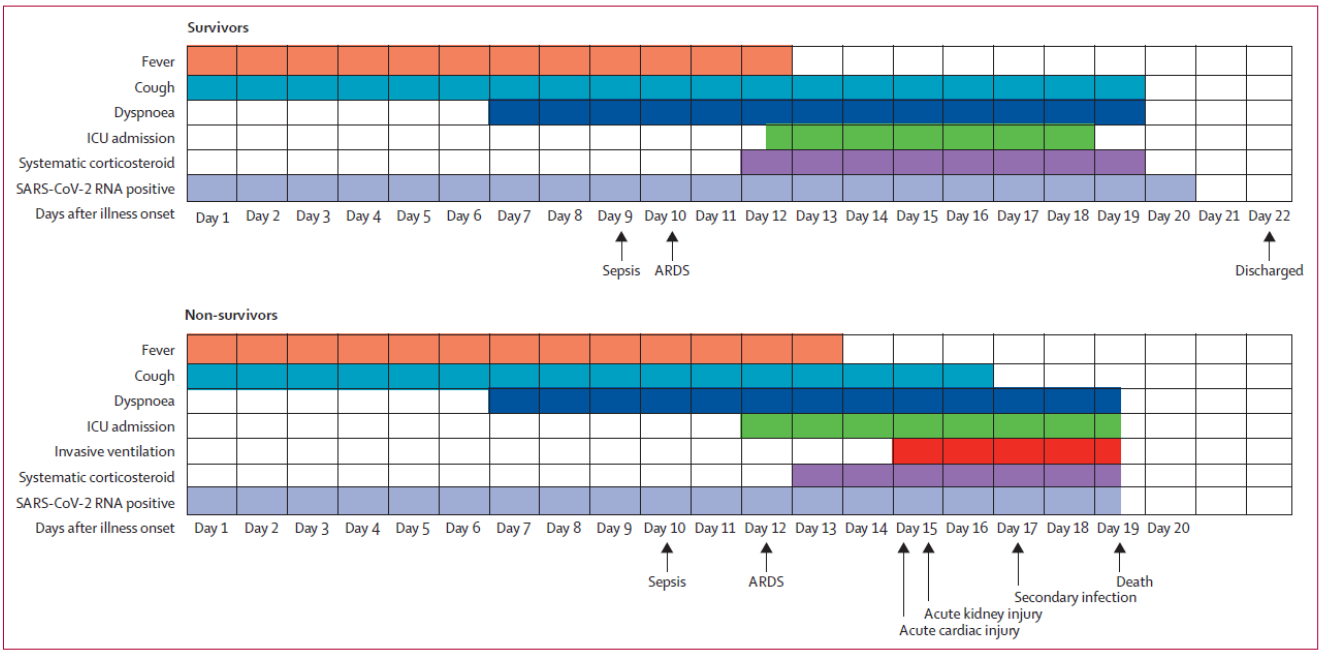


Figure 1. Clinical Courses of Major Symptoms and Outcomes and Duration of Viral Shedding [from Zhou, et al.; Lancet (2020)].(4) Figure shows median duration of symptoms and onset of complications and outcomes. ICU, intensive care unit; ARDS, acute respiratory distress syndrome.

PLANNING AND PREPARATION

Facility Incident Command and Systems.

1. A local emergency response command structure with clearly defined roles and lines of communication should be defined.(32, 33) These structures should have the ability to coordinate expansion or restriction of resources in conjunction with unit medical directors, help coordinate "just in time" training as well as regional expert consultation (i.e. tele-consultation with critical care, infectious disease, or other specialists), facilitate the flow of staff, critical equipment and patients, and coordinate with Contingency the Crisis Standard of Care (CSC) changes on both a local and regional level. Additionally, the local Incident Command Center (ICC) should liaise and coordinate with the community as transition through crisis care levels and resource triage if needed, depends on regional, not just local, healthcare utilization.
2. Establish and Manage Crisis/Contingency Standards of Care
   a. Crisis Standards of Care 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."(34)
   b. The establishment of CSC should enable specific legal and regulatory protections for health care providers. For reference, DODI 6200.03 allows for establishment of a CSC within the DoD.
   c. Design and implementation of these standards for each agency should remain flexible based on each situation and should be tiered (i.e. normal operations, contingency, crisis) and have specific triggers to engage. In general Contingency when >120% typical capacity and Crisis when >200% capacity.
   d. Contingency Care is more similar to typical care standards with most staff working in their usual environments but with expanded clinical responsibilities.
   e. Crisis Standards of Care, if invoked, triggers significantly altered staffing models as described below with incumbent assumed risks of increased morbidity and mortality. CSC should be developed by multi-disciplinary groups and collated by the Incident Command Center (ICC) and should be individualized to a facility. A list of topics that should be included:
      - Authority and triggers for enacting escalating from usual to Contingency then Crisis
      - Just in time training & 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).
      - Alternations from normal should be limited as much as possible to mitigate patient safety risks.
3. Establish clear lines of communication (LOC) to ensure:
   a. The ability to communicate updated processes and protocols.
   b. The ability to transfer clinical information with patients through the system.
   c. That communication be consistent, from designated sources, and information be trusted by staff.(35-37)
4. Establish Patient Tracking and Re-unification systems: Plan and coordinate a system for patient tracking, identification, and the ability to communicate with next of kin who may be restricted from visitation.(37)
5. Establish security, access points, and "clean" areas with access restricted:
   a. Security should be included in the planning process given increased community stress and security risks during the COVID-19 pandemic.
   b. Establish "satellite" units in alternative locations to care for patients unaffected by the pandemic to protect non-infected patients and high-risk staff (e.g., underlying medical conditions, age >60).(38)
   c. Consider access to specialty or routine care that may be needed in these areas with screening as patients enter.
   d. Establish single or controlled points of entry for every facility and initiate screening procedures for possibly infected patients at entrances.
6. Coordination of re-prioritization of clinical duties:
   a. Focus on urgent care, but ensure a process for providing necessary routine care when unsafe to defer.
   b. Care should be primarily virtual unless a face-to-face visit is necessary as determined by the care team.
   c. Closely track access and demand and consider expanding or contracting services based on local epidemiology and need.

d. Coordinate re-allocation of assets off loaded by limitations to areas of need (Critical Care, Inpatient care, Initial triage, and Urgent/Emergency Care).(39)
e. Limit administrative, educational and academic duties to those necessary to directly support patient care.
f. Frequently message patients and staff any changes in services, clinic hours, entry procedures, etc. to manage their expectations.

Decreasing ← Morbidity and Incident demands → Increasing

	Conventional	Contingency	Crisis
Space	Usual patient care spaces maximized	Patient care areas re-purposed (PACU, monitored units for ICU-level care)	Non-traditional areas used for critical care or facility damage does not permit usual critical care
Staff	Additional staff called in as needed	Staff extension (supervision of larger number of patients, changes in responsibilities, documentation, etc')	Insufficient ICU trained staff available/unable to care for volume of patients, care team model required & expanded scope
Supplies	Cached/on-hand supplies	Conservation, adaptation and substitution of supplies with selected re-use of supplies when safe	Critical supplies lacking, possible allocation/reallocation or lifesaving resources
Standard of care	Usual care	Minimal impact on usual patient care practices	Not consistent with usual standards of care (Mass Critical Care)
ICU expansion goal	X 1.2 usual capacity (20%)	X 2 usual capacity (100%)	X 3 usual capacity (200%)
Resources	Local	Regional/State	National

Normal ← Operating Conditions → Extreme

Figure 2. A framework outlining the conventional, contingency, and crisis surge responses. PACU: post-anesthesia care unit. [from Christian, et al.; Chest (2014)].(40)

7. Develop Recall Roster for all assets (nursing, physician, housekeeping, dietary, security, admin, etc) and triggers for re-calling those who may be needed from remote work.
8. Consider logistic/ancillary support needs when determining "Essential Personnel" for tasks including:
   a. Disposal of personal protective equipment (PPE) and cleaning both "dirty" rooms and shared spaces. These tasks should be prioritized and will be in very high demand.(41)
   b. Allocation of adequate space for safe, respectful care of the deceased.(42)
   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.(38, 39)

Preparing Critical Care Resources & Teams.

1. Understand the following steps provide a framework and are not the "correct" way to manage bed or staffing expansion. Exact staffing models, ratios, logistic and system support models should reflect the needs of the community and resources available at local centers. Transitioning to Crisis Care models carries with it significant increases in both morbidity and mortality above that seen in standard care models. It should be undertaken only when absolutely necessary, with careful consideration, and in an iterative way assessing for increased volume paradoxically leading to excessively increased morbidity and mortality.
2. ***Staffing*.** In a global pandemic causing a surge of emergency room and admitted patients, additional staffing models should be considered. Although telehealth resources should be optimized, there may still be significant deficits in critical care trained healthcare workers.

a. Staff Shortages:
   i. Illness, fatigue, fear, and care giver duties, particularly with school/daycare closure, limit staff availability with some estimates as high as 40-60% absenteeism.(38, 43)
   ii. Augmenting staffing initially with increased "mandated overtime" should be avoided as long as possible to avoid early staff burn out.
   iii. Facility based alteration of staffing ratios (i.e. less provider staff in the inpatient setting overnight) may help reduce staff burden while maintaining reasonable coverage in keeping with typical hospital processes.
   iv. Strategies listed above may mitigate (facility based child care, cohort care teams, etc.) but planning should consider at least a 25-40% reduction in staff availability. Additional recommendations to augment staff availability include:(44)
      - A PPE officer (can be trained non-clinical staff) to train and monitor PPE and staff exposure on each ward
      - Mental health support or "resiliency teams" with focus on staff wellness and support
      - Team "Safety officers" to monitor/ensure breaks, hydration, toileting and nutrition
   v. *Critical Care.* The Society of Critical Care Medicine (SCCM) recommends staffing models to support expanded critical care bed capacity in the event of a global pandemic, which includes use of multiple non-ICU trained healthcare workers. Those staff noted below should be ICU trained and experienced and include: (45)
      - Critical Care Physician
      - Respiratory Therapist
      - Advanced Practice Providers (APP)
      - Critical Care Nurse (CCRN or experienced active RN working in critical care)
      - In facilities without intensivists, critical care teams may be directed by anesthesiologists, pulmonologists, hospitalists, or others with experience caring for critically ill patients.(45)
      - Staffing for the roles could include but are not limited to those with some previous critical care training or experience and could include:
         - Non-ICU physician: anesthesiologists, hospitalists, general surgeons or others with experience caring for critically ill patients
         - CRNA, CAA, MD/DO: Residents from medical or surgical specialties (with appropriate supervision and graduated responsibility) or other medical or surgical staff preferably with experience in inpatient medicine
         - Non-ICU nurse tiered from best to least suited:(44)
            1. RN currently working in progressive care units (telemetry or step down units)
            2. Ambulatory care setting with previous ICU experience (preferably within 3 years)
            3. Paramedics, EMTs or RNs and medical assistants/LPN that work in urgent care

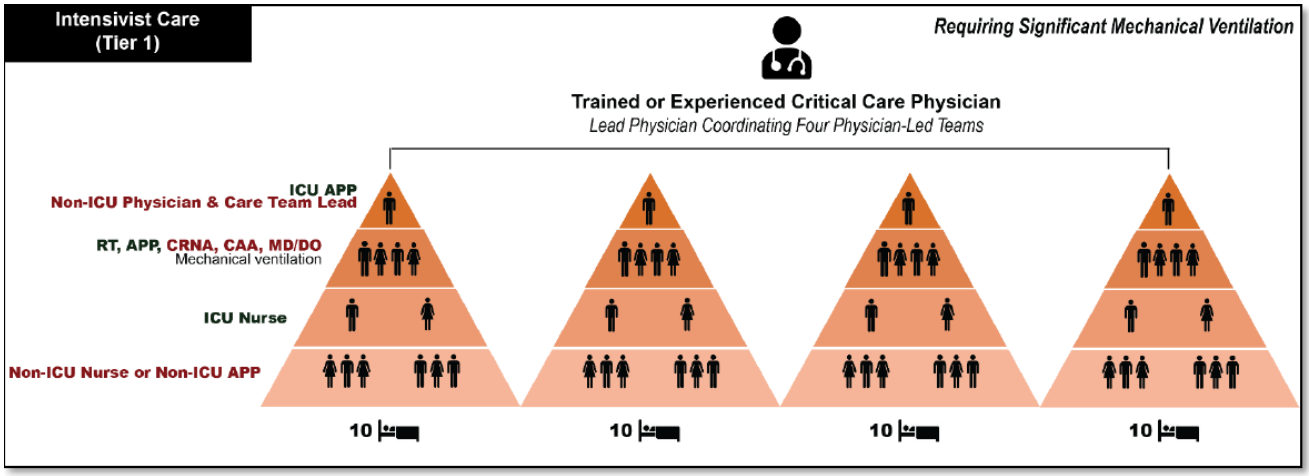


Figure 3. SCCM Tiered Critical Care Staffing Strategy for Pandemic. APP: advanced practice provider; RT: respiratory therapist; CRNA: certified registered nurse anesthetist; MD/DO: physician [modified from SCCM link above].(45)

vii. *Step-down Care/Intermediate Care Ward (ICW).* Figure 4 provides a framework staffing model for patients requiring more intensive support but not mechanical ventilation/vasopressor support, or those at imminent risk of requiring mechanical ventilation/vasopressor support, such as could be managed in a step-down unit. Ideally, this team would be led by an experienced hospitalist or intensivist who oversees the care of physician-led teams. Ideally, these staffing models would be supported by a minimum of two teams working no longer than 12-hour shifts. (38) In the setting of COVID-19, these are likely patients that would be hospitalized in fixed facilities by not in ICUs.

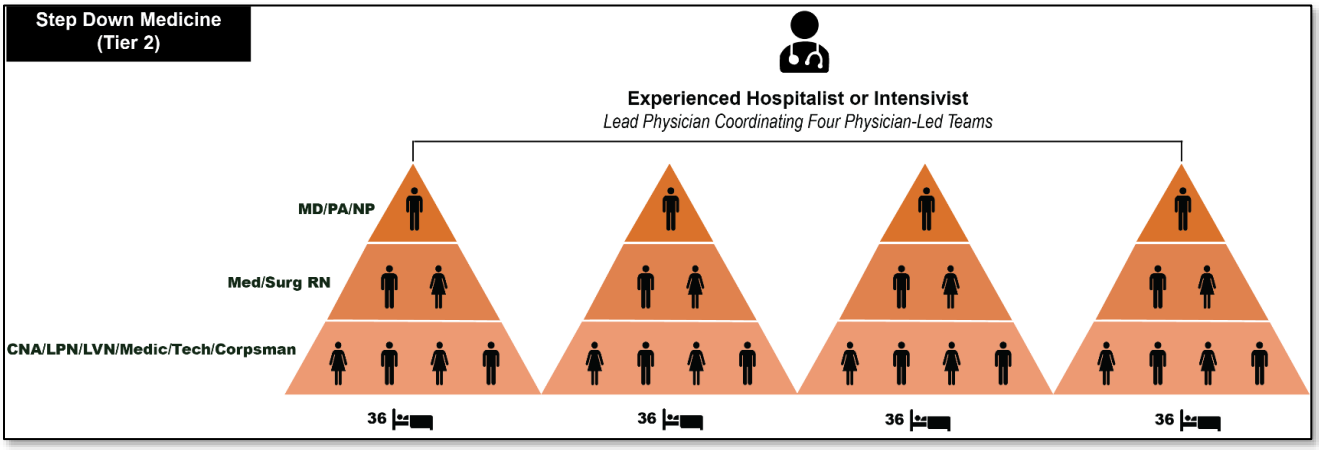


Figure 4. Tier 2 Staffing Strategy for Step-down Level Care during a Pandemic

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

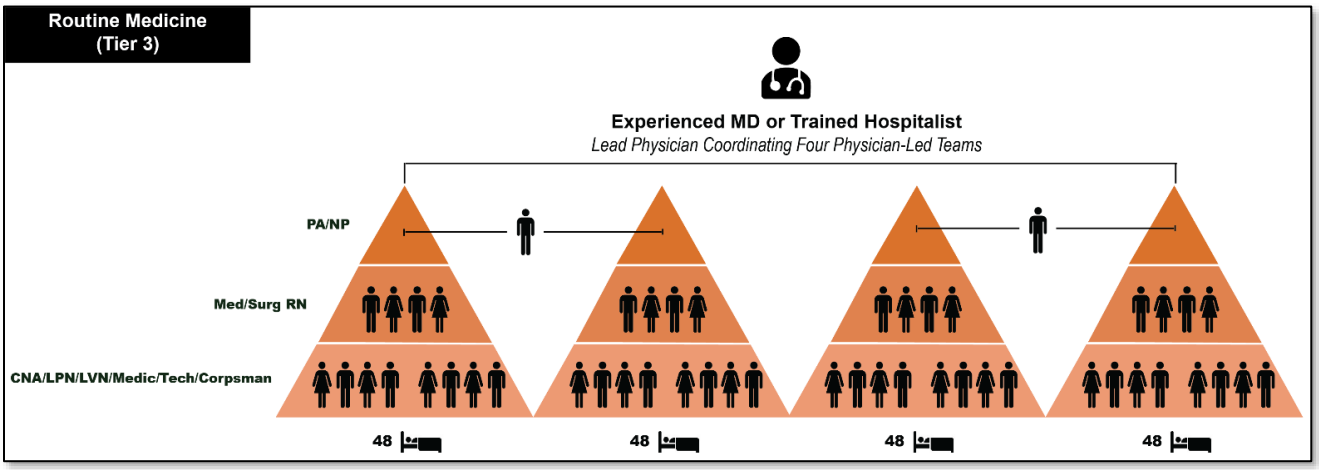


Figure 5. Tier 3 Staffing Strategy for Routine Ward Level Care during a Pandemic

vii. *Pediatric Care.* For MTFs that have a large footprint of pediatric providers (pediatric residencies, pediatric intensivists, pediatricians, pediatric nursing), there should be consideration to flex pediatric age range up to 30 in the Contingency Stage. This will leverage appropriate expertise to care for young adults, which is common both for these providers especially in the military, and offload patient numbers from the adult care teams. For smaller MTFs that have minimal pediatric beds, minimal pediatricians (i.e., Family Practice caring for children), there should be consideration of diverting inpatient pediatric patients to dedicated children's hospitals. This decision should be made based on available community capacity and there should be communication with local facilities to strategically plan for patient distributions. MTFs must still maintain dedicated non-COVID-19 medical missions, and should not sacrifice care in other areas (e.g., use NICU beds/ventilators for adult patients if needed in the NICU).

b. **Privileging Options.** In accordance with national standards for accreditation, local leadership may cross-level providers to provide patient care, treatment and services necessary as a life-saving or harm reducing measures, provided the care, treatment, and services are within the scope of the individual's license without modification of existing privileges. Disaster privileges can only be granted to volunteer licensed independent practitioners when the organization's Emergency Operations Plan has been activated. During emergencies, providers undergoing "just in time" training for work outside their normal areas may work within the scope of their individual licensure and do not require privilege modification, addition or supervision. Privileging authorities may award disaster privileges on activation of their emergency management plans consistent with provisions established in DHA PM 6025.13, Volume 4.

2. ***Staff Training.***
   a. *ICU* "Just in time training" for augmentees are available at https://www.sccm.org/covid19, https://www.chestnet.org/Guidelines-and-Resources/COVID-19/On-Demand-e-Learning, https://www.chestnet.org/Guidelines-and-Resources/COVID-19/Updates-and-Resources, https://www.sccm.org/disaster, and https://covid19toolbox.com.
   b. *Training and augmentation platforms.*
      - If local expertise is not available, utilization of existing DHA teleconsultation platforms (PATH, ADVISOR) may augment capabilities.
      - Places with ICU care should develop brief local ICU orientation models focusing on safety practices, unit hierarchy, protocols, and consultative relationships (brief, max 4-8 hours).
      - Training platforms for provider and nursing augmentees should focus on remote learning resources to provide baseline didactic training such as those above or those locally developed.
   c. Critical care considerations for pregnant women online training is available at: https://www.smfm.org/critical-care/cases/new-2019.
   d. DHE Clinical RN Refresher Training Packet was released with the intent of helping to refresh inpatient nursing experience. (https://info.health.mil/edu/Pages/COVID.aspx)
   e. PPE; Donning and doffing officers should be assigned to train and monitor, which can be personnel pulled from non-clinical roles (administrators, support staff, etc.) that can fulfill a vital safety role after being trained. Training video: https://www.youtube.com/watch?v=bG6zISnenPg (46)

3. ***Equipment and Consumables.*** Daily assessment of ventilators, ventilator circuits, PPE, fluids, and sedating medication should be tracked with equipment burn rates estimated and updated as information is available.
   a. Consider creating intubation/procedure packs with all necessary equipment and supplies to avoid going in and out of the room repeatedly.
   b. Consider alternative options to reduce and re-use critical items such as PPE and ventilator circuits. Encourage sharing local policies and solutions as they become available.
   c. Consider utilization of anesthesia ventilators during expansion, but ensure some remain in reserve based on facility needs for acute, non-COVID-19 emergencies.
   d. Inventory management.
      - Develop a list of key inventory to include PPE, ventilators and supporting equipment, fluids, key medications, fluids, nutrition, IV and other vascular access supplies, etc.
      - Assign personnel to develop a tracking system and publish regularly to ICC. Utilize models to predict inventory burn rate. A sample PPE utilization calculator available at: https://www.chestnet.org/Guidelines-and-Resources/Resources/Essential-Institutional-Supply-Chain-Management-in-the-Setting-of-COVID-19-Pandemic (47)

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

COVID-19 inpatient care should be limited to specific areas of the hospital with designated travel routes reserved for flow of COVID-19 positive patients.

Establishment of a DoD Case Registry for Clinical Performance Improvement.

1. Systematic collection and iterative analysis of key clinical data is essential to optimize delivery of care.
2. The registry currently being implemented will support performance improvement in the setting of a learning health system.
3. Standardized electronic health record (EHR) templates have been developed to increase harmonization and completeness of important data elements needed for the registry.

Returning to the "New Normal"

The decision to de-escalate from contingency and crisis care should be governed by similar principles with ICC coordination, triggers for phased de-escalation, and clear communication. The risk of prolonged delay in routine care or altered practice models creating urgent or emergent care needs and increasing morbidity and mortality should be considered as the decision of when/how to transition back to more normal care models. Additionally, institutions should recognize and plan for a prolonged period (months or longer) with low level COVID-19 care needs requiring cohorted outpatient, emergency, and inpatient services as much as possible to avoid Healthcare associated spread. Plans should be in place with clear triggers to re-escalate to contingency or crisis care with the relaxing of social distancing.

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

1. **Screening:** Screen and isolate all patients with suspected COVID-19 at the first point of contact with the health care system (ER/clinic/drive-through screening/labor and delivery). Establish processes for how to handle people screening positive at entrances. Processes should be clear and easy to follow and be standardized across facilities within the Local Command. It is also recommended to direct low-risk patients to drive-through screening facilities as available to reduce exposure and conserve PPE in MTFs.
2. **Triage:** Triage patients using standardized triage tools and initiate the appropriate disposition decision depending on the clinical setting. Ensure standard protocols established in cooperation with Infectious Disease and Public Health that are clear and easy for staff to follow. Try to keep protocols aligned with national (CDC) and local (state or municipal) guidance and update regularly as new guidance emerges. Triage should be conducted telephonically or in a designated outdoor or dirty area when possible. Staff evaluating patients face-to-face should be pre-identified and outfitted and trained on appropriate PPE. Patients can pre-screen themselves using available self-checkers from the CDC and other organizations.
   a. **A potentially useful tool for initial categorization of clinical severity and aiding in triage is the National Early Warning Score (NEWS)**, Figure 6**.** This clinically derived score is easily measured in a triage area, clinic, emergency department or other initial assessment environment and consists of parameters listed below.
   b. The score ranges from 0-21 and higher scores have been demonstrated to correlate with worsened mortality. A score of above 5 increases the likelihood of eventual ICU level of care.(48)
   c. NEWS in COVID-19 has distinct advantages over qSOFA which can underestimate the severity of presentation if confusion, and hypotension are absent as they often are in COVID-19 patients.
3. **Initial treatment of hospitalized inpatients** consists of optimized supportive and symptomatic care in the ward or intensive care unit. Patients with increased risk of severe disease and mortality include:
   - Age >60
   - Diabetes mellitus
   - Hypertension
   - 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.
   a. Additional consideration should be given to a patient's resource level in their residence, and ability to quarantine and self-monitor when deciding to admit or discharge a mildly symptomatic patient.

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

Figure 6. National Early Warning Score (NEWS).(48)

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.cdc.gov/coronavirus/2019-ncov/hcp/guidance-home-care.html).
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 plan is provided below.

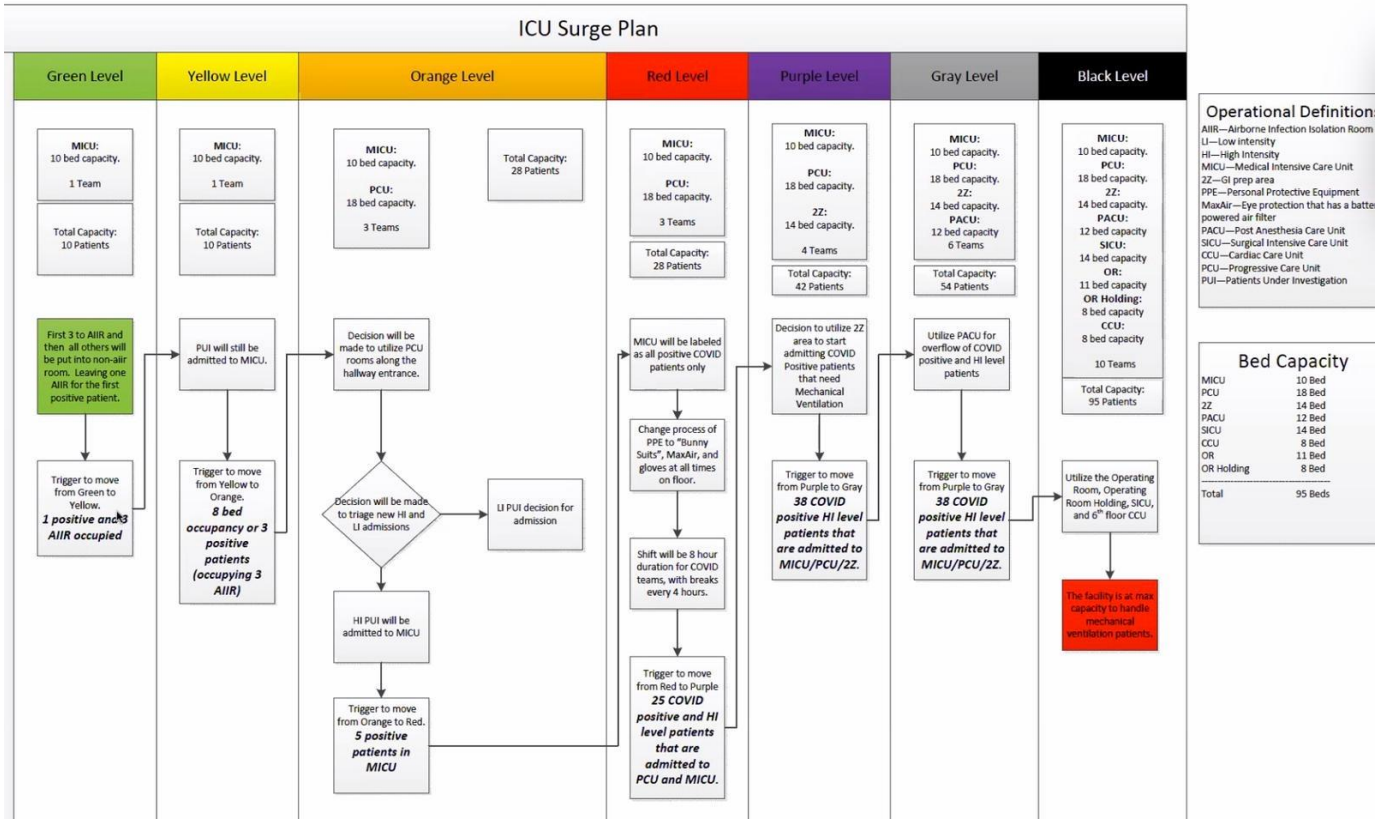


Figure 7. Example of an ICU Surge Plan (from the San Antonio Veteran's Affairs Hospital)

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

1. All employees working in inpatient units, ambulatory clinic spaces, and procedural areas should wear a surgical face mask, at all times, while in their respective clinical care settings. Such requirements align with current policies from leading healthcare systems, including the University of Nebraska. Additional information can be found at the following link: https://www.nebraskamed.com/sites/default/files/documents/covid-19/surgical-mask-policy-and-faq-nebraska-med.pdf. See **Appendix A** for PPE donning/doffing and mask use.

CATEGORY	DEFINITION	REQUIRED ISOLATION/PPE
0	Patient not suspected of having COVID-19	**STAFF:** • Surgical mask • PPE according to task. *See Standard Precautions.* **PATIENTS:** Masking (e.g.,cloth ,surgical mask)
1	Asymptomatic patient with known exposure to COVID-19 **OR** Traveled from high-risk areas within last 14 days	**STAFF:** • Surgical mask • PPE according to task. *See Standard Precautions.* **PATIENTS:** MUST wear surgical mask if traveling outside room for medically essential purposes
2	Patient under investigation (PUI) or positive COVID-19	**STAFF:** • Contact Precautions (gown and gloves) • Droplet Precautions (surgical mask appropriate per current CDC guidelines if no aerosol-generating procedures performed in room) • Eye protection (face shield or goggles) **PATIENTS:** MUST wear surgical mask if traveling outside room for medically essential purposes
3	**Positive COVID-19** requiring aerosol-generating procedures (i.e., BiPAP, CPAP, endotracheal intubation, high- flow nasal cannula, nebulizers, tracheal suctioning)	**STAFF:** • Contact Precautions (gown and gloves) • Consider head and foot covers • Airborne Precautions (N95 Respirator or PAPR) • Eye protection (face shield or goggles) • Negative pressure room **PATIENTS:** MUST wear surgical mask if traveling outside room for medically essential purposes

*Figure 8. PPE Recommendations for the MHS (Adapted for the MHS using CDC guidelines accessed 24 April 2020: https://www.cdc.gov/coronavirus/2019-CoV/hcp/index.html) ; **PAPR**, powered air-purifying respiratory; PPE, personal protective equipment; PUI, patient under investigation; High-risk Area* - Areas with a Level 3 Travel Health Notice identified by the CDC
Visit www.cdc.gov/coronavirus/2019-ncov/travelers/after-travel-precautions.html for current list.
Special Situations: ED staff and outpatient healthcare workers with any patient encounter with a PUI: Follow Category 2.

2. Appropriate use of PPE plays an important role in the prevention of disease transmission, however ensuring appropriate work practice and environmental controls are in place is critical. In addition to implementing the PPE guidelines provided in Figure 8, MTFs should adhere to the following essential practices:
   a. Screen all visitors and healthcare workers before entry into the MTF (i.e., inside as they enter).
   b. Implement restricted visitation policies for the facility (refer to example provided by Emory Healthcare: http://www.emoryhealthcare.org/covid/index.html, no federal endorsement is intended or implied)
   c. Practice social distancing
   d. Adhere to frequent hand hygiene and wear a surgical or cloth mask at all times (includes visitors).
   e. Surgical masks are preferred over cloth masks for healthcare personnel. Consider continuing to wear respirator or facemask (extended use) while in the facility instead of intermittently switching back to cloth face covering which could cause self-contamination.

f. Limited re-use of N95 Respirators refers to practice of using same respirator by one HCP for multiple encounters with different patients but removing after each encounter. If no manufacturer guidance is available data suggest limiting the number of reuses to no more than five uses per device. (23 April) https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/index.html#crisis

3. **PPE Visual for Use During Supply Shortages:** The following visuals from Emory University are available as printable PDFs: https://med.emory.edu/departments/medicine/divisions/infectious-diseases/serious-communicable-diseases-program/covid-19-resources/conserving-ppe.html
4. **Questions related to IPC** can be sent to: dha.ncr.clinic-support.list.ipc-group@mail.mil

COLLECTION OF SPECIMENS FOR LABORATORY DIAGNOSIS

1. **Triage:** Patients should be triaged and initial testing optimally performed in a manner separated from the general patient population such as in a tent or designated area within a facility. Initial laboratory collection will include nasopharyngeal swab for COVID-19 testing and additional tests as indicated.
2. **Specimen Collection:** Collect specimens from the upper respiratory tract (URT), as viral density/load is highest in the nasal cavity and nasopharynx. Nasopharygeal swabs are preferred compared to washings or other methods, as these increase the risk of aerosolization and transmission of the virus. If unable to collect from the URT, consider collecting specimens from the lower respiratory tract (LRT) using expectorated sputum or endotracheal aspirate. Testing for other viral infections such as influenza should be obtained, or if available a respiratory viral panel (i.e. Biofire). Avoid bronchoscopy and nasal endoscopy to minimize aerosolization.(49)
3. **Confirming COVID-19:**
   a. Diagnosis of COVID-19 is primarily confirmed by nucleic acid amplification techniques (NAAT) of SARS-CoV-2. The most common tests are real-time reverse transcriptase polymerase chain reaction (RT-PCR) tests, but other NAATs (in-situ hybridization and others) are also used.
   b. The CDC's PCR assay received emergency use authorization (EUA) on 3Mar20. Since then numerous commercial laboratories and universities have developed assays with subsequent approval.(50)
   c. These assays are, in general, highly specific, but the sensitivity may depend on the disease process (mild upper respiratory infection vs severe pulmonary disease) and the site of specimen collection. At this time there are few data available to assess sensitivity of these assays and even fewer data to evaluate the assays based on clinical specimen type.
   d. Nasopharyngeal swab specimens are most commonly recommended as noted above; however in an intubated patient tracheal aspirates should also be obtained. The majority of data on sensitivity of NAATs from different specimen sites are from retrospective, descriptive data from cohorts of Chinese patients with COVID-19. One manuscript describing 1070 specimens from 205 patients with COVID-19 suggested that LRT samples were most likely to be positive for viral RNA.(51)
   e. Consider retesting if clinical suspicion for COVID-19 remains (false-negative results possible).
   f. Comparing sensitivity of nucleic acid testing to the experience of Chinese and other researchers may have limitations. The WHO assay uses RNA-dependent RNA polymerase, whereas the CDC assay targets genes which target viral nucleocapsid genes (N genes). One non-peer reviewed publication suggested that the nucleocapsid assays have higher sensitivity than the WHO assay. As a result, any data on sensitivity from a NAAT performed under the WHO assay (to include reports from China) may underestimate sensitivity of assays in the United States.(52)
   g. Serologic assays have been developed to assess antibody response to COVID-19 infection. As of 3 April the FDA issued the first EUA for an IgG/IgM assay for SARS CoV-2. Over 70 assays have been developed and are being marketed; the FDA has neither evaluated nor approved those tests, and the performance of these tests is unknown. On 22 April the Infectious Disease Society of America (IDSA) advised against use of serologic testing as a screening for patient due to high rates of false-positive (likely secondary to cross-reactivity to other coronaviruses), and false-negative results (as the development of antibody response is inconsistent).(53) On 24 April the World Health Organization (WHO) issued a statement warning that prior infection with SARS CoV-2 has not been proven to confer immunity to reinfection.(54)
4. **Hospitalized Patients:** In hospitalized patients with confirmed COVID-19, repeated URT and LRT samples can be

collected to demonstrate viral clearance. The frequency of specimen collection will depend on local epidemic characteristics and resources. Initially, the CDC recommended 2 negative tests after clinical recovery to document clearance. This is no longer recommended. Prolonged positivity of PCR testing in patients who have clinically recovered is being reported. Follow-up testing after clinical improvement may result in unnecessary prolongation of hospitalization and excess utilization of scarce laboratory resources.

5. **Personal Protective Equipment (PPE):** Use appropriate PPE for specimen collection (droplet and contact precautions for URT specimens; airborne precautions for LRT specimens).
6. **For pregnant and recently postpartum patients:** COVID-19 testing of symptomatic women may need to be prioritized due to need for inpatient care with delivery and ongoing outpatient visits, to enable access to specialized care, to allow appropriate maternal PPE, and appropriate care for the newborn.
7. **Co-infection:** Dual infections with other respiratory viral and bacterial infections have been found in SARS, MERS and COVID-19 patients. As a result, a positive test for a non-COVID-19 pathogen does not rule out COVID-19. At this stage, detailed viral and microbiologic studies are needed in all suspected cases.

MANAGEMENT OF COVID-19 BASED ON ILLNESS CATEGORY

Per National Institutes of Health (NIH) COVID-19 Treatment Guidelines, in general, patients with COVID-19 can be grouped into the following illness categories:(55)

- ***Asymptomatic or Pre-symptomatic Infection*:** Individuals who test positive for SARS-CoV-2 but have no symptoms
- ***Mild Illness*:** Individuals who have any of various signs and symptoms (e.g., fever, cough, sore throat, malaise, headache, muscle pain) without shortness of breath, dyspnea, or abnormal imaging
- ***Moderate Illness*:** Individuals who have evidence of lower respiratory disease by clinical assessment or imaging and a saturation of oxygen (SaO_2) >93% on room air at sea level.
- ***Severe Illness*:** Individuals who have respiratory frequency >30 breaths per minute, SaO_2 ≤93% on room air at sea level, ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO_2/FiO_2) <300, or lung infiltrates >50%.
- ***Critical Illness*:** Individuals who have respiratory failure, septic shock, and/or multiple organ dysfunction.

OUTPATIENT MANAGEMENT OF COVID-19: SYMPTOMATIC TREATMENT AND MONITORING

1. **Overall management:** The mainstay of treatment for mild cases of COVID-19 is supportive care.
2. **Disposition:** Those with mild or moderate disease may be managed as an outpatient. Moderate cases should be considered for admission for close observation due to the risk of rapid pulmonary disease progression. The determination of outpatient vs inpatient care should be individualized based on consideration of symptom severity, risks for adverse outcomes (e.g., underlying illness and age), and the patient's social context:
   a. Their access to resources such as food and other necessities for daily living
   b. Their access to appropriate caregivers or ability to engage in self-care
   c. Their ability to engage in symptom and public-health monitoring
   d. The transmission risk within the home (e.g., the availability of a separate bedroom to minimize sharing of immediate living spaces; their access to PPE such as gloves and a facemask; their ability to adhere to home isolation, respiratory and hand hygiene, and environmental cleaning; and household members at increased risk for COVID-19 complications).(15, 56, 57)
3. **Monitoring for symptomatic progression:** Monitoring for the evolution of symptoms may be conducted by clinical staff or public-health personnel, depending on local policy.
   a. Although 81% of patients in a Chinese case series had mild symptoms, those who progressed to more severe disease were hospitalized a median of 7-11 days after the onset of illness.(4, 9, 58) Therefore, close monitoring for symptomatic progression through the second week of illness is important for non-hospitalized patients.
   b. Close monitoring should be emphasized in any patient who is identified as being at higher risk for severe

illness per CDC guidelines at https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html. Monitoring via telehealth may be an option for these patients.

4. **Home care guidance:** Healthcare providers may provide patients and caregivers with available CDC guidance on home care:
   a. Preventing the Spread of Coronavirus Disease in Homes and Residential Communities (https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-prevent-spread.html)
   b. What to Do If You Are Sick (https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html)
   c. Caring for Someone at Home (https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/care-for-someone.html)
   d. Caring for Yourself at Home (https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/caring-for-yourself-at-home.html)
5. **Targeted therapy:** There are currently no approved or proven targeted therapies for the treatment of COVID-19. While the majority of clinical trials are focused on hospitalized patients, there are a growing number of clinical trials targeting mild, outpatient cases and investigating the use of repurposed antiviral, antimalarial, and immunomodulatory agents, among others. Further information and updates can be found at https://www.clinicaltrials.gov. The NIH COVID-19 Treatment Guidelines (https://covid19treatmentguidelines.nih.gov/introduction/) provides updated recommendations and supporting evidence for antiviral therapy and immunomodulatory agents.
6. **Concomitant medications:** The NIH Guidelines provide recommendations and supporting evidence regarding the role of concomitant medications such as angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), corticosteroids, HMG-CoA reductase inhibitors (statins), and non-steroidal anti-inflammatory drugs (NSAIDs).(55)
7. **Discontinuation of home isolation:** Clinicians should contact local military public health and/or local/state health departments regarding criteria for discontinuation of home isolation and establish clear and easy-to-follow protocols to guide staff, patients, and commands on return to work/duty criteria.(57) Local implementation of discontinuation strategies may be based on availability of testing supplies, laboratory capacity, and community access to testing. Local authorities may also consider differential application of discontinuation strategies to unique populations based on their risk for transmission to susceptible contacts (e.g., following a test-based strategy for healthcare workers or those living in congregate settings, such as nursing-home residents or basic trainees, vs a non-test-based strategy for the general population). Military bases or units may have administrative requirements for service members to be able to return to work/duty independent of clinical standards. Examples of such protocols can be found in **Appendix B**. The CDC guidelines for discontinuing isolation can be found at https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html.

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 mono-infection, with minimal bacterial co-infections reported except in pediatric patients where >80% are reported to be elevated.(59)
3. Post-mortem results reported from China suggest concern for Aspergillus pulmonary superinfections in critically-ill patients. This is well-described in severe influenza as well. The optimum diagnostic strategy remains to be determined, but a syndrome of worsening fever, hypoxemia, and airspace opacification in a previously-improving patient may suggest secondary aspergillosis. Diagnostic options include serum 1,3-beta-D-glucan and galactomannan assays and (potentially) galactomannan measurement in bronchoalveolar lavage (BAL) fluid, although bronchoscopy should be performed only if no less-invasive option is available and only in airborne infection isolation rooms (AIIRs) with appropriate personal protective equipment (PPE). The culture of *Aspergillus* from tracheal aspirates or BAL is suggestive but not diagnostic.
4. Recommend empiric antimicrobials for intubated patients with COVID-19. The recommended empiric antibiotic therapy is as per the 2019 ATS/IDSA Community Acquired Pneumonia (CAP) guidelines or as per critical care or infectious disease consultation.(60) As a starting point upon intubation, Table 1 can be used until consultation is available:
5. Recommend obtaining blood cultures and tracheal aspirate prior to initiation of antibiotics if feasible.

6. As noted in section on diagnostic testing, co-detection of other respiratory pathogens has been observed with SARS-CoV-2. For example, Stanford researchers recently provided rapid communication of experience with 562 SARS-CoV-2 tests; of 49 positive SARS-COV-2 results, 11 (22.4%) also had a co-infection, and of 127 positive for other viruses, 11 (8.66%) had a SARS-COV-2 co-infection. (https://medium.com/@nigam/higher-co-infection-rates-in-COVID-19-b24965088333)

Table 1. Empiric Antimicrobial Considerations for Intubated COVID-19 Patients (or PUI)

	Starting Antibiotic Regimen
No comorbidities or immunosuppression or risk factors for MRSA or *Pseudomonas aeruginosa**	• Ceftriaxone† 2 g once daily, *and* Azithromycin† 500 mg once daily
With comorbidities‡	• Cefepime 2 g every 8 hours, *and* Azithromycin† 500 mg once daily *OR* • Piperacillin-Tazobactam 4.5 g every 6 hours (or every 8 hours by extended infusion), *and* Azithromycin† 500 mg once daily

Definition of abbreviations: MRSA = methicillin-resistant *Staphylococcus aureus*
*Risk factors include prior respiratory isolation of MRSA or *P. aeruginosa* or recent hospitalization AND receipt of parenteral antibiotics (in the last 90 d). If concern for MRSA, add **vancomycin** 15-20 mg/kg q 8-12 hours
†If Ceftriaxone is not available, replace with **ampicillin/sulbactam** 3 g q6h; If Azithromycin is not available or contraindicated, replace with **doxycycline** 100 mg q12h
‡Comorbidities include chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; immunodeficiency/asplenia.
These are general recommendations: Please refer to local antibiogram for alternative empiric choices.

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

1. Give supplemental oxygen therapy immediately to patients with respiratory distress, hypoxemia, or shock and target SpO2 92-96%.(61, 62) Hyperoxia (PaO_2 >225mmHg) should be avoided and is associated with worse outcomes.(63)
2. Begin with low flow nasal cannula (1-6 L/min) followed by high flow nasal cannula (Figure 10).
3. ***High-flow nasal cannula (HFNC).*** Although an area of controversy, early expert opinion favors HFNC over other NIV modalities (https://emcrit.org/ibcc/COVID-19/#high_flow_nasal_cannula) because it appears to be well tolerated and less aerosolizing. There is presently no definitive evidence that HFNC augments transmission of virus, however HFNC will disperse air farther the higher the flow is set, (but not as far as CPAP). (64) A surgical mask should be placed over the HFNC in an effort to minimize aerosolization risk. Consider intubation for higher flow rates (>40 L/min), especially if the patient is not in a negative pressure room.
4. ***Non-invasive ventilation (NIV).*** It is recommended to avoid NIV because of increased aerosolization generated by the facemask and lack of an exhalation filter. If there is an exception to this such as patients that chronically use NIV or DNI patients, these patients will require airborne isolation regardless of ICU/acute care status.
5. ***Helmet ventilation.*** The helmet can be connected to either a BiPAP circuit or a HFNC circuit (up to 60 L of flow) to increase the PEEP that the patient receives.(65, 66) The helmet has a tight seal around the neck and should decrease the amount of leak usually seen with mask interface NIV (such as BiPAP and CPAP). In one study comparing helmet to mask NIV with ARDS, there was a decreased rate of intubations.(66) There has been concern that CO_2 washout was inefficient using the helmet,(67) but a follow up study did not support that concern.(65) Helmet ventilation can prevent aersolizing the virus.
6. **Awake proning** of non-intubated patients is currently being performed at some hospitals across the world.(68) A retrospective study of 15 non-intubated, hypoxemic patients placed in the prone position showed improvement of oxygenation. The effects were not sustained upon supine positioning.(69) See **Appendix C** for full protocol for prone positioning of non-intubated patients.
7. **Aggressive fluid resuscitation may worsen oxygenation** and outcomes in both children and adults, so in the absence of shock, fluid boluses should be minimized. Consider no more than 30 ml/kg ideal body weight (IBW) of isotonic crystalloid for adult patients, assuming no ongoing active fluid losses (e.g., from diarrhea).

8. **Avoid nebulizers**, as metered dose inhalers are recommended for staff protection/avoidance of aerosols.(49)
9. **Admission studies and labs**: Consider the following diagnostic studies in Table 2 for diagnosis, prognosis and risk stratification (and/or safety of agents) for all hospitalized patients with confirmed COVID-19 and for PUIs.
10. Due to infection prevention needs, do not allow ICU visitors during a pandemic except under exigent circumstances.
11. Facilities should assess daily operational status via huddle of equipment including ventilators, medications (e.g. anelgesics, sedatives, and paralytics), and staffing (including respiratory therapists, physicians and nursing) and initiate contingency or crisis standards of care as appropriate.

Table 2. Laboratory and Study Considerations for Hospitalized Patients with COVID-19 (or PUI)

Recommended Daily Labs:

- Complete Blood Count (CBC) with differential (trend neutrophil-lymphocyte ratio, NLR)*
- Complete metabolic panel (CMP)
- C-reactive protein
- D-dimer

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

- PT/PTT, Fibrinogen
- Ferritin
- LDH
- IL-6
- SARS-CoV-2 RT-PCR testing (e.g., CDC EUA assay, Biofire COVID-19 panel, Hologic, etc.)
- Electrocardiogram (ECG) (consider utilization of telemetry with severe infection; ECG if changes on telemetry)
- Portable CXR

If Clinically Indicated

- Blood cultures
- Troponin and BNP (if suspect acute coronary syndrome or heart failure)
- 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/

Endotracheal Intubation

1. **Decision to intubate:** Recent non-peer reviewed references regarding COVID-19 respiratory support should be considered with caution. Neither a practice of 'early intubation' (reflexive decisions to intubate once a patient requires more than 5-6 L/m of oxygen), nor 'permissive hypoxemia/happy-hypoxemic' (allowing patients to persist with an oxygen saturation of lower than 80% for prolonged duration in order to avoid harms of intubation and mechanical ventilation) are evidence based. However, in the absence of significant clinical experience or high quality evidence with COVID-19 ventilation, it may be reasonable to not intubate select patients with stable mild hypoxemia on supplemental oxygen, but low $PaCO_2$ and without signs or symptoms of end-organ damage who demonstrate pulmonary shunt physiology for which intubation would not be expected to help.(70) Clinical decisions to intubate should be based on existing evidence-based guidelines balanced with evolving knowledge regarding COVID-19 and preserving healthcare staff safety.
2. **Clear indications to intubate include progressive hypoxia and worsening chest infiltrates, hypercarbia or decreasing mental status, and progressive dyspnea.**
3. Intubation (along with subsequent extubation) has the highest risk of aerosolization and exposure to COVID-19 of all procedures, and the person performing intubation is most at risk.(49) 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 PAPR during intubation. If PAPR is unavailable, an appropriate alternative may be the M50 CBRN gas mask. If these options are not available, N95, hair cover, gown, double gloves, face shields, goggles, and shoe covers should be used, along with a protective clear plastic cover over the patient to optimize protection for the providers. Consider intubation teams and limit the number of staff members during airway manipulation to reduce unnecessary exposure. (https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/)
4. A pre-intubation checklist is encouraged, which should include supplies to be brought inside the room by specific team members and others that should remain outside the room. **Appendix D** provides an example

intubation checklist (adapted from University of Washington). *Note: a disposable stethoscope should be used to avoid viral transfer and staff should touch as little as possible in the room to avoid fomites.*

5. For patients with a normal airway assessment, awake intubation should be avoided and modified RSI with sufficient muscle relaxation is strongly encouraged. For patients with difficult airways, good preparation of airway devices and detailed intubation plans should be made in advance.(71)
6. Some centers have advocated for further reducing exposure during pre-oxygenation and ventilation through preparing an additional COVID-19 Intubation Pack, in addition to intubation meds, a video laryngoscope (if used, or direct laryngoscopy), and a non-vented BiPAP mask. The following video demonstrates the set-up: (https://youtu.be/C78VTEAHhWU).
7. **Appendix E** provides a framework for intubation with medications and doses, although this is not a substitute for clinical judgement.
8. Additional cognitive aids have been developed and might be useful. **Appendix F** provides examples.
9. **Extubation:** While the risks of aerosolization of COVID-19 during intubation have been well described there has been less attention paid to extubation. During intubation, particularly with RSI, paralytics limit coughing and patient movement. During extubation coughing can be pronounced and difficult to control. A protective algorithm similar to intubation should be used for extubation. **Appendix G** provides an example protocol, which was adapted from University Medical Center in Las Vegas, NV.

Management of ARDS after Intubation

1. **Mechanical Ventilation.** It has been reported that many patients with COVID-19 pneumonia are initially characterized by a low elastance and high compliance despite severe hypoxemia, which is generally not observed in typical ARDS.(72) They presented the concept of a "Light" or "L" type with near normal lung compliance and severe hypoxemia due to a low V/Q ratio as a result of the loss of hypoxemic vasoconstriction. These patients have low lung recruitability. The so called "heavy" or "H" type is more typical of ARDS with high elastance and low lung compliance and hypoxemia due to shunting through nonventilated areas of lung that are presumably recruitable.(73) It has been postulated that a high PEEP strategy in the "L" type may be ineffective and cause cardiovascular impairment while in the "H" type may lead to increased recruitment of nonventilated lung and improved oxygenation. It is likely that there is a spectrum of lung pathologies with the "L" type on one end and the "H" type on the other with most patients falling somewhere in-between or progressing towards the "H" type throughout the course of their illness. Despite these differences the best available data demonstrates that a low tidal volume approach with appropriate PEEP as described below is the most effective treatments strategy for ARDS.(62, 74)
    - **a.** Target an *ARDSnet lung-protective strategy* (**4-8 mL/kg ideal body weight**), and lower inspiratory pressures (**plateau pressure <30 cm H_2O**).(62, 74)
        - **i.** Start with 6 mL/kg ideal body weight tidal volume and titrate to as high as 8 mL/kg as long as the lungs are compliant.
        - **ii.** In patients with moderate to severe ARDS, suggest titrating to a higher PEEP as tolerated. PEEP tables are available to guide titration: http://www.ardsnet.org/tools.shtml
    - **b.** *Permissive hypercapnia* ensuring adequate hemodynamics and a pH >7.15 may be tolerated
    - **c.** Humidification will likely be needed to manage thick secretions. However, keep in mind the risk of aerosolization associated with breaking the circuit to change heat and moisture exchangers (HME) if this is all that is available. Ventilators with heated humidifiers do not require breaking the circuit to humidify the inspiratory limb and are preferred. Consider clamping the ETT during any circuit breaks.
2. **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).(75-79) Anecdotal reports from Italy and Singapore have found that patients with COVID-19 usually respond well to early pronation.(68)
    - **a.** Prone positioning requires proper sedation/pain medications and paralytic agents if necessary.
    - **b.** Length of pronation cycle should be a minimum of 16 hours in the prone position with a return to supine positioning at least once a day.

c. Prone positioning should be performed as clinically indicated within the first 24 hours of the diagnosis of severe hypoxemia.
d. Recommend use of a manual proning protocol with coordination if mechanical beds are not available. **Appendix C** provides an example protocol, which was adapted from University Medical Center in Las Vegas, NV. Additional protocols (including videos) are available.(80)
e. Pregnancy is *not* a contraindication for proning or neuromuscular blockade.(81)
f. Consider the facility and staff safety and capacity for proning. Proning requires significant PPE and personnel resources (occupy staff in patient room for prolonged period of time). Circuit disconnection and loss of vascular access are among potential risks. The loss of manpower during proning and repositioning may be a contraindication in resource limited environments.

3. **Neuromuscular Blockade.** In patients with moderate-severe ARDS (PaO_2/FiO_2<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.
4. **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.
5. **Bronchoscopy.** Routine diagnostic bronchoscopy (including nasal endoscopy or any instrumentation of this area) is **not** recommended. It is not necessary for the diagnosis of viral pneumonia and should be avoided to minimize aerosolization. Tracheal aspirate samples for diagnosis of COVD-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.

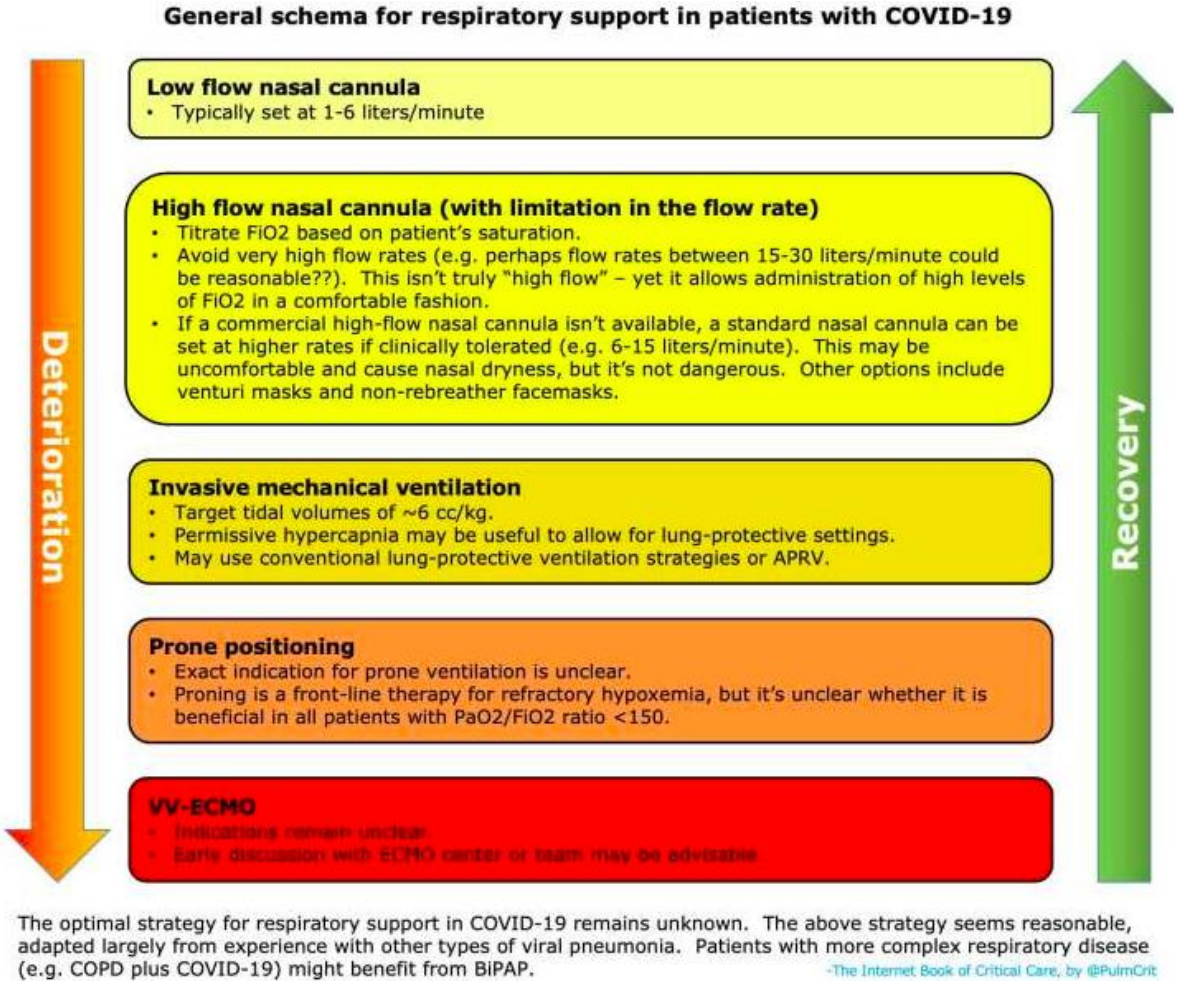


Figure 10. General Schema for Respiratory Support in Patients with COVID-19 (https://i1.wp.com/emcrit.org/wp-content/uploads/2020/03/respsup.jpg?resize=713%2C600&ssl=1).

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

Oxygen Delivery and Mechanical Ventilation in Settings with Resource Limitations

1. As the COVID-19 pandemic places additional strain on available resources, the supplies of available ventilators may not meet clinical demand of patients in respiratory failure in need of invasive positive pressure ventilation (IPPV). Facilities should assess respiratory support operational status daily to account for equipment including ventilators, medications (induction agents, anxiolytics, sedatives, analgesics and paralytics), and staffing (respiratory therapists, providers and nurses).
2. Facilities must be prepared with alternate methods to support patients requiring IPPV in the event the number of patients with respiratory failure exceeds the number of ventilators. Alternate strategies in a crisis resource-limited clinical environment include the following:(82-85)
    - **a.** Deliver manual breaths via a manual resuscitator ("self-inflating bag").
    - **b.** Transport mechanical ventilators may be used for prolonged ventilation of stable patients in the MTF (e.g. Impact 754 and 731 transport ventilators, see **Appendix H**), but need to be used with a viral filter.
    - **c.** Ventilators in storage (Home Station Medical Response materiel, War Reserve Material, and national stockpiles)
    - **d.** Anesthesia gas machines capable of providing controlled ventilation or assisted ventilation outside of the traditional use for anesthetic indication.
    - **e.** Some non-invasive ventilators (e.g., for CPAP or BiPAP) can be used for invasive mechanical ventilation, but should only be used if the standard ventilator supply is exhausted and it is confirmed with the manufacturer (e.g V60) that they are invasive capable and can deliver prescribed breaths. In this case, a HEPA filter should be inserted into the expiratory limb to prevent aerosolization.
3. Conserve accessories used with ventilators, but use viral filters if available. Consider extending the duration of use of breathing circuit supplies and in-line heat and moisture exchangers for treating individual patients.(82)
4. In accordance with professional society consensus statements, U.S. Public Health Service, and FDA guidance:(82, 83, 85)
    - **a.** Use FDA-cleared conventional/standard full-featured ventilators to support patients with respiratory failure.
    - **b.** Use one ventilator per patient, matching ventilator settings with the patient's individual respiratory requirements.
    - **c.** While ventilators may have mechanical capacity to split circuits to support multiple patients, it is excessively difficult to safely implement. There is insufficient body of evidence to support consistent application of this practice. Neither research using animals and test lungs nor case reports of crisis or contingency application of this technique establish clinical safety.

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

Cardiovascular Disease (CVD)

Cardiovascular comorbidities and the presence of CVD are common in patients with COVID-19 infections. The presence of CVD and risk factors correlate with increasing age, and are associated with increased mortality.(86-88)

1. **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. The concentrations of BNP/NT-proBNP reflect the presence or extent of pre-existing cardiac disease or the acute hemodynamic stress. Troponin value, velocity of change in troponin level, elevated BNP/NT-proBNP and echocardiographic imaging should guide the management of the elevated biomarkers, although current opinion advises that troponin and BNP should only be measured if clinical evaluation suggests acute coronary syndrome or heart failure.(89)

2. **Electrocardiogram (ECG).** Recommend ECG in suspected or acute coronary syndrome. May consider of obtaining from cardiac tele-monitoring screen.(89)
3. **Echocardiogram.** An echocardiogram should only be ordered if it is likely to provide clinical benefit. Consider repeat echocardiograms only for clear change in clinical status. Point of Care Ultrasound (POCUS) exams may be used to screen/triage patients. Transesophageal echocardiogram (TEE) requests should only be considered when no other alternative imaging modalities are available as the procedure may be aerosol producing.(90)
4. **Acute Myocardial Injury.**
   a. Definition: An algorithm for the interpretation of myocardial injury is provided for reference and is based on the 4th Universal Definition of Myocardial Infarction.(91)
   b. Incidence and Prognosis: Recent reports found that up to 19% of hospitalized patients with COVID-19, have a combination of elevated cardiac biomarkers, in addition to electrocardiographic and echocardiographic abnormalities.(3, 4, 9, 92) There are two patterns of myocardial injury, one pattern of a continued rise with inflammatory markers, and a second pattern similar to the pattern seen in patients with predominantly cardiac symptoms.(93) Myocardial injury appears to be a late manifestation (up to 14 days from illness onset) and has been found to be independently associated with an increased risk of mortality.(4, 89, 92)
   c. Evaluation: Cardiac Computed Tomography (CCTA): There may be a role for the use of CCTA as a non-invasive means to rule out significant coronary pathology as a cause of myocardial injury. Assessment for the appropriateness of testing and imaging protocols should be made in conjunction with a consulting Cardiologist and Radiologist as capabilities are site specific.(94)
5. **Myocarditis.**
   a. Incidence: In a case series of 150 patients with COVID-19 patients, nearly 10% of deaths were attributed to myocarditis with circulatory failure, and in 33% of cases it was believed to have contributed as a mechanism for multisystem organ failure.(95)
   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. There are case reports on different treatment strategies, but none are validated by clinical trials.(89)
6. **Acute Coronary Syndrome.**
   a. Incidence: Based on available published data, there is a potential symptom overlap between acute coronary syndrome and COVID-19 infection.(2)
   b. Evaluation: Goal is to differentiate acute plaque rupture, demand related ischemia or myocarditis. Recommendation is for cardiology consultation when unable to determine etiology.
      i. ST segment elevation on the 12 lead EKG has been reported in the absence of coronary thrombosis or spasms in COVID-19 patients.(86) The mechanism for these EKG changes is uncertain but is felt to be attributable to myocarditis vs possible endothelial dysfunction with micro thrombus formation.(86, 96) Confirmation of a wall motion abnormality, indicating regional myocardial ischemia, can be made with POCUS prior to invasive angiography to aid selecting a revascularization strategy. Each MTF should consider individualizing its approach to the STEMI patients based on local expertise and patient characteristics.
   c. Management: Once the diagnosis of acute coronary syndrome is made, medical management should be coordinated with cardiology.
      i. Cardiac Catheterization Laboratory Considerations: As most cardiac catheterization laboratories are either normal or positive pressure rooms, the benefits of invasive therapeutics must be weighed against the transmission risk to staff and patients. Deferral of invasive management can be

considered based on these factors in favor of medical stabilization if necessary. Patients with borderline or deteriorating respiratory status should be considered for intubation prior to transport to the laboratory. Right heart catheterization, pericardiocentesis, and intra-aortic balloon pump placement can be done at bedside when appropriate. Fibrinolytic protocols should be reviewed at each institution with cardiology to discuss care plans if strained resources.(97)

7. **Cardiac Dysrrhythmias.**
   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 tachydysrrhythmias in combination with acute myocardial injury should raise suspicion for potential underlying myocarditis.(2)
   b. Management: Follow recently published COVID-19 specific ACLS/PALS protocols.(98) In patients with atrial fibrillation requiring cardioversion, CCTA may be preferred over TEE to rule out left atrial appendage or intra-cardiac thrombus.(94)
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.(89, 95)
   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. (99)
   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 as it can impact mortality.(100) Assessment of continuation of these therapies should be determined on a frequent basis depending on the patient's clinical status. 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, American Heart association, and European Society of Cardiology have published statements at the time of this writing that recommends continuation of ACE-I/ARB therapy in patients with COVID-19.(89)

Acute Kidney Injury

1. The reported incidence of AKI with COVID-19 varies from 0.5% to 19.1%.(4, 6, 9, 10, 101, 102) This wide range is likely due to in part to the definition of AKI used and to the population studied. Rates of severe AKI requiring renal replacement therapy (RRT) range from 1.4% to 9%.(9, 10) Mortality is increased in patients with AKI, a relationship that appears to be dose-dependent based on AKI severity.(102)
2. The etiology of AKI in COVID-19 is predominantly acute tubular necrosis in the setting of multi-organ failure and shock. However, there have been unpublished reports of SARS-CoV-2 being isolated from urine and observed on kidney pathology. In conjunction with evidence that hematuria and proteinuria are common findings in COVID-19, this suggests that direct viral injury to the kidney may also play a role.(102)
3. The standard of care for critically ill patients with severe AKI is continuous RRT (CRRT). The dose of CRRT is the same as that recommended for other critically ill patients: 25mL/kg/hr.(102, 103)
4. If a MTF admits a large number of patients, it is likely that there will be a shortage of CRRT supplies. If this occurs, slow low efficiency dialysis (SLED) should be considered. SLED is a hybrid therapy that utilizes standard dialysis machines.
5. Regardless of the modality of RRT used, special attention should be paid to volume status and ultrafiltration, consistent with the goals of a restrictive fluid strategy.
6. The preferred location of a dialysis catheter is the right jugular vein, followed by a femoral vein, followed by the left jugular vein.(103) The subclavian vein should be avoided.
7. Patient with COVID-19 are hypercoagulable and will likely require anticoagulants to maintain filter patency. Regional anticoagulation with citrate is preferred, however this should only be done by centers that are already familiar with the technique given the risks of hypocalcemia and citrate toxicity. Second line anti-coagulation is heparin. This topic is reviewed extensively in section 5.3 of the Kidney Disease: Improving

Global Outcomes Guidelines on AKI.(103) Other methods to improve filter patency are to increase blood flow (up to 400 mL/min), periodic 100mL flushes of the circuit, and pre-filter replacement fluid (if doing continuous veno-venous hemofiltration).

Hematology

1. Important pathophysiologic considerations concerning vasculature and blood in COVID-19:
   a. Endothelial cells abundantly express ACE2, the principal ligand for the SARS-CoV-2 Spike protein.
   b. SARS-CoV-2 infects and damages endothelium. The endotheliopathy caused by SARS-CoV-2 is characterized by viral inclusions in endothelial cells, endothelial apoptosis and lymphocytic infiltration.
   c. Damaged endothelium is incapable of maintaining an anticoagulant surface; microvascular and large vessel thrombosis is common in severe SARS-CoV-2 infection.
   d. A recent study in ventilated ICU patients found thrombosis (PE or DVT) in 100% of patients receiving VTE prophylaxis (LMWH) and 56% of patients receiving full anticoagulation (anticoagulation treatment decisions made based on risk, not VTE diagnosis).
   e. In severe SARS-CoV-2 infections, macrophage hyper-activation can occur and hemophagocytosis has been observed in spleen and lung. These findings are associated with elevated levels of IL-1B and IL-6, a so-called "cytokine storm."
2. Key Hematologic Lab findings that may be associated with worsened prognosis in hospitalized patients:
   a. Lymphopenia (60% of hospitalized patients with ALC<1000; severe depletion of CD4+ lymphocytes associated with worse prognosis; lymphocyte recovery associated with viral clearance and improving clinical course)
   b. Thrombocytopenia (most patients between 100-150; lower counts with severe disease)
   c. Elevated D-dimers
   d. Elevated fibrinogen (typically around 500 mg/dl)
   e. Prolonged prothrombin time (generally mild, 1-2 seconds beyond normal range)
   f. Hypercoagulability as measured by TEG or ROTEM (shorter K or CFT, elevated MA or MCF)
   g. Hyperferritinemia (400-1500 ng/ml)
   h. Elevated IL-6
3. Patient Management:
   a. Hematology laboratory testing to consider for known or suspected COVID-19 cases:
      i. CBC with differential (track lymphocyte count)
      ii. Ferritin
      iii. Type and Screen (needed if considering convalescent plasma treatment)
      iv. D-dimer
      v. TEG
      vi. PT
      vii. aPTT
      viii. Fibrinogen
      ix. Anti-Xa activity
   b. Anticoagulation considerations: (adapted from Washington University – St. Louis practice guidelines)
      i. All admitted patients should receive <u>at a minimum</u> VTE chemoprophylaxis (enoxaparin 40 mg sc daily). If possible, check anti-Xa daily 4hrs after third dose with goal 0.3-0.5. If at goal, no need to re-check; if not, adjust dose and monitor until at goal.
      ii. In patients at higher risk of VTE or with more severe COVID-19 disease (evidence of coagulopathy with elevated D-dimers, prolonged PT, elevated fibrinogen, TEG hypercoagulability; intubated, proned and persistently hypoxic; MOF; requiring CVVH), it is reasonable to consider therapeutic anticoagulation or higher dose prophylaxis (e.g., enoxaparin 30 mg sc q12 hrs – "trauma dose" -- or enoxaparin 40 mg sc q12 hrs for patients with BMI>40).
      iii. Persistent hypoxia should prompt evaluation for PE.
      iv. VTE treatment (therapeutic anticoagulation) with enoxaparin should target anti-Xa of 0.6-1.0. Anticoagulation with unfractionated heparin should target anti-Xa of 0.3-0.7 (see dosing table).

v. Strongly consider discharge prophylaxis for patients with moderate to severe COVID-19 not diagnosed with VTE (e.g., Apixaban 2.5 mg po q12 hrs for 30 days or Rivaroxaban 10mg PO q24 hours 30 days

c. **Appendix I** is a Weight-based Heparin Dosing Algorithm for venous thromboembolism

Nutrition

1. Nutrition care decisions are based on the patients' clinical presentation and the need to limit healthcare provider's exposure to patients, minimize contamination of equipment, and avoid transport.
2. Oral and enteral routes of nutrition are preferred. See **Appendix J** for Enteral Nutrition Pathway.
3. Ensure patients deficient in Vitamin D and Zinc are properly supplemented.(104-113)
4. Ensure patients get adequate amount of Vitamin A and Vitamin C either in their diet or other route of nutritional support.(114, 115)
5. Enteral Nutrition (EN) for COVID-19 Patients:
   a. Consult a Registered Dietitian locally or via virtual health
   b. Give early enteral nutrition (ideally within the first 24-36 hours of admission or within 12 hours of intubation), including patients on ECMO
   c. Prefer gastric feeding for ease of placement and potential to use an existing NGT or OGT
   d. Energy supply should target 15-20 kcal/kg actual body weight; target protein content is 1.2-2.0 g/kg daily.
   e. Choose an nutrition formula based on facility availability and patient's medical presentation: https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/EN_Formula_Guide/EN_Adult_Formulas/
   f. Note: A standard high-protein (>20% protein) polymeric isosmotic enteral formula is recommended pending no renal insufficiency and normal GI function
   g. Assess for risk of malnutrition/refeeding syndrome; if present, start at 25% of caloric goal (monitor serum phosphate, magnesium & potassium)
   h. Continuous infusion is recommended; start nutrition at a slow rate (10ml-20ml/hr) and advance to goal as tolerated (ideally within 3-7 days of initiation)
   i. If patient is to be placed in the prone position, raise HOB 10-25%. Patients in prone position generally tolerate gastric feedings
   j. Monitor fluid intake closely
   k. Consider medications that provide calories and adjust tube feeding rate as needed: Propofol (1.1kcal/ml); Dextrose (3.4kcal/ml); Glycerol (4.3kcal/ml)
   l. Labs: monitor electrolyes and glucose closely and triglycerides if patient is on propofol.
   m. See The American Society for Parenteral and Enteral Nutrition's (ASPEN) Resources for Clinicians Caring for Patients with Coronavirus:(116) https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Resources_for_Clinicians_Caring_for_Patients_with_Coronavirus/
6. If unable to initiate EN due to failed EN trial with appropriate gastric tube placement, use of prokinetic agent, and/or post-pyloric tube placement, or EN is contraindicated (ileus, SBO, Mesenteric ischemia, high pressure respiratory pressure etc.), consult Registered Dietitian locally or via virtual health immediately for possible parenteral nutrition (PN) initiation. For patients with COVID-19, the threshold to utilize PN may be lower than other critically ill patients.

Other

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

Table 3. Prevention of Complications

Anticipated outcome	Interventions
Reduce days of invasive mechanical ventilation	• 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	• Oral intubation is preferable to nasal intubation in adolescents and adults • Keep patient in semi-recumbent position (head of bed elevation 30–45º) • 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	• Use pharmacological prophylaxis (low molecular-weight heparin [preferred if available] or heparin 5000 units subcutaneously BID or TID) in adolescents and adults without contraindications. For those with contraindications, use mechanical prophylaxis (intermittent pneumatic compression devices)
Reduce incidence of catheter-related bloodstream infection	• 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	• Turn patient every 2 hours
Reduce incidence of stress ulcers and gastrointestinal (GI) bleeding	• 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	• 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 despite adequate fluid resuscitation.(61, 117)
2. Recognize septic shock in children with any hypotension (systolic blood pressure [SBP] < 5th percentile or > 2 SD below normal for age) or two or more of the following: altered mental state; bradycardia or tachycardia (HR < 90 bpm or > 160 bpm in infants and HR < 70 bpm or > 150 bpm in children); prolonged capillary refill (> 2 sec) or feeble pulses; tachypnea; mottled or cold skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia.
3. Standard care includes early recognition and the following treatments within 1 hour of recognition: antimicrobial therapy, and initiation of fluid bolus and vasopressors for hypotension (Surviving Sepsis Guidelines). The use of central venous and arterial catheters should be based on resource availability and individual patient needs. Detailed guidelines from the Surviving Sepsis Campaign and WHO are available for the management of septic shock in adults and children.
4. Due to physiologic changes in pregnancy, standard risk scoring systems are less predictive for sepsis in pregnancy, although the Modified Early Obstetric Warning Score (MEOWS) has a sensitivity of 89% and a specificity of 79% in predicting morbidity in the obstetric population.(118, 119)

Septic Shock Resuscitation.

1. For septic shock in adults: give 250–500 mL crystalloid fluid as rapid bolus in first 15–30 minutes and reassess for signs of fluid overload after each bolus.(117)
2. For septic shock in children, give 10–20 mL/kg crystalloid fluid as a bolus as quickly as possible using a manual push and reassess for signs of fluid response after each bolus.(120)
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 without a history suggestive of hypovolemia (e.g. prolonged vomiting and diarrhea).(121) Consider use of 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. Clinical trials conducted in resource-limited studies comparing aggressive versus conservative fluid regimens suggest higher mortality in patients treated with aggressive fluid regimens.
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; normalization of capillary refill; improved level of consciousness; and clearance of lactate).
5. In **pregnant women**, (>18 weeks gestation or when the uterus reaches the umbilicus) compression of the

inferior vena cava can cause a decrease in venous return and cardiac preload and may result in hypotension and hypoperfusion. For this reason, pregnant women with sepsis and or septic shock should be placed in the left lateral decubitus position at 30 degrees to off-load the inferior vena cava. Respiratory failure and sepsis are managed similarly to non-pregnant adults.

6. Do **not** use hypotonic crystalloids, starches, or gelatins for resuscitation.
7. Vasopressors should be administered when shock persists during or after fluid resuscitation to maintain MAP goal 60-65 mmHg.
8. If central venous catheters are not available, vasopressors can be given through a peripheral IV, but use a large vein and closely monitor for signs of extravasation and local tissue necrosis. If extravasation occurs, stop infusion, aspirate as much as possible, and consider subcutaneous phentolamine. Vasopressors can also be administered through intraosseous needles.
9. If signs of poor perfusion and cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine.
10. Norepinephrine is considered first-line treatment in adult patients; epinephrine or vasopressin can be added to achieve the MAP target. Vasopressors are safe in pregnancy and MAP goal is >65 mmHg.
11. Intravenous hydrocortisone (200-300 mg total daily dose, administered in divided doses every 6-8 hours or as a continuous infusion after a 50-100 mg loading dose) is recommended for patients with persistent hypotension despite the use of two or more vasopressor agents.
12. Angiotensin II (Giapreza) is a vasopressor that may provide benefit in vasodilatory refractory shock as a third-line or fourth-line agent.
13. In children, epinephrine is considered the first-line vasopressor, while norepinephrine can be added if shock persists despite optimal dose of epinephrine.

Rapid Response and Code Blue.

Closed chest massage and Bag Mask Ventilation are extremely aerosolizing. Each institution should consider, based on local prevalence and perceived risk, whether all Code Blues and RRTs on patients who don't have a known recent highly-reliable negative PCR should be performed with full PPE and treated as a suspected COVID-19 patient. **Appendix K** provides an example protocol, which was adapted at Brooke Army Medical Center (BAMC).

1. The American Heart Association (AHA), in collaboration with multiple medical specialty societies, released interim guidance that was published in *Circulation* on 09 Apr 2020 to help rescuers treat victims of cardiac arrest with suspected or confirmed COVID-19. Current cardiopulmonary (CPR) recommendations were reviewed in the context of the COVID-19 pandemic. In this context, the delicate balance is to provide timely and high-quality resuscitation to patients while simultaneously protecting rescuers.(98)
2. The AHA Interim Guidance should be used to develop local "Protected Code Blue" and "Protected Rapid Response Team (RRT)" Protocols for medical emergencies that involve the resuscitation or clinical deterioration of COVID-19 suspected or confirmed patients. These policies and protocols should be peer-reviewed and based on the best available data and evidence, and should also be updated based on performance improvement data and experience. Refer to **Appendix L** for AHA ACLS and PALS protocols.
3. Protecting healthcare personnel (HCP) is a major priority in medical emergencies for suspected or confirmed COVID-19 patients. Although medical emergencies are time-sensitive situations, donning the appropriate PPE is extremely important as unintentional HCP exposure can result in detrimental effects to the workforce. Central strategies to protect HCPs during a medical emergency include efficient placement of appropriate PPE outside a patient's room, minimizing personnel in the room, and regular training.
4. Regular training should focus on the expectations, roles, and responsibilities for the individual participants in these medical emergency events, as outlined in **Appendix K**. Mock simulated scenarios should be regularly used to practice these clinical situations. Here are some hyperlinked video examples from Brooke Army Medical Center of simulated scenarios with a COVID-19 RRT and COVID-19 Code Blue.
   http://amedapbamc0542.med.ds.osd.mil/VEMSWeb/VEMSHost.html?VBTemplate=Templates/UserLoginTemplate.xml
   http://amedapbamc0542.med.ds.osd.mil/VEMSWeb/VEMSHost.html?VBTemplate=Templates/VideoInfoTemplate.xml&contentID=6475
5. For activation of a RRT or Code Blue on a suspected or confirmed COVID-19 patient, the following are recommended:

a. Donning of enhanced PPE in an expeditious fashion should be performed with a PPE Buddy to confirm the appropriate infection control procedures.
b. Consider having PPE readily available for rescuers, such as having a "go bag" or have it positioned on each ward or in the immediate vicinity of the crash cart.
c. Entry to a patient's room during a RRT or Code Blue should be minimized to essential personnel.
d. The patient should be assessed by the most senior medical staff available to determine appropriate management and disposition, unless deferred by the responsible staff.
e. If a patient starts to decompensate or is found unresponsive, the initial responder should prioritize the placement of a closely available surgical mask on the patient.
f. Chest compressions during cardiopulmonary resuscitation (CPR) is aerosol generating. Before commencing CPR, all medical personnel should wear airborne PPE, including PAPR if able. If available, an automated compressor device should be used to minimize personnel and exposure.
g. Appropriate equipment and supplies (viral filter, video laryngoscope, etc) should be prepositioned in the vicinity of the crash cart on COVID-19 ICUs and/or wards. Depending on local availability of resources, consider modifying the protocol for bringing the entire crash cart into the room. Due to the high risk of aerosol generation that occur during these clinical events, attempts should be made to minimize the degree and amount of door opening that occurs.
h. If not intubated, a non-rebreather mask should immediately be placed on the patient for passive oxygenation. NOTE: ensure continuous oxygen delivery is temporarily removed for defibrillation to avoid airway fire. Depending on local protocol, a bag-valve mask (BVM) with a viral filter may be considered if using a two-person technique to ensure a tight seal.
i. Use intubator with highest likelihood of first pass success. Chest compressions should be paused for intubation, and ideally timed with a pulse and rhythm check. Video laryngoscopy recommended to reduce direct exposure to generated aerosols from direct laryngoscopy; however, the intubator should use the technique with which she/he is most likely to have first-pass success.
j. Minimize closed-circuit disconnection. If the patient is connected to a ventilator, attempt to remain connected and adjust the settings to replicate the bag-valve mask delivery of oxygen, unless airway obstruction or ventilator malfunction is suspected. Consider adjusting the set respiratory rate to 10 breaths per minute during CPR. Alternatively, or if it is felt that the patient is not getting adequate ventilation through the ventilator, the ETT can be clamped and the patient can be disconnected from the ventilator and connected to a bag at which point the ETT can be unclamped for traditional bag ventilation.
k. Focus on potentially reversible conditions (H's and T's): DOPE (Displacement of breathing tube, Obstruction, Pneumothorax, Equipment failure) mnemonic for sudden hypoxia, and identification and treatment of shockable rhythm. Consider use of portable ultrasound and obtain a blood gas.
l. Avoid prolonged codes in patients with cardiac arrest. Consider discontinuation after 20 minutes.

6. 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.

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

	Minimum	Better	Best
Advance Directives (Code status, goals of care)	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.
Alert mechanism	Educate current Code Team members about who should respond to "Overhead Code Blue" to COVID-19 patients (used as backup or multiple codes at once)	Early activation	Directed announcement ONLY to COVID-19 Code Team
PPE / Precautions	Droplet for room; Minimize door opening	Airborne/Negative ISO; Infection Control Gatekeeper; Door remains closed	Regular practice with "Tactical PPE Donning" Checklist

Communication ***(via PAPRs or individuals outside room)***	Whiteboard for written instructions; Closed-loop	Vocera; Speakerphone in room; Gatekeeper	Personal communication devices; Dedicated audiovisual devices
CPR	Rotate 2 individuals who don't leave room	Rotate 2 individuals who don't leave room and accomplish additional tasks based on pre-established priorities	Automated compressor device (e.g. LUCAS) to reduce risk to HCPs
IV access	Two standard functioning PIVs for all COVID-19 patients	Tibial IO (if needed)	Early placement of central access prior to arrest
ACLS Equipment	Dedicated Code Cart for COVID-19 ICU and wards; Accounting for Code Carts to ensure appropriate backups	For high-risk patients: consider early placement of defib pads in room or on patient, or prepositioning the Code Cart outside patient room	Specialized cart/kit containing appropriate meds, modular packs of equipment, and designated defibrillator; Dedicated COVID-19 ward: US, EKG machine, portable CXR
Airway ***(see "Intubation" protocol)***	NRB mask immediately over patient mask	BVM with viral filter and $ETCO_2$ (2-person technique to ensure tight seal) Consider LMA (with viral filter) by trained and experienced personnel	Strict adherence to COVID-19 Intubation Protocol Protocol to identify high risk patients so that early intubation occurs BEFORE arrest
Simulation/Practice	Ongoing review and regular familiarization with this guidance; Development of didactic & "Mock COVID-19 Code Blue" scenarios	One-time practice with all members of the COVID-19 response teams	Regular practice and policy updates to all members of the COVID-19 response team

Patient Transport.

1. If COVID-19 is widespread in the community, surgical masks should be considered for ALL patients irrespective of COVID-19 status.
2. The movement of patients with COVID-19 should be limited with all efforts made to ensure the patient is initially admitted to the appropriate location.
3. If patient transport is necessary:
   a. Non-intubated patients should be transferred wearing a surgical mask over their oxygen delivery device which may include nasal prongs or a non-rebreather mask up to 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 and cuff pressure should be maintained to avoid air leaks.

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

Imaging findings have been widely reported in the context of COVID-19 but local policies for when and how to use imaging are widely variable and must take into consideration many site-specific, regional and organizational factors. Imaging exams for non-COVID-19 patients will be impacted as facilities work to limit avoidable exposures for patients and healthcare workers. The American College of Radiology (ACR) has consolidated generalizable guidance for imaging department workflow, COVID-19 imaging findings and standardized reporting on its "ACR COVID-19 Clinical Resources for Radiologists" page which is updated regularly.(122)

Radiology Department Guidance for Rescheduling Exams.

1. The ACR fully supports CDC guidance advising medical facilities to "reschedule non-urgent outpatient visits." These include but are not limited to the following imaging procedures: (122)
   - Screening mammography (123-126)
   - Lung cancer screening Computed Tomography (CT)
   - Non-urgent radiography, fluoroscopy, CT, US, and MRI exams

- Non-urgent or elective image-guided procedures

2. If rescheduling exams, Radiology departments should work directly with referring providers to ensure only non-urgent studies are delayed. All other imaging exams should continue as scheduled or be accelerated in order to expedite necessary imaging prior to local/regional incidence of COVID-19 increases with a corresponding influx of COVID-19 patients expected to occupy more healthcare resources.

Use of Imaging for COVID-19

1. Whether to image a patient suspected of having COVID-19 or diagnosed with COVID-19 depends on multiple factors including clinical symptoms, pre-test probability, potential for imaging results to alter management, and local resource availability. Various guidelines on imaging indications continue to be published regularly.
    - The ACR, Society for Thoracic Radiology (STR) and the American Society of Emergency Radiology (ASER) recommend that CT should not be used to screen or as a first-line test to diagnose COVID-19. (127)
    - Imaging should be reserved for cases where it will impact management or in order to evaluate for urgent/emergent alternative diagnoses. (128)
    - Multinational consensus statement from the Fleischner Society on the role of chest imaging (CXR and CT) for COVID-19 was published 7 April 2020 and provides specific imaging recommendations based on three clinical scenarios: 1) patients presenting with mild features of COVID-19, 2) moderate-severe features of COVID-19 and 3) moderate-severe features of COVID-19 in a resource constrained environment.(129)
2. The reported sensitivity of Chest CT for COVID-19 ranges from 80-90% and the reported specificity ranges from 60-70%. (130, 131)
    - A normal chest CT does not mean a patient does not have COVID-19; a normal imaging study should not keep a patient from being quarantined if they meet other clinical criteria.
    - An abnormal CT is not specific for COVID-19 and it does not obviate the need for confirmatory laboratory testing. (132)
3. There is accumulating evidence of thromboembolic complications of COVID-19. In the event of acute clinical deterioration with suspected pulmonary embolism and/or elevated D-dimer levels, CT pulmonary angiography should be considered. The National Institute for Public Health of the Netherlands recently published recommendations for imaging for pulmonary embolism or deep venous thrombosis (DVT) in COVID-19 patients.(133)
4. ACR recommends minimizing magnetic resonance imaging (MRI) use except where absolutely necessary. (ACR guidance on COVID-19 and MR use, https://www.acr.org/Clinical-Resources/Radiology-Safety/MR-Safety/COVID-19-and-MR-Use)
5. **Infection control and PPE**: When imaging is performed on patients who are positive or suspected positive for COVID-19, consider implementing the following infection control precautions. (128)
    - Portable imaging is preferred when possible, preferably using a portable x-ray machine dedicated for imaging COVID-19 suspected/positive patients [N.B. when possible, similar designation of other radiology equipment (e.g. ultrasound, CT and MRI) specifically for imaging COVID-19 suspected/positive patients should be made to limit cross contamination.
    - Imaging should be performed nearest to the patient location to minimize exposure
    - Droplet precautions should be employed for all patients who are positive or suspected positive for COVID-19. Patients should be masked throughout the imaging exam and deep cleaning of all surfaces is performed afterward by someone wearing proper PPE.
    - Airborne precautions are reserved for patients undergoing aerosol-generating procedures (bronchoscopy, intubation, nebulization, or open suction).
    - Healthcare providers (technologist, nurse, etc.) should wear appropriate PPE (gloves, mask, eye-shield and possibly gown depending on the possibility of close or direct contact with the patient)
    - Record a census of other patients and staff present at the time of the patient visit, should the patient later test positive for COVID-19
6. When performing image-guided procedures on patients who are positive or suspected positive for COVID-19, consider implementing the following infection control precautions: (134)

- Store all PPE in secure locations with limited access, implement inventory controls, and clearly define PPE to be used based on patient status.
- Identify a dedicated room to perform procedures on PUIs and COVID-19-positive patients. An air-negative room is strongly recommended if available.
- Empty rooms designated for procedures on COVID-19-suspected/confirmed patients of all non-essential equipment and supplies to avoid contamination.
- Create a staffing plan designed to preserve physician and staff availability if individuals become exposed and sick. Consider backup teams.
- Minimize staff in the procedure room.
- Develop clear plans for removing and disposing contaminated PPE.
- Have a clear exit plan for COVID-19-suspected/confirmed patients to minimize staff exposure.
- Ensure staff scrubs are changed and lead aprons are cleaned with EPA-approved disinfectants.

Imaging Findings of COVID-19 on Chest Radiographs

1. If imaging is part of a pre-hospital assessment of COVID-19 positive or PUI patients, portable x-ray is preferred (preferably using a dedicated portable x-ray machine to limit cross contamination).
2. In one study of 64 patients, baseline chest radiograph (CXR) had a sensitivity of 69%. (135)
3. Bilateral consolidation and ground glass opacities were the most common findings (59% and 41%, respectively) in a peripheral and lower lung distribution (51% and 63% respectively).
4. Severity of CXR findings peak at 10-12 days from date of symptom onset. (135)

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

1. CT findings of COVID-19 overlap with findings of other viral pneumonias.
2. CT findings of COVID-19: (130, 136-139)
    - Extent - bilateral, multi-lobar
    - Distribution – peripheral and basilar or random
    - Characterization – rounded or peripheral ground glass opacities (GGO) without or with septal thickening ("crazy paving" pattern), consolidation, central low attenuation (reverse halo sign of organizing pneumonia)
3. Lymphadenopathy, pleural effusions and a nodular pattern are not common.
4. CT finding severity peak from 6-11 days after symptom onset. (140, 141)
5. Standardized reporting guidelines were developed and endorsed by the Radiological Society of North America (RSNA), the Society of Thoracic Radiology and the American College of Radiology. (142)
    - Consultation with clinical colleagues at each institution is suggested to establish a mutual approach.
    - If features of COVID-19 are discovered *incidentally* on exams performed for other indications, contact referring providers to discuss the possibility of viral infection and consider using the more general term "viral pneumonia" in the differential diagnosis. However, if after discussion COVID-19 is felt to be likely, then the authors suggest using one of the four structured reporting categories listed below.
6. Structured reporting categories for COVID-19 on chest CT.
    - Typical appearance
        1. Findings: Peripheral, bilateral GGO with or without consolidation or visible septal lines ("crazy paving"); multifocal rounded GGO; reverse halo sign or other signs of organizing pneumonia (later in disease).
        2. Suggested reporting language: "Commonly reported imaging features of COVID-19 pneumonia are present. Other processes such as influenza pneumonia and organizing pneumonia, as can be seen with drug toxicity and connective tissue disease, can cause a similar imaging pattern."
    - Indeterminate appearance
        1. Findings: Absent typical features AND multifocal, diffuse, peri-hilar or unilateral GGO with or without consolidation lacking a specific distribution; lacking a rounded or peripheral characterization; few very small GGO non-rounded and non-peripheral.

2. Suggested reporting language: "Imaging features can be seen with COVID-19 pneumonia, though are nonspecific and can occur with a variety of infectious and noninfectious processes."

- Atypical appearance
  1. Findings: Absent typical or indeterminate features AND isolated lobar or segmental consolidation without GGO, discrete small nodules (centrilobular or "tree-in-bud"), lung cavitation, smooth interlobular septal thickening with pleural effusion.
  2. Suggested reporting language: "Imaging features atypical or uncommonly reported for COVID-19 pneumonia. Alternative diagnoses should be considered."
- Negative for pneumonia
  1. Findings: No CT features to suggest pneumonia.
  2. Suggested reporting language: "No CT findings present to indicate pneumonia. (Note: CT may be negative in the early stages of COVID-19.)"

ADJUNCTIVE THERAPIES FOR COVID-19: TREATMENT PROTOCOLS

NIH COVID-19 Treatment Guidelines *are available at: http://covid19treatmentguidelines.nih.gov/*

These evidence-based recommendations focused on medical therapies are complementary to the PMG, and like it are intended to be updated regularly in response to emerging evidence.

Summary of treatment recommendations according to patient's disease status, as of 24 April 2020:

- **For uninfected persons and for asymptomatic/pre-symptomatic people with infection – No agents are recommended for use outside a trial**
- **For those with mild; moderate; severe; or critical illness – There are insufficient data to recommend for or against any antiviral or immunomodulatory therapy**

Recommendations on select specific agents:

- **Insufficient data to recommend for or against the use of: chloroquine/hydroxychloroquine, remdesivir, plasma / hyperimmune immunoglobulin, IL-6 / IL-1 inhibitors.**
- **Recommend against the use of: hydroxychloroquine + azithromycin, HIV protease inhibitors, other immunomodulators, except in a clinical trial.**

Note: *All therapies are investigational and none are proven as the literature is evolving quickly. No FDA unapproved medications should be routinely recommended for use outside of a clinical trial. There is no evidence for use of the following medications for outpatients or mildly ill patients. The American Society of Health-System Pharmacists (ASHP) website has a number of regularly updated resources at: https://www.ashp.org/Pharmacy-Practice/Resource-Centers/Coronavirus.*

Ethics of Clinical Research during a Pandemic: There is genuine uncertainty in the expert medical community over whether proposed off-label and investigational treatments are beneficial. Randomized, placebo-controlled trials (RCT) are the gold standard for determining if an experimental treatment can benefit patients. Some may question whether it is ethical to deprive patients of an agent that could potentially prevent or treat COVID-19, given the high mortality rate among critically ill patients and lack of known and available treatment options. A Committee of National Academies of Science, Engineering, and Medicine reviewed and conducted an analysis of the clinical trials conducted during the 2014–2015 Ebola virus disease outbreak in West Africa and found the 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." (143)

Steroids.

1. There is a strong consideration to avoid routine steroids.(144)
2. However, new consensus guidelines recommend considering **methylprednisolone** for intubated COVID-19 patients with ARDS.(61, 145)
3. Steroids may be indicated for vasopressor-refractory shock, asthma, COPD exacerbation, or for antenatal therapy at risk for preterm birth from 24-34 weeks of gestation (see Pregnancy Section).

Remdesivir.

1. Remdesivir is an investigational intravenous drug with broad activity against RNA viruses that inhibits replication through premature termination of RNA transcription. Remdesivir has *in vitro* activity against SARS-CoV-2 and *in vitro* and *in vivo* activity against related beta-coronaviruses. It has shown promise *in vitro* and in animal models for coronavirus infections.(146-148)
2. Data from uncontrolled compassionate use case reports has suggested potential benefit; safety and efficacy data from RCTs conducted in China found that remdesivir use was not associated with the primary endpoint, a difference in time to clinical improvement. A statistically non-significant faster time to clinical improvement compared to placebo was seen among patients with symptom duration of 10 days or less; however, this study was terminated early due to low enrollment, and may have been underpowered.(149) Preliminary data from the Adaptive COVID-19 Treatment Trial (ACTT) led by National Institute of Allergy and Infectious Diseases (NIAID) (https://clinicaltrials.gov/ct2/show/NCT04280705) indicate that patients who received remdesivir had a significantly faster time to recovery compared to placebo (11 days versus 15 days, $p<0.001$) with a trend towards improved survival.(150) In the SIMPLE trial, a Gilead-sponsored Phase 3 randomized open-label trial of remdesivir comparing 5 days to 10 days of therapy for severely ill patients not on mechanical ventilation, the company reported that the two regimens did not appear to differ in terms of efficacy (https://clinicaltrials.gov/ct2/show/NCT04292899). Neither ACTT or Save been published or undergone formal peer review at the time of this writing.
3. Exclusion criteria in the RCTs included increased ALT or AST levels (>5 times the upper limit of normal) and impaired creatinine clearance (CrCl<30), which clinicians should consider regarding applicability of the preliminary findings to the care of individual patients.
4. On 01 May 2020, the FDA issued an emergency use authorization (EUA) for the use of remdesivir. At this time, access to remdesivir under the EUA remains limited and will be directed towards regions with the highest burdens of COVID-19, under the direction of the federal government for now. Within the MHS, the USAMMDA Force Health Protection Division has established an expanded access program ("Intermediate-Size Patient Population Expanded Access Protocol for Treatment of Coronavirus Disease 2019 (COVID-19) with Remdesivir"). This program has a limited number of treatment courses of remdesivir for active duty service members both within CONUS and OCONUS, as well as for federal civilian and contract employees deployed OCONUS while in support of operational forces. There may be limited availability of remdesivir for other MHS beneficiaries (e.g., retirees, dependents), which may be reviewed with USAMMDA. Access to the protocol requires a site investigational new drug (IND) submission to USAMMDA for patients meeting inclusion criteria. Clinicians can contact USAMMDA FHP Division to determine eligibility to receive product using their 24-hour international telephone: +1-301-401-2768.

Chloroquine (CQ) and Hydroxychloroquine (HCQ).

1. FDA gave Emergency Use Authorization (EUA) for use in COVID-19 patients on 28 Mar 2020: https://www.fda.gov/media/136534/download
2. However, on 24 April FDA "cautions against use of hydroxychloroquine or chloroquine for COVID-19 outside of the hospital setting or a clinical trial due to risk of heart rhythm problems; close supervision is strongly recommended." (151)
3. These drugs have been used as anti-malarial prophylaxis and to treat autoimmune conditions.
4. BLUF: No high-quality evidence exists to support use at present. *Potential toxicities include QTc prolongation, risk for arrhythmias, and retinal pigmentation and vision loss*.
5. Early reports from France that treatment with HCQ alone and HCQ + azithromycin were associated with marked reduction in time to clearance of SARS-CoV-2 RNA have not been substantiated in a subsequent report.(152,

153)

6. In a trial comparing "high dose" with "low dose" chloroquine for treatment of COVID-19 in Brazil, enrollment in the high dose arm was terminated early on the recommendation of the trial Data and Safety Monitoring Board due to concerns of toxicity and increased mortality.(154)
7. Hydroxychloroquine/chloroquine are associated with QTc prolongation. Prior to initiation of therapy a 12 lead EKG should be performed. Consider alternative therapy in subjects with known Long QT syndrome; discontinue combination with other QT prolonging drugs if QTC >500msec (or >530-550msec if QRS >120msec).(152, 155)
8. Several clinical trials have been initiated/are planned to study CQ/HCQ for treating or preventing COVID-19.

Lopinavir/Ritonavir.

1. Coronavirus cellular infectivity and replication are dependent on virally-encoded and cellular protease activity. Clinically used protease inhibitors effective for HIV and HCV infection have been examined for potential utility in treatment of SARS, MERS, and COVID-19, but are currently not recommended.
2. 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.(156-158)
3. Do not use in combination with amiodarone (fatal arrhythmia), quetiapine (severe coma), or simvastatin (rhabdomyolysis).

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

Anti-IL6 monoclonal antibodies.

1. A variety of therapies are being administered to severely ill patients in China and elsewhere. One that is receiving substantial attention currently is an anti-IL6 receptor humanized monoclonal antibody, tocilizumab (Actemra®), which was added to the treatment guidelines published by China's National Health Commission (4 Mar 20) to treat serious coronavirus patients with lung damage.
2. Tocilizumab and sarilumab are licensed in US for treatment of giant cell arteritis, rheumatoid arthritis, and cytokine release syndrome following CAR-T therapy. They carry a black box warning for risk of severe, potentially fatal, infections.
3. No high-quality evidence currently exists to support use. Some reports from China have suggested elevated IL6 levels are associated with severe disease in COVID-19 infection, though other reports have not found the same association. Tocilizumab has been used in Italy according to anecdotal reports and an unpublished uncontrolled case series from China treated 21 hypoxemic patients with tocilizumab 400 mg IV x1 and reported improvement in respiratory parameters.(159, 160)
4. Manufacturer-supported US randomized controlled trials of tocilizumab and sarilumab are planned.

Convalescent Plasma.

1. Convalescent plasma from patients who have recovered from SARS CoV-2 infection has been proposed as a potential therapy for patients with severe COVID-19.(161) In an uncontrolled case series in China, 5 patients were given plasma from patients that had recovered from COVID-19 with improvement in clinical status.(162) No data from controlled trials suggest benefit for COVID or other coronavirus infections. A Phase 2 and a subsequent Phase 3 RCT of convalescent plasma for influenza A did not show clinical benefit.(163, 164) Convalescent plasma treatment carries known risks of transfusion-associated acute lung injury (TRALI) and transfusion-associated circulatory overload (TACO), and theoretical risk in the setting of coronavirus disease of possible "immune-enhanced pathology."
2. As of 3 April, the FDA has authorized the use of convalescent plasma to treat "serious or life threatening" COVID-19 disease under Investigational New Drug (IND) protocols.(165) Requests may be made by email and there is a number to call for expedited use. The following website provides instructions for requests: https://www.fda.gov/vaccines-blood-biologics/investigational-new-drug-ind-or-device-exemption-ide-process-cber/investigational-covid-19-convalescent-plasma-emergency-inds

a. Severe disease is defined by the FDA as follows: dyspnea, RR>30 breaths/min, SpO_2 <93% on RA, PaO_2:FiO_2 ratio of <300, or increases in lung infiltrations by >50% within 24-48 hours.
b. Life threatening disease is defined by the FDA as follows: respiratory failure, septic shock, or multiple organ dysfunction or failure.

3. DASD (HRP&O), DHA, and R2O2 coordinated with Mayo Clinic to establish a process by which DoD Military Treatment Facilities (MTF) can participate in Mayo's Expanded Access Program (EAP) compliant with DoD requirements and simultaneously adheres to the procedures established by the Mayo Clinic for all participating sites.
4. A DOD EAP for convalescent plasma sponsored by Army OTSG and executed through USAMMDA FHP Division is in process as of 27 April, and is still in process as of 13 May.

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.

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

OVERVIEW

- It is not currently known if pregnant people have a greater chance of getting sick from COVID-19 than the general public, nor whether they are more likely to have serious illness as a result. Based on available information, **pregnant people seem to have the same risk as adults who are not pregnant**.
- Healthcare providers should be aware of the physiologic changes associated with pregnancy. Pregnant people have changes in their bodies that may increase their risk of some infections. Pregnant people have had a higher risk of severe illness when infected with viruses from the same family as COVID-19 and other viral respiratory infections, such as influenza.
- Healthcare providers treating pregnant women should be aware of the most current guidance on Pregnancy/ Lactation guidance as prescribed by the Centers for Disease Control and Prevention (CDC), American College of Obstetricians and Gynecologists (ACOG) and Society for Maternal-Fetal Medicine (SMFM), among others.
- Visitors are limited to one (healthy) support person during the entire admission.
- Cross-collaboration with surgical services healthcare providers and communities and pediatric and neonatal healthcare providers and communities is essential to ensuring positive outcomes.

Caring for Pregnant Women during the COVID-19 Pandemic

1. Based on limited data, pregnant women do not appear to be at higher risk for severe disease. Emerging reports from the United States suggest that pregnant women may be at higher risk of being an asymptomatic carrier and having an atypical presentation with severe respiratory morbidity and preterm labor.(16-19) Clinical findings in reported cases were similar in cases of non-pregnant adults. Pregnant women experience immunologic and physiologic changes that make them more susceptible to viral respiratory infections.(17) Pregnant women are at greater risk for severe illness, morbidity, or mortality compared with the general population, as is observed with other related coronavirus infections.(18, 19) Pregnant women should receive the same care as those not pregnant in regards to screening, radiology studies, laboratory evaluations and critical care.
2. **Pregnancy complications:** Pregnancy in the setting of a COVID-19 infection is associated with higher rates of miscarriage (39.1%), preterm birth less than 37 weeks (24.3%), preeclampsia (16.2%), cesarean delivery (84%), increased incidence of neonatal admission (57.2%) and perinatal death (11.1%) Some cases of preterm birth were iatrogenic and not due to spontaneous preterm labor. (17, 18)
3. Pregnancy care should be considered non-elective during the COVID-19 pandemic.
4. Providers are encouraged to encourage patient enrollment of pregnant patients confirmed with COVID-19 in the Pregnancy Coronavirus Outcomes Registry (PRIORITY) (https://priority.ucsf.edu/).
5. Health care providers should be familiar with the physiologic changes of pregnancy that make pregnant women more susceptible to some respiratory infections.
   a. Immune modulation of pregnancy

b. Pregnant women are more susceptible to respiratory failure and can decompensate quickly (especially in the third trimester) due to 20% decrease in functional residual capacity.
c. Respiratory changes: Pregnancy is a metabolically compensated respiratory alkalosis
   i. Normal pregnancy ABG pH 7.4-7.47
   ii. Normal pregnancy PaO_2 75-106 mm Hg (PaO_2 increases by 30 mm Hg)
   iii. **Normal pregnancy $PaCO_2$ 26-32 mm Hg** ($PaCO_2$ *decreases* by 30 mmHg)
   iv. Normal pregnancy HCO_3 18-21
d. **A PaCO2 of 35 to 45 is ABNORMAL in pregnancy, and signifies impaired ventilation and impending respiratory compromise.**
e. Critical care considerations for pregnant women; online training available at https://www.smfm.org/critical-care/cases/new-2019

6. **Screening Guidelines**: ACOG and SMFM algorithm for outpatient assessment and management of pregnant women with suspected or confirmed COVID-19: https://www.acog.org/-/media/project/acog/acogorg/files/pdfs/clinical-guidance/practice-advisory/covid-19-algorithm.pdf?la=en&hash=2D9E7F62C97F8231561616FFDCA3B1A6
7. A system should be in place for pregnant women who are tested for COVID 19 to be reported to their OB Providers. This will allow OB providers to make critical delivery, care planning recommendations and decisions related to PPE recommendations, as all obstetric patients will require inpatient admission for delivery and initial postpartum period (1-4 days).
8. **Risk of vertical transmission**: Case series to date suggest no evidence of vertical transmission, similar to other viral respiratory illnesses, such as influenza.(17, 18)
9. **Changes to routine OB care** during COVID-19 pandemic: To decrease opportunities of exposure to coronavirus, OB providers should be taking steps to reduce patient encounters and optimize telehealth visits and home blood pressure monitoring. Guidance for practice has been published and we recommend developing plans at each MTF to standardize changes in Prenatal Care. (166)
10. **Inpatient Obstetric Staffing**: To ensure the availability of healthy providers and nurses to support ongoing needs of necessary care, consider workplace segregation, which will ensure service continuity and social distancing of healthcare workers, infection control and facilitate contact tracing. This is especially important for obstetric and newborn service lines which must continue to provide necessary prenatal, intrapartum and neonatal/postpartum care.
11. **Care for the pregnant patient with PUI or COVID 19**
    a. **Admission**: Patients with suspected or confirmed COVID-19 should be admitted to a unit capable of caring for the respiratory needs of the patient as well as provide appropriate fetal monitoring as clinically indicated. Patient should be in isolation per hospital and CDC guidance.
       i. Pregnant women should be admitted to the hospital for treatment of COVID symptoms if there is concern about respiratory status (02 requirement to maintain saturations above 92%, increased work of breathing, RR> 24 bpm), tachycardia > 110 bpm, dehydration, obstetric concerns.
    b. COVID-19 may be associated with a transaminitis and thrombocytopenia, this is an important consideration when assessing women with a hypertensive disorder to determine if she has features of preeclampsia or HELLP syndrome (hemolysis elevated liver enzymes low platelet count).
    c. **Guidance for treatment**: Aggressive infection control, testing for COVID-19, testing for co-infection, oxygen therapy as needed, avoidance of fluid overload, empiric antibiotics (due to risk of superimposed bacterial risk), fetal and uterine contraction monitoring for viable pregnancies, early mechanical ventilation for progressive respiratory failure, individualized delivery planning, Maternal Fetal Medicine (MFM) consultation, Pulmonology, Critical Care and Infectious disease involvement as indicated. Team based management is recommended. Consider early transfer to higher level facility if unable to provide services at MTF.(167)
       i. Chloroquine and Hydroxychloroquine are well tolerated in pregnancy and human data in exposed pregnancies do not suggest harm.(168)
       ii. Remdesivir is not studied in pregnancy and no human or animal data could be found. (168)
       iii. **Imaging**: ***Necessary radiographic studies should not be withheld from a pregnant patient. Fetal risk of anomalies, growth restriction or abortion have not been reported with radiation***

exposure of less than 50 mGy, a level above the range of exposure for most diagnostic procedures.

12. **Delivery**: Timing of delivery, in most cases, should not be dictated by maternal COVID-19 infection. For women infected early in pregnancy who recover, no alteration to the usual timing of delivery is necessary. For women infected in the third trimester who recover, it is reasonable to attempt to postpone delivery (if no other medical indications arise) either until a negative COVID-19 testing result is obtained or quarantine status is lifted in an attempt to avoid transmission to the neonate. ***In general, COVID-19 infection itself is not an indication for delivery.*** Recommend health care team wear appropriate PPE during delivery and delivery should occur in a negative pressure room. Skin to skin care following delivery is not recommended. In cases of severe maternal infection with a term infant, care teams may consider avoiding delayed cord clamping to minimize the risk of transmission to the neonate.
13. **Cardiac arrest:** in pregnancy should be managed similar to cardiac arrest in non-pregnant adults. If pregnancy is ≥ 20 weeks (uterus at or above the umbilicus), significant aortocaval compression exists. Left uterine displacement is recommended during high-quality CPR, with resuscitative cesarean delivery (perimortem cesarean delivery) if ROSC not achieved by 4-5 minutes. Resuscitative cesarean delivery should be performed at the bedside (do not move to the OR).(169)
14. **Antenatal surveillance**: Gestational age appropriate fetal monitoring should be part of the initial assessment of any women with respiratory symptoms. Continuous fetal monitoring in the setting of severe illness should be considered only when delivery would not compromise maternal health, or as another noninvasive measure of maternal status. For women who recover from an acute infection, antepartum testing later in the pregnancy is not needed.
15. **Ultrasound** consider a detailed level 2 anatomic survey for women following recovery from a first trimester infection and a fetal growth assessment in the third trimester for women who recover from an infection later in pregnancy (later second trimester and third trimester infections). Healthcare providers should be aware of the ISUOG Safety Statement: Safe performance of obstetric and gynecological scans and equipment cleaning in the context of COVID-19 (https://www.isuog.org/resource/isuog-safety-committee-position-statement-safe-performance-of-obstetric-and-gynecological-scans-and-equipment-cleaning-in-the-context-of-covid-19.html). **Appendix M** has detailed instructions on preparation and cleaning of ultrasound rooms for patients.
16. **Follow up after diagnosis of COVID-19**: When patient is discharged from the hospital a plan for follow up should be established. Recommend follow up with patients via phone or video telehealth assessments 5-7 days after discharge. Return precautions should be reviewed with the patient prior to discharge If patients symptoms worsen arrangements should be made for patient to be seen in person by a health care provider to assess clinical status.

12. **Antepartum Care**:
    a. **Outpatient:** Patients who do not meet criteria for admission to the hospital should be conservatively managed at home on self-quarantine. Follow up with an OB provider can be made utilizing Telehealth services per local guidance. It is recommended that patients have a follow up with a health care provider 5-7 days after initial presentation to evaluate for resolution of symptoms (may be via telehealth).
    b. **Inpatient**: Pregnant women should be admitted to the hospital for treatment of COVID-19 symptoms if there is concern about respiratory status (O_2 requirement to maintain saturations above 92%, increased work of breathing, RR> 24 breaths per minute), tachycardia > 110 bpm, dehydration, obstetric concerns.
13. **Intrapartum Care:**
    a. Screen all patients and support person(s) according to ACOG SMFM algorithm upon presentation to L&D.
    b. We also suggest asking all patients and support person(s) about exposures (close contact) to COVID positive patients and if they themselves have been tested in the past 14 days for COVID-19.
    c. Recommend a designated staff member at the front of the unit to verbally screen for URI symptoms, diagnosis of COVID-19 or PUI within the past 2 weeks.
    d. Any patient with fever, cough, or respiratory symptoms (+/- fever) should put on a surgical mask and be evaluated by a nurse or provider (and put in a room).
    e. If a patient screens positive to any of the above prior to a scheduled delivery (IOL or CD), evaluate to determine if re-scheduling in 2-3 days is feasible to allow for results of COVID-19 testing

f. For COVID-19 positive patients with mild or moderate symptoms not requiring immediate care, it is important to recognize that the severity of disease peaks in the second week, so planning delivery prior to that time is optimal.
g. Risk of vertical transmission – no documented evidence of vertical transmission based on limited case series
h. Avoid oxygen for fetal resuscitation (this intervention has not been shown to be beneficial and may increase the risk of aerosolization).
i. If a birth partner (support person) has a fever, cough, or respiratory symptoms (+/- fever) (or confirmed COVID-19 positive or PUI), they should not come to L&D, and will not be admitted to L&D as a support person.
j. Support persons of a COVID-19 positive or PUI mother should wear a mask during their hospital stay, and are restricted to the patient room. They are not allowed to visit hospital areas outside the patient room. They should use the bathroom in the patient room, and should have all meals brought to the room.
k. Routine preop labs for scheduled cases should be drawn the day of procedure to minimize trips to the hospital.
l. **Intrapartum fever** – should be evaluated in the usual fashion with consideration for both obstetric and non-obstetric causes. Recommend empiric treatment for the clinically suspected cause (e.g. chorioamnionitis), with increased vigilance and consideration of rapid COVID-19 testing, as early experience has shown the possibility of asymptomatic pregnant patients to develop symptoms postpartum.
m. **Cesarean section**: As for all patients, cesarean section should be reserved for maternal and fetal indications. Consider conversions of operating rooms to negative pressure rooms (conversion to negative pressure ante-rooms or neutral pressure ORs are alternatives) for COVID positive or PUI. Such conversions may not be possible in all facilities, and with proper PPE and patient transfer protocols, cesarean deliveries can still be safely performed in a positive-flow OR. In general, negative pressure ORs should not have open surgical equipment (as is often done for designated emergent cesarean delivery rooms). Teams should coordinate with local infection control teams to inform these decisions. Consider universal airborne PPE use (including N95 masks) for all surgical procedures for COVID+/PUI patients during labor and delivery due to high risk for aerosolizing procedures (intubation).

14. **Support Person:** If a birth partner (support person) has a fever, cough, or respiratory symptoms (+/- fever) (or confirmed COVID-19 positive or PUI), they should not come to L&D, and will not be admitted to L&D as a support person.
    a. Visitors are limited to one (healthy) support person during the entire admission. (166)
    b. Support persons of a COVID-19 positive or PUI mother should wear a mask during their hospital stay, and are restricted to the patient room (should not visit hospital areas outside patient room). They should use the bathroom in the patient room, and should have all meals brought to the room.
15. **Inductions of Labor:**
    a. Induction of labor with medical indications in asymptomatic women should **NOT** be postponed or rescheduled. This includes 39-week inductions after patient counseling. However, in cases of extreme healthcare burden, it may be appropriate to consider postponing or rescheduling inductions. For example, in a region early in a COVID-19 emergency, it may be prudent to get patients delivered prior to high COVID-19 burden in the hospital.
    b. Consider outpatient cervical ripening with Foley in low-risk women to limit hospital time.
    c. Management of the first stage of labor is not generally altered. Oral restriction of fluid and solid food in the first stage of labor is not recommended, oral water and clear fluids can be encouraged as tolerated in labor. If oral restriction, IVF at 250 mL/hr. containing dextrose, with upright positions in the first stage of labor for women without epidural. If walking, must stay in the room. Oxytocin augmentation is recommended to shorten time in labor if slowed progress, with early amniotomy.
    d. Intrapartum oxygen therapy has no fetal benefit and may cause harm**, recommend NOT utilizing oxygen therapy for fetal resuscitation**. Given the high rate of asymptomatic carriers, this principle applies to all patients on L&D regardless of the patient's COVID-19 status. Supplemental oxygen may be administered for maternal indications, cover nasal cannula with a surgical mask.

16. **Second Stage (Pushing to delivery):** Pushing should not be delayed for any delivery as it prolongs time to delivery and increases chorioamnionitis and postpartum hemorrhage.
17. **Third Stage (Delivery of baby to delivery of placenta):** There are concerns about limited blood resources during the COVID-19 pandemic. The below recommendations apply to all deliveries to further minimize use of blood products at delivery.
    a. Recommend optimizing antenatal hemoglobin prior to delivery to minimize the need for blood transfusion at delivery.
    b. Consider prophylactic TXA (1g) and 400 mcg misoprostol buccally with delivery (to decrease risk of PPH).
18. **PPE Considerations during COVID-19 Pandemic for Pregnancy**:
    a. Screen positive patients (symptoms or prior COVID-19 diagnosis) or PUI:
        i. PPE during admission: Surgical mask for all patients with symptoms or COVID-19+/PUI. Airborne precautions: N95 masks and droplet PPE (Gown, gloves, mask/face shield) for all HCP.
    b. Screen negative patients (no symptoms or prior COVID-19 diagnosis):
        i. PPE during delivery: Surgical mask and droplet PPE (Gown, gloves, mask/face shield) should be used during all patients in the second stage. N95 Mask could be considered for the surgical team for any cesarean section as there is the potential risk of requiring intubation during the surgery. Provider discretion and individual MTF PPE availability can be considered.(166)

Table 5. Suggested PPE During Obstetric Care (166)

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

    c. Women who are COVID-19+ or PUI should wear a surgical mask at all times as clinically able.
    d. Women who are COVID-19+ or PUI should be placed in an isolation/private room. Airborne infection isolation rooms (negative pressure rooms), if available, can be used if performance of aerosolizing procedures is anticipated. In general, isolation rooms with droplet precautions are recommended.
    e. Staff PPE:
        i. Proper donning and doffing of PPE takes time. Training in the use of PPE should emphasize safety of healthcare workers, recognizing that clinical response times may be slowed by these precautions.
        ii. Proper donning and doffing procedures should be reviewed and practiced frequently; Recommend simulated patient transfers (e.g. from L&D to OR).
        iii. Recommend posting diagrams and checklists in areas where donning and doffing will occur.
        iv. For HCP that do not fit N95 masks, PAPR should be used. For staff in the operating the OR, the PAPR with shroud must be used, followed by sterile gown over the shroud. This ensures proper venting of the PAPR out the bottom of the surgical mask to ensure sterility of the field.
        v. Have an observer witness donning/doffing when possible.
    f. Anticipate emergencies as best as possible; plan ahead and proactively intervene for situations that could result in emergent cesarean delivery (e.g. Category II FHR), early peds notification.
    g. Collaborate closely with Surgical Services to support additional operating room/staffing capabilities.
    h. Define patient OR plan on admission (COVID-19 or not)
    i. Coordination with Pediatrics and Neonatology upon admission for any mother COVID-19+ or PUI
18. **Considerations for Support Person/VISITORS to L&D and ANTEPARTUM/POSTPARTUM**
    a. One designated (healthy) support person during the entire admission, easily identifiable by L&D staff. Consider a colored wrist band for identification. Support person should be screened as above, wear a mask, and remain restricted to the patient room for mothers that are COVID-19 positive or PUI.
    b. No children < 16 years permitted.

c. Additional visitors for end-of life situations or bereavement (e.g. IUFD) may be considered/evaluated on a case-by-case basis.
d. All efforts should be made to limit the movement of COVID-19 positive/PUI women from one care area to another. Consider postpartum care in the same room as delivery if possible.
e. If increased prevalence of disease and community transmission is present, individual MTFs could consider a no visitation policy to minimize potential exposure of staff and patients.

19. **Anesthesia Considerations for Intrapartum Care (Refer to Implications for Surgical Care Section)**
    a. Recommend early epidural to minimize need for general anesthesia in the event of an emergent cesarean.
    b. COVID-19 is not a contraindication to neuraxial anesthesia.
    c. Anticipate emergencies as best as possible; plan ahead and proactively intervene for situations that could result in emergent cesarean delivery (e.g. Category II FHR tracing).
    d. Recommend limiting exposure of trainees to COVID+/PUI, with experienced staff providing care.
    e. Suspend nitrous oxide programs on L&D due to possible aerosolization.
20. **Care of Critically Ill COVID-19 Pregnant Patient**
    a. Judicious use of corticosteroids for fetal maturation, balancing gestational age with potential risks of worsening maternal morbidity. Discussions with critical care team and neonatology.
    b. **Fetal monitoring**: at > 24 weeks, electronic fetal monitoring for antenatal surveillance at least daily. Recommend additional fetal monitoring with any change in the maternal status if a cesarean at bedside is feasible. The fetus can be a sixth vital sign reflecting early deterioration in maternal status.
    c. Recommend maintaining maternal O_2 saturations at > 95%.
    d. Pregnancy has a natural respiratory alkalosis with a normal PCO_2 of 28-32.
    e. Therapy for ARDS involves low tidal volumes and permissive hypercapnia (PCO_2 > 60). Data on permissive hypercapnia in pregnancy are limited, but there do not appear to be adverse fetal effects.
    f. It may be necessary to increase tidal volume and/or PEEP to meet goal $PaCO_2$ and oxygenation targets while remaining mindful not to allow alveolar plateau pressures to exceed 35 cm H_2O.
    g. Prone ventilation has been found to improve oxygenation in the setting of ARDS and its feasibility and safety in pregnancy have been documented.
    h. In the third trimester, increased PEEP may be required for pregnant moms on mechanical ventilation.
    i. Veno-venous ECMO is a proven life-saving salvage therapy for severe reversible respiratory failure, and its benefit among critically ill pregnant women has been reported.
    j. Goal BP should be < 160/110.
    k. Patient should be positioned with left lateral tilt (if no other position is mandated for their treatment, for example, prone position) to relieve pressure from the gravid uterus on venous return.
21. **Delivery Planning in ICU**
    a. Equipment for emergency cesarean delivery should be at bedside, with neonatal resuscitative equipment including warmer.
    b. Hemorrhage Code Purple cart stocked with medications and devices should be in the ICU. Medications should readily available include methergine, hemabate, Tranexamic acid (**TXA**) and misoprostol.
    c. Use of terbutaline should be reviewed with critical care team, depending on patient's clinical status due to the risk of tachycardia.
    d. Establish effective means of communication with Nursing, ICU, anesthesia, neonatal, and obstetrical teams.
    e. If emergent delivery is planned, this may be performed at bedside in the ICU, or in MOR.
    f. Timing – consideration should be given to delivery > 34 weeks for critically ill maternal patient. Delivery may help optimize maternal status.
    g. Intrapartum care if a pregnant patient at term in critical condition goes into labor, precautions as above should be initiated. Assisted second stage (OB forceps/Vacuum) is likely to be necessary.
    h. A dedicated obstetrician should be present at the time of delivery, and infant placed in isolation after delivery given the unknown risks of transmission.
    i. Prevention of postpartum hemorrhage as detailed above.
    j. Breast pumping encouraged after review of maternal medications.
22. **Postpartum Care**

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

23. **Obstetric medications**
    a. Indomethacin – in the setting of indications for tocolysis, nifedipine may be considered as an alternative, given the uncertainty regarding NSAID impact on COVID-19.
    b. Betamethasone/Dexamethasone for fetal maturation – given the association between steroids and worsening morbidity of viral pneumonia, specifically COVID-19, steroids for fetal maturation should be used judiciously. **AVOID late preterm steroids 34-46 weeks** in COVID-19+/PUI patients.
    c. Magnesium sulfate is recommended for fetal neuroprotection for anticipated preterm delivery <32 weeks or for seizure prophylaxis for Preeclampsia with severe features. Given potential respiratory complications, ***use judiciously in the setting of severe respiratory symptoms***. Magnesium sulfate may be used in patients with mild-moderate symptoms, may consider single 4 gm bolus.

Table 6. Use of Common Obstetric Medications:

Gestational Age	< 32 weeks		32-34 weeks		34-36 weeks
Respiratory Sx	**Mild-Mod**	**Severe**	**Mild-Mod**	**Severe**	**Any**
Steroids for fetal maturation /rescue steroids	Use	Discuss risks/benefits with multi-D team (ID, Critical care, Neonatology)	Consider	Avoid	Avoid
Indomethacin	May consider	Use nifedipine instead	Use nifedipine instead	Use nifedipine instead	Consider nifedipine instead
Magnesium sulfate neuroprotection	Use	Discuss risks/benefits with multi-D team (ID, Critical care, Neonatology)			

22. **Pregnant patient work restrictions**: Delivery is a unique scenario in the COVID-19 pandemic. Hospital admissions for delivery are anticipated around the patient's due-date. In anticipation of hospital admission for delivery, if feasible and mission permitting, consider having pregnant women work from home at 37 weeks (2 weeks prior to 39 weeks or 2 weeks prior to anticipated delivery), and practice strict social isolation during this time. (166) Strict social isolation is encouraged for the entire family unit. The goal is to limit risk of exposure around the time of delivery. Depending on mission requirements and increasing disease burdens, such accommodations may not be possible but should be considered.(166)
23. **Pregnant health care workers**: Facilities consider limiting exposure of pregnant HCP to patients with confirmed or suspected COVID-19 infection, especially during higher-risk procedures such as aerosol generating procedures (intubation, extubation, BiPAP, high flow nasal cannula, nebulized medications and second stage of labor) if feasible based on staffing availability. With ongoing stresses in the MHS and increasing disease burdens, such accommodations may not be possible.

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

1. Current evidence is inconclusive about in utero transmission of SARS-CoV-2 from mothers with COVID-19 to their newborns. Vertical transmission does not appear to occur, but perinatal infection leading to severe manifestations has been documented. It is unknown whether newborns with COVID-19 are at increased risk for severe complications, but transmission after birth via contact with infectious respiratory secretions is a concern.(170)
2. To reduce the risk of post-natal transmission from mother to infant, the CDC and American Academy of Pediatrics recommends consideration of temporarily separating a symptomatic PUI or COVID-19 positive mothers from her infant (e.g. separate rooms). In the absence of more definitive data, this decision should reflect an individualized risk - benefit consideration for the mother and infant, cognizant of the potential for

delayed maternal-child bonding and impaired breastfeeding. This will require an additional healthy (non-infected) adult to care for the infant while separated from mother.

3. COVID-19 positive postpartum mothers as well as postpartum PUIs will be counseled about the risks and benefits of colocation vs. separation.
   a. If a postpartum PUI mother elects to be separated from infant and then her test is negative for COVID-19, the mother and infant can be reunited and 'room in.'
   b. Postpartum COVID-19+ or PUI mothers who elect to co-locate (also referred to as 'rooming in') with their infants should be instructed to wear a facemask at all times. They will also practice hand hygiene before each feeding and wear gloves during infant contact. They will also be encouraged to wash any skin that may come in contact with the infant (e.g. breasts, chest, arms, etc.). They will be encouraged to limit other close contact with the infant(s) and a separate non-infected caregiver should be present to help care for the infant. This separate non-infected caregiver should perform a majority of the infant's care. While not breastfeeding, infants should be kept greater than 6 feet away from the mother within the room, per CDC guidance.

Lactation: Breastfeeding, Pumping, or Expressed Breast Milk (171)

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 in then placed to identify date, time, and patient.
   d. Transport and storage of breast milk from isolation room to common refrigerated storage should follow strict infection control procedures per hospital policy.

Infants

1. Infants born to mothers with confirmed COVID-19 should be considered PUIs.
2. All infants born to mothers with suspected or confirmed COVID-19 should, , if resources allow, be resuscitated in a separate adjacent room utilizing airborne PPE due to potential for aerosolization during the 2nd stage of labor and potential need for intubation of the infant. The infant should be bathed as soon as clinical condition allows.
3. If local resources allow, PUI infants should be tested at ~24 hours with repeat testing at 48 hours.
4. All elective procedures to include circumcision should be deferred while infant is a PUI.
5. If hearing tests can be performed outpatient, it is acceptable to defer until COVID-19 testing is negative. If it is not easily available outpatient, ensure proper disinfection measures are used when cleaning equipment.

Neonatal Intensive Care Unit (172)

1. Recommend any infant who has symptoms that meet criteria for NICU admission be assessed by the NICU team and admitted to a COVID-19 cohort pod or other segregated section of the unit.
2. Healthcare workers should wear full PPE including N95 (or PAPR), eye shields, gown, hair cover, and gloves should be worn when caring handling the PUI infant.
   a. In situations where there is limited PPE available, N95 (or PAPR) use should be prioritized for use in infants requiring CPAP, SiPAP or undergoing aerosolizing procedures such as intubation or use of high-flow nasal cannula with flow rate >2LPM/kg.

Newborn Visitation

1. No visitors experiencing cough, fever, or shortness of breath should be allowed in any care setting.
2. All visitors should wear a facemask and adhere to local infection control policies.

3. For NICU: COVID-19 positive persons or their household contacts should not be allowed to visit until they meet the following requirements:
   a. Resolution of fever without antipyretics for 72 hours
   b. Improvement in respiratory symptoms
   c. Negative results of a molecular assay for detection of SARS-CoV-2 from at least 2 consecutive nasopharyngeal swab specimens collected at least 24 hours apart.
   d. Entrance to other family support personnel should be determined on a case by case basis.
4. For Labor and Delivery, Post-partum / Newborn Nursery: each COVID-19 positive or PUI postpartum mother may be allowed to have one support person with her who must remain with her throughout the admission. This support person should be isolated to the post-partum room and not traveling elsewhere in the hospital.
   a. If the mother chooses to co-locate with the infant, the support person should help with infant care.
   b. If the mother chooses to be separated from her infant, the support person may help with the infant's care when they are brought to the room.
5. AAP recommends that well newborns, defined as negative molecular testing and asymptomatic, can receive circumcision. Newborns who are PUIs are not eligible for elective circumcision.

Newborn Discharge

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

https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcare-guidance.html
University of Washington Handling of Breast Milk of COVID-19 Mothers (https://covid-19.uwmedicine.org/Pages/default.aspx)
AAP Initial Guidance: https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/
https://downloads.aap.org/AAP/PDF/COVID%2019%20Initial%20Newborn%20Guidance.pdf

Caring for Children with COVID-19

1. Children (0-18 years) make up less than 2% of the laboratory-confirmed COVID-19 cases worldwide, though this may represent an ascertainment bias of symptomatic cases or known contacts.
2. Approximately 90% of children with COVID-19 are more likely to remain asymptomatic or have mildly symptomatic disease. Pediatric symptoms, if present, are similar to common viral respiratory infections with a majority of symptoms affecting the upper airway (rhinorrhea, congestion, cough). This differs from adults, who tend to have lower respiratory symptoms most prominent. Fever is the most common symptom but often brief, lasting only 1-2 days. GI symptoms such as diarrhea have been reported but are less frequent than in adults. Severe symptoms include hypoxia and respiratory distress.(22, 25, 173)
3. Recent reports have identified children presenting with symptoms of a multisystem inflammatory syndrome with features overlapping Kawasaki disease, toxic shock syndromes and myocarditis. Patients present with fevers, progressive hypotension and oxygen requirement along with other variable minor symptoms. Hypotension can be severe with notable decreased EF, dilated coronary arteries, conduction disturbances and/or pericardial effusions. Patients may rapidly progress to requiring VA ECMO support for refractory shock. In addition to supportive hemodynamic interventions and consideration of anti-viral therapy, treatment with IVIG and high dose aspirin is appropriate if patient meets Kawasaki criteria (pre-IVIG plasma and oropharyngeal swabs should be obtained for future studies). Anecdotal reports suggests patients may be COVID-19 PCR negative but antibody positive, often with recent history of minor URI symptoms. Despite severe course outcomes are thus far promising.(174)
4. Hospitalization rates in the US are higher for children 0-4 years-old as compared to 5-17 years-old but both are still markedly below adults. This is consistent with data from China which showed children <5 years-old having

more severe disease with the highest rates in those <1 year-old. There are case reports in the US of febrile infants <3 months-old who required hospitalization for fever evaluation, all of which was negative except positive for SARS-CoV-2.(25, 175-177)

5. One report found 23% of children with COVID-19 had ≥1 underlying condition with the most common including chronic lung disease (including asthma), cardiovascular disease, and immunosuppression.(173)
6. The mortality rate appears to be extremely low worldwide; total pediatric deaths related to COVID in the single digits per each country. 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.(178, 179)
7. Respiratory virus co-infections and secondary bacterial infections are possible, but less common. However, the detection of a non-COVID-19 virus does not exclude COVID-19 infection. There are anecdotal, but as yet unpublished reports from Seattle Children's Hospital of co-infection with Rhinovirus/Enterovirus but the clinical impact is unknown.
8. 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.
9. Most labs are normal to include inflammatory markers (ESR, CRP), chemistries, kidney and hepatic function. White blood cell count is typically normal but may be low. Procalcitonin may be elevated but might suggest co-infection.(59)
10. When imaging is abnormal in children with COVID-19, CXR reveals non-specific increased lung markings or patchy infiltrates, and chest CT reveals glass opacities and halo signs.(59)
11. Pediatric patients can be considered mild or moderate disease if there is no new supplemental oxygen requirement or no increased requirement for patients who require supplemental oxygen at baseline. A majority of these patients will self-resolve without intervention.
12. Those who require hospitalization should receive supportive care to include critical care interventions as required.
    a. Respiratory Support
        i. 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.
        ii. For flows over 3LPM use of a heated/humidified circuit (HHFNC) or non-invasive positive pressure ventilation (CPAP or BiPAP) are well tolerated but increase aerosolization.
        iii. There is no current evidence to alter treatment of severe respiratory failure from standard pediatric ARDSNet guidelines, including indications for intubation.
        iv. When treating ARDS in younger children, the maximal PEEP setting is 15 cm H_2O as higher PEEP can result in decreased cardiac output.
    b. Septic Shock
        i. Recognize septic shock in children with any hypotension (systolic blood pressure [SBP] < 5th percentile or > 2 SD below normal for age) or two or more of the following: altered mental state; bradycardia or tachycardia (HR < 90 bpm or > 160 bpm in infants and HR < 70 bpm or > 150 bpm in children); prolonged capillary refill (> 2 sec) or feeble pulses; tachypnea; mottled or cold skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia
        ii. 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.(120)
        iii. Aggressive fluid resuscitation may worsen oxygenation and outcomes so in the absence of shock, fluid boluses should be minimized.
        iv. 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), then reduce or discontinue fluid administration.
        v. Resuscitation endpoints include perfusion targets (e.g. urine output > 1 mL/kg/hr in children; improved level of consciousness; and resolving lactate).
        vi. In children, epinephrine is considered first-line treatment, while norepinephrine can be added if

shock persists despite optimal dose of epinephrine.

c. Antivirals Use – for severe patients only
   i. Enrollment in clinical trials or compassionate use of experimental therapies to include antivirals, should be considered for children with severe disease on a case-by-case basis with appropriate monitoring and in consultation with Peds ID when possible.(180)
   ii. Remdesivir is available from the manufacturer for children <18 years-old as compassionate use and for children ≥ 12-years old as part of randomized clinical trial (see adjunctive therapies section above for more information).
      - Dosing recommendations from Pediatric Infectious Disease Society (verify with manufacturer)
        - <40kg: 5mg/kg IV loading dose on day 1; followed by 2.5mg/kg IV Q24hr
        - ≥40kg: 200mg IV loading dose on day 1; followed by 100mg IV Q24hr
        - Recommended duration: up to 10 days with 5-day duration favored for fast responders
   iii. Hydroxychloroquine may be considered in patients who are not candidates for remdesivir or when remdesivir is not available. However, it is NOT advised to use in combination with azithromycin for children due to the risk of toxicity, specifically prolongation of QTc. There is emerging data and concerns after safety and efficacy of hydroxychloroquine for treatment of COVID.
      - Dosing options as recommended from Pediatric Infectious Disease Society
        - 13mg/kg/dose (max 800mg) PO followed by 6.5mg/kg/dose (max 400mg) PO at 6, 24, and 48hrs after initial dose
        - 6.5mg/kg/dose (max 400mg) PO BID on day 1, followed by 3.25mg/kg/dose (max 200mg) PO BID for up to 3-5 days

13. There is no evidence to suggest that prophylaxis is necessary or effective for the majority of children.
14. Children appear to efficiently shed the virus, even if asymptomatic. RNA viral load is detectable in respiratory secretions for up to 2 weeks and in stool for up to 4 weeks.(181, 182)
15. Given the prolonged duration of shedding of respiratory viruses in children, during periods of community transmission of SARS-CoV-2, it may be prudent to assume symptomatic children are infected, unless proven otherwise from an infection control standpoint - an issue particularly relevant to caregivers from vulnerable risk populations.

Caring for Older Persons with COVID-19

1. COVID-19 can result in severe disease and death among older adults. Data from China and Italy suggest that the majority of deaths have occurred among adults aged ≥60 years, especially those with underlying health conditions. In the United States, 8 out of 10 deaths have been in adults above age 65. Mortality rates in patients > 85 have ranged 10-27%, and 4-11% among patients 65-84 years.(183, 184)
2. Older adults, especially those that are frail and have multiple comorbidities, may not present with the typical syndrome of fever, fatigue, or cough. Atypical presentation of disease includes tachypnea, delirium, malaise, myalgias, and diarrhea early in the disease course; fever was not as prominent in several cases.(185)
3. Older adults are the highest risk patient group.
4. Have a high index of suspicion for COVID-19 in those patients not at their baseline, especially those residing in long term care facilities who present with respiratory difficulties, changes in vital signs other than temperature or other signs of infection or sepsis.
5. Ensure that care for the older adult and severely ill is in keeping with their goals of care, advance directives and patient and family wishes.
6. Conversations regarding goals of care should continue to be part of routine care.
7. Patients should be informed about their condition & their prognosis (if desired), in a way easy to understand.
8. If the patient is unable to communicate meaningfully, ensure that a surrogate decision maker or health care agent has been identified in accordance with state law based on facility location.
9. All providers should provide basic symptom management, perform routine discussions about goals of care and code status in seriously ill patients. If complex symptom management or difficult discussions surrounding goals of care or code status arise, consult a palliative medicine subspecialist if available at your institution.
10. Symptom management: Aggressive control of symptoms such as pain, dyspnea, or other symptoms relieves

unnecessary suffering, which is crucial for all patients regarding of age, function, comorbidities and prognosis.

a. *Pain*
   - Acetaminophen should be used first, typically 500mg every 6 hours as needed.
   - If acetaminophen is insufficient, and other modalities such as topical agents are ineffective, start an opioid for moderate to severe pain (drug, dose, route, and frequency should be individualized and based on symptom severity, kidney/liver function and prior opioid exposure: See Table 7). Consider local supply in drug selection to mitigate risk of drug shortage.
   - Start a stimulant laxative, such as Senna 8.6mg PO daily, if prescribing an opioid to prevent constipation. Titrate to effect. Escalate bowel regimen as needed, with a goal of one soft bowel movement at minimum every other day.

b. *Dyspnea*
   - If providing supportive care and supplemental oxygen is ineffective for management of severe dyspnea, a low-dose opioid may be used to help alleviate symptoms.

11. Communication challenges may be exacerbated by the use of PPE. In patients with sensory impairments it is important to remember to eliminate or minimize background noise, state information slowly, and avoid yelling. It may be helpful to display information in writing. Hearing aids/glasses should be worn if available.
12. Older adults, especially those with cognitive impairment, when ill, hospitalized, or placed in a new environment may become anxious, agitated or less interactive. Delirium, a diagnosis not exclusive to older adults, manifests as acute onset inattention, disorganized thinking and an altered level of consciousness. Delirium may be seen any patient, especially those with severe infection, and those requiring mechanical ventilation. Hyperactive delirium (delirium with agitation) may make management and risk mitigation challenging in those diagnosed with COVID-19. (186)

a. Early recognition and management of delirium is important. Regular delirium screening should occur using validated methods such as the Confusion Assessment Method, bCAM, or the 4AT (www.the4AT.com).*(187, 188)*

b. Risk factors for delirium include older age, sensory impairment (vision and hearing), history of dementia, patients admitted from long-term care units, and those with serious infection.(189)

c. Management of Delirium: (190, 191)
   - Prevention of delirium is the best strategy. Strategies include maintaining normal circadian rhythms, exposure to natural light, regular reorientation, mobilization, treating pain, fever, and nausea, maintaining oxygenation, avoiding constipation and urinary retention, and performing medication reconciliation to minimize potentially inappropriate medications. Ensure basic needs are met for food and water.
   - Standard non-pharmacological approaches such as frequent reorientation, family at bedside, hospital environmental manipulation (maintenance of day/night cycle, appropriate use of TV and lights), calming music, calls from family, and professional sitters should be employed but may not be feasible in an isolation setting.
   - In patients with hyperactive delirium, try nonpharmacological techniques first.
   - Current evidence does not support routine use of antipsychotics in management of delirium.(192)
   - If severe agitation occurs, and nonpharmacological approaches have not been effective or more rapid control is needed for the safety of the patient or others, antipsychotics may be used but are off- label. When using an antipsychotic, use the lowest effective dose for the shortest amount of time. Of note, all antipsychotics carry a FDA Black Box warning due to an increase in mortality when used in patients with dementia. The patient should be monitored closely for side effects such as QTc prolongation and over sedation.
     - Some examples of antipsychotics are Quetiapine 25mg - 50mg PO, Olanzapine 2.5mg - 5mg PO/IM, and Haldol 0.25mg -1mg IV

d. Cautious use of antipsychotic medication is needed especially in patients with movement disorders such as Parkinson's disease and Lewy Body Dementia as this class of medication may exacerbate extrapyramidal symptoms. Quetiapine is preferred if antipsychotic medications are needed in patients

with movement disorders given its lower risk of extrapyramidal symptoms.(193) Any patient is at risk for acute dystonic reaction to antipsychotic medications.

13. Many older adults will recover from their illness, and it is important to not forget other complications such as hospital-associated deconditioning, falls and wounds. Standard of care should be provided for these other common complications alongside supportive care for COVID-19. Prompt mobilization and therapy should be started, when able, in accordance with infection control practices. Focusing on other treatable conditions should continue alongside supportive care for COVID-19.

PALLIATIVE MEDICINE DURING THE COVID-19 PANDEMIC

Palliative medicine can assist at all stages of contingency/crisis planning. Prepare for increased use of symptom management resources including opioids (morphine IV and PO, hydromorphone IV and PO, oxycodone PO, fentanyl IV and transdermal), and benzodiazepines. Consider dedicated space for end-of-life care beds. Where possible, symptom management resources should be de-conflicted with highly utilized intensive care medications use to prevent and adapt to shortages.

Goals of Care Discussions

(Adapted from vitaltalk.org COVID-19 Open Source Resources. www.vitaltalk.org)

1. Eliciting a patient's goals of care is integral to providing the best and most appropriate medical care and can improve resource allocation during a time of scarcity. Engage patients proactively in goals of care discussions informed by personal values and clinical context.
2. Treat patients and their families with respect and compassion. Quickly and effectively elicit a patient's concerns, values, and preferences with a few key statements. Table 7 offers suggestions and examples to help guide your conversations.

Table 7. Difficult Conversations and Scripts for Communicating with Patients and Families

What the patient/family says	What you may say
Admitting a Patient	
How bad is this?	• From the information I have now and from my exam, your situation is serious enough that you should be in the hospital. ***We will know more in the coming hours to days***, and we will update you. Who else should know about your/their situation and how will they know?
Is my grandfather going to make it?	• **I imagine you are scared**. Here's what I can say: because he is 90, and is already dealing with other illnesses, ***I worry that he is at risk of dying if this worsens in the hospital. While it is too soon to say for certain, what worries you most about that?***
Are you saying that no one can visit me?	• **I know it is hard to not have visitors**. The risk of spreading the virus to other vulnerable people is so high that ***they and those they contact will be in more danger if they come into the hospital.*** I wish things were different.
How can you not let me in for a visit?	• The risk of spreading the virus is so high that I am sorry to say we cannot allow visitors. We can help you be in contact electronically. ***I wish I could let you visit, because I know it's important, but it is not possible now.***
When things aren't going well, goals of care discussion, code status discussions	
I want everything possible. I want to live.	• We are doing everything we can. This is a tough and scary situation for many of us. Could we step back for a moment so I can learn more about you? ***What do I need to know about you to do a better job taking care of you?***
I don't think my grandfather would have wanted this.	• Well, let's pause and talk about your concern. ***Can you tell me what we should know to take the best care of him?***
I don't want to end up being a vegetable or on a machine.	• Thank you, it is very important for me to know that. ***Can you say more about what you mean?***
I am not sure what my grandfather wanted – we never spoke about it.	• You know, many people find themselves in the same boat. This is a hard situation. To be honest, given his overall condition now, I worry that further treatments may not be successful in preventing him from dying. ***In a situation like that, I have recommended that we allow a natural death.*** That could be hard to hear. What do you think?
When coping needs to be boosted, or emotions are running high	
I'm scared.	• This is such a tough situation. ***I think anyone would be scared.*** Could you share more with me?
I need some hope.	• Tell me about the things you are hoping for? ***I want to understand more.***
You people are incompetent!	• I can see you are not happy with things. ***I am willing to do what is in my power to improve things for you.*** What could I do that would help?
I want to talk to your boss.	• I can see you are frustrated. ***I will ask my boss to come by as soon as they can. Please realize that they are juggling many things right now.***
Do I need to say my goodbyes?	• I'm hoping that's not the case and I worry time could indeed be short. ***What is most pressing on your mind?***

Symptom Management Guidelines

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

1. Patients with COVID-19 infections experience many of the same symptoms as other patients: dyspnea, oral secretions, anxiety and pain. Symptom management should be individualized based on clinical status.
   a. **Dyspnea** – *dyspnea can present as anxiety – treat the dyspnea!*
      - Non-pharmacologic management for shortness of breath:
        - Positioning, cool room temperatures, removing restrictive clothing
        - Avoid bedside fan for patients with COVID-19. Consider bronchodilator therapy, fluid overload therapies, and heart rate control if >120 BPM. h:
        - Opioids are the mainstay of comfort care in severe dyspnea. When dosed effectively to control dyspnea, they **do not** contribute to a hastened death.
        - Treat and reassess. IV opioids works within 10-15 min, oral opioids within 30-45 min.
      - Goals for treatment: respiratory rate <25, minimal use of accessory muscles, resolution of pursed lip breathing, nasal flaring, and retractions or subjective dyspnea. Patient comfort is the goal.
      - See Table 8 for recommended opioid dosing. If the dose does not work, increase it!
   b. **Respiratory Secretions/Congestion Near End of Life**
      - Discuss congestion and secretions with family and bedside staff. Pharyngeal secretions are normal at end of life and rarely require treatment. A productive cough may benefit from mucolytics or opioids (Table 7). Limit oropharyngeal suction. Reduce or stop saline infusions.
      - Medications may include:
        - **Glycopyrolate** 0.4 mg SQ/IV q4H PRN
      - If severe and refractory to above medications, consider:
        - **Furosemide** 20 mg SQ/IV q2h PRN with close monitoring of response.

Table 8. Opioid Dosing to Relieve Dyspnea and Pain in Adults

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

Opioid	Bolus Dose	Basal Rate (if severe symptoms)
MORPHINE	1.5 mg q10mins	1-2 mg/hour
HYDROMORPHONE	0.2 mg q10mins	0.1 – 0.3 mg/hour
FENTANYL	20 micrograms q10mins	10-25 micrograms/hr

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

PCA Infusion Pump Strategy for Patient ALREADY Taking Opioids

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

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

d. **Delirium**
- Delirium, either hypoactive or agitation, is common in hospitalized patients and can be distressing. Avoid benzos. Treat underlying causes of delirium if possible.
  - **Haloperidol** 0.5 mg PO **OR** 0.5 – 1 mg IV q4H PRN. Consider scheduling the medication Q4H if requiring frequent PRN dosing. Titrate dose in 0.5mg increments.
  - **Olanzapine** 2.5 – 5 mg PO qHS and q8 hr PRN. This comes as a regular or oral dissolving tablet and can be titrated.

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

Palliative Ventilator De-Escalation

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

The following protocol is assumed to take place after appropriate goals of care discussions with family and/or surrogate decision makers. The endotracheal tube will remain in place and the ventilator circuit will remain intact to reduce the risk of COVID-19 exposure.

Pre-Procedure.

1. Prepare family that prognosis can be as short as a few minutes but as long as a few days.
2. Deactivate defibrillators first. A magnet can also be placed over the device if needed to deactivate.
3. Ensure no paralytic medications are on board.
4. Code status should be DNR/ comfort measures only for patients at the end of life.
5. Discontinue tube feeds and remove unnecessary equipment from the room.

Procedure.

1. Turn off alarms and change room monitor to comfort care setting or turn off if family is present.
2. If a continuous opioid infusion is in place, continue THE SAME medication. All opioids contribute to relief of pain/dyspnea.
3. If the patient is already on a continuous opioid infusion, double current drip rate and order bolus doses of 100-200% of drip rate to be given q10min PRN. Use bedside infusion to provide boluses whenever possible.
4. If the patient is opioid naïve and not on a continuous infusion, begin with morphine 5mg IV or hydromorphone 0.5 – 1 mg IV q10min PRN. If possible, bring at least four doses into patient room for ventilator de-escalation.
5. Order midazolam 2-4 mg q10min PRN or lorazepam 2 mg q30min PRN for anxiety/breathlessness. If patient is already on a midazolam continuous infusion, double current rate and give boluses of 100-200% of drip rate available q10min PRN. Use bedside infusion to provide boluses PRN.
6. Pre-medicate with an opioid bolus as above (100% of drip rate) 10 minutes prior to de-escalation.
7. Pre-medicate with 2 – 4 mg of midazolam 10-15 min or 1 – 2 mg of IV lorazepam or prior to de-escalation.
8. Recommend glycopyrrolate 0.4 mg IV q4H PRN for secretions.
9. If patient requires sedative medication (propofol, precedex, etc) for comfort, continue as ventilator is weaned.
10. Stop vasopressors prior to weaning ventilator.
11. Ensure that patient appears comfortable prior to reducing ventilator settings. Titrate to comfort to palliate signs of discomfort: grimacing, agitations, or labored respirations.
12. For agitation/delirium management, consider Haloperidol 0.5 – 1 mg IV q30mins PRN.
13. If patient is obtunded and expected to die abruptly after ventilator is weaned, recommend immediate

reduction in ventilator settings to pressure support 5/5 and room air. Bolus opioid and benzodiazepine aggressively as needed to ensure comfort.

14. If the patient is alert, consider a gradual reduction in ventilator settings. Decrease FiO_2 to 40%, PEEP to 10, RR to 16. Recheck patient comfort and re-bolus opioids prn to achieve comfort. Reduce PEEP to 5, FiO_2 to 0.21.
15. Once the ventilator is set at PS 5/5 and FiO_2 of 21%, leave endotracheal tube in place and leave the ventilator circuit intact for the end of life.
16. Continue to re-bolus opioids, benzodiazepines and sedation as needed to ensure comfort.

IMPLICATIONS OF COVID-19 ON SURGICAL CARE

Priorities for Surgical Resources

Force Protection: Protection of personnel and patients from disease transmission
Mission Capability: Maintaining capability to provide safe and effective surgical care
Mission Support: Support of the healthcare community response to COVID-19 through preservation of critical resources and re-deployment of personnel

Surgical Triage and Decision-making

The ability to provide surgical care should be determined by health protection conditions, local and regional healthcare capability and capacity with consideration of logistic constraints.

1. During sustained or widespread community transmission, surgical care should be restricted to reduce risks of transmission between patients and healthcare personnel. To the extent possible, clinical encounters should be accomplished through virtual means and surgical treatment options deferred or delayed.(194)
2. MTFs should establish a review process to triage and prioritize medically necessary and time-sensitive surgical care.(195) This process should include multidisciplinary representation and be led by a senior surgeon, preferably the Department/Service Chief.(196)
   a. This review should consider medically necessity, time sensitivity, risk and impact of viral transmission to either the patient or medical personnel, suitability of alternative treatment options, resource utilization, impact of delay of treatment, as well as readiness and mission impact.
   b. Consider using an acuity scale or scoring system to assist in decision making.(197)
3. Preoperative COVID-19 testing is recommended to assist in decision-making for all surgical patients including symptomatic and asymptomatic. In the event of a positive test, the surgical treatment plan can be reconsidered to reduce patient risk of morbidity and mortality and to reduce the risk of transmission to medical personnel and the community.
4. In areas with low incidence or sustained reduction in the rate of new COVID-19 cases, expansion of surgical services should be considered.(198) Surgical services must adapt traditional and contingency operations into a new normal of patient care in the setting of ongoing COVID-19 risk. The surgical review and triage process should continue to prioritize surgical care as outlined in 2a above but can apply a progressively lower threshold to proceed with surgical care and utilization of healthcare resources.
5. Prior to resumption of elective surgery, the following should be established:
   a. Local Objective Triggers: Transition of an MTF to the next phase of medical activities should be guided by the local Health Protection Condition (HPCON) level or guidance from local or state governments or from the Uniformed Military Department or installation commander, in addition to DHA recommendations based on coordination in key healthcare-sustaining areas discussed below. Triggers at the local level are:
      i. Symptoms: Downward trajectory of influenza-like illnesses (ILI) reported within a 14-day period; and a downward trajectory of COVID-like cases reported within a 4-day period.
      ii. Cases: Downward trajectory of documented cases within a 14-day period or a downward trajectory of positive tests as a percent of total tests within a 14-day period (flat or increasing volume of tests).
      iii. Hospitals: Treat all patients without crisis care; and robust testing program in place for at-risk HCP.

b. Sufficient resources are available across phases of care, including PPE, healthy workforce, facilities, supplies, testing capacity, and post-acute care.
   i. Performance of elective surgery must not negatively impact capability to provide medically necessary and time sensitive surgical care.
   ii. Surge capacity should be preserved.
c. Policies and process are established for perioperative screening and testing of surgical patients.
d. Evidence-based infection prevention policies and procedures are established to ensure a safe environment in which elective surgery can occur. (i.e., access control, workflow and distancing)
e. Non-COVID Care areas should be established to reduce risk of COVID-19 exposure and transmission; preferably these areas should be separate from other facilities to the extent possible (i.e., separate building, or designated rooms or floor with a separate entrance and minimal crossover with COVID-19 areas).
f. CONUS: The guidelines for "Opening Up American Again" based on Centers for Medicare & Medicaid Services recommendations offer the following 3 phases:(199)
   i. Phase 1: Elective surgeries and procedures can resume, as clinically appropriate, on an outpatient basis
   ii. Phase 2: Elective surgeries and procedures can resume, as clinically appropriate, on in-patient bases
   iii. Phase 3: Patient care as indicated. Visits to hospitals can resume. Those who do interact with patients must adhere to strict hygiene protocols.

Phases of Surgical Care Recommendations

Preoperative Care.

1. Virtual and telehealth should be utilized to accomplish preoperative administrative tasks, education, and assessments that do not require face to face interaction.
2. Post-operative care needs should be assessed and resource availability confirmed.
3. Patients planned for surgical care should be screened for symptoms or exposure history. Those patients that screen positive should undergo testing and their surgical treatment plan should be reconsidered.
4. When available, preoperative COVID testing should be performed to identify asymptomatic patients whose surgical care plan can be altered in the event of a positive test result. Timing of the test should balance considerations regarding the availability and turnaround time of test against the risk of patient exposure and infection in the interval between testing and the scheduled procedure.

Immediate Preoperative Care.

1. Recommend establishing Intubation Teams consisting of providers with a high degree of comfort with PPE and airway skills. Teams should bring their own PPE, medications, and airway equipment to avoid delays while limited or unfamiliar PPE is made available. During the pandemic, any emergency airway should be treated as potentially COVID-19 positive and full PPE worn.
2. For purposes of perioperative care, patients should be treated as presumed COVID-19 positive if they have symptoms/exposure history that warrants testing. PUI patients at MTFs without an urgent indication for surgery preferably are tested for COVID-19 before any operative intervention (provided testing availability).
   a. Surgeries and procedures on COVID-19 positive patients and PUIs when possible should occur in a negative pressure room or an OR equipped with HEPA-rated filters on all air outflow vents.
   b. Optimally, an OR or pod of ORs should be predesignated with a distinct anteroom to maintain separation from non COVID-19 patients. If a negative pressure OR is not available, consult with facilities to ensure air handling is routed through a HEPA filter.
3. All patient interaction with COVID-19 positive or PUI patients will be performed with airborne and contact precautions, including eye protection:
   a. N95 mask with surgical mask over the N95 mask, consider PAPR for aerosol generating procedures.
   b. Eye protection consisting of goggles, full face shield/mask worn over N95, or plastic disposable wrap-

around glasses. Eyeglasses alone are not adequate.

c. Gown, double gloves, hair cover, shoe covers

d. Remove PPE except N95 mask before exiting the room. Surgical scrubs should be changed after each case.

4. The anesthesia service provider should attempt to remove all necessary medications and equipment from the carts prior to bringing the patient into the room. Avoiding contamination of the carts/machine should be prioritized over wasting consumable supplies.
5. Anesthesia providers should not expect routine breaks during the case. Consider leaving cell phones, smart watches, and other personal devices out of the OR. Ensure there's a way to communicate/call for assistance organic to the OR.
6. Patients on the ward should be transported directly to the OR by the anesthesia service team. If assistance is needed with transport, every attempt should be made to enroll a member from the care team (nurse, surgeon, technician, etc.) to minimize staff exposure.

Intraoperative Care. (200, 201)

1. Surgeons and non-essential staff should not be present in the OR for either intubation or extubation unless necessary for patient safety.
2. Only essential staff should be present in the OR during surgery, and should all be wearing enhanced droplet PPE at minimum.
3. Laryngoscopy and Intubation should be performed in accordance with Anesthesia Patient Safety Foundation (APSF) guidelines.(202)
4. Place a HME/HEPA filter between the Y-piece of the breathing circuit and the patient's mask, endotracheal tube or laryngeal mask airway. The gas sampling line must exit the circuit proximal (closer to the machine) than the filter. The ASA/APSF recommends adding a second HME/HEPA filter on the expiratory limb before entering the anesthesia machine.
5. For sedation cases, a procedural/OR mask should be placed on the patient over the oxygen source. If a gas sampling line is used to monitor end tidal CO_2, ensure a filter is used prior to gases entering the machine. The filter found in most epidural kits may be placed in-line and provide adequate machine protection. For sedation procedures that instrument the esophagus (TEE, EGDs) and generate high volume aerosolized secretions, intubation may be the best way to limit room exposure. Alternately, a Procedural Oxygen Mask may limit room exposure where intubation is contraindicated.
6. For pediatric patients or patients in whom the additional dead space or weight of the filter may be problematic, the HEPA filter can be placed on the expiratory end of the corrugated breathing circuit before expired gas enters the anesthesia machine. Again, ensure the gas sampling line is protected from contaminating the anesthesia machine.
7. Use disposable covers whenever possible (e.g., plastic sheets for surfaces, long ultrasound probe sheath covers) to reduce droplet and contact contamination of equipment and other environmental surfaces.

Postoperative Care.

1. Non-ICU patients should recover in a PACU negative pressure room. If a suitable recovery room isn't available, the OR may substitute until ready for Phase II.
2. Remove all PPE (except N95 mask) before exiting the OR. Avoid touching hair or face & perform hand hygiene.
3. Surgical scrubs should be changed immediately at the conclusion of each case.
4. Cloth surgical caps should not be worn in PUI cases.
5. Shoes should be disinfected routinely after each case.
6. The room should be cleaned in accordance with the designated processes for terminally cleaning rooms for a highly infectious agent.
7. Once the patient has left the operating room, leave as much time as possible prior to subsequent patient care to allow removal of airborne infectious contamination. Consult with physical facilities for the air exchange of each procedural room and the wait time required to provide maximum efficiency.
8. When transporting a ventilated patient, ensure a HEPA filter is placed between the ETT and the Ambu bag. Connect the Ambu bag to the ETT prior to opening the door in the negative pressure room. Ensure the door is closed when returning the patient before switching to the ventilator. The same filter may also be used on the

exhalation loop of the anesthesia machine.

9. When transporting patients between the OR, a "clean" person who does not contact the patient should accompany the team to safely interact with the environment (e.g. open doors or elevators).

Post-discharge Care.

1. Post-discharge care needs should be assessed and resource availability confirmed.
2. Discharge care plans should consider the risks of exposure from extended healthcare stay (nursing home or other inpatient care facility) and face to face follow-up.
3. Virtual and telehealth should be utilized to accomplish postoperative assessments that do not require face to face interaction.

Special Considerations

Aerosol-Generating Procedures.

Viral concentration in the aerodigestive tract and respiratory system and aerosol generation during surgical care present additional risks to surgical personnel.

1. The performance of high-risk procedures should be limited and risk mitigated through refinement of technique and/or utilization of adjunctive technology and protections. High risk activities include:
   a. Endotracheal intubation
   b. Oral surgery
   c. Tracheostomy and endotracheal tube manipulation/care
   d. Upper aerodigestive endoscopy (including nasal endoscopy, laryngoscopy, bronchoscopy, and esophago-gastro-duodenoscopy)
   e. Surgery involving the airway/upper aerodigestive tract, lower airways, or the potential to enter into the upper aerodigestive tract or lower airway.
2. Aerosol generation during surgical procedures can also be limited through the following:
   a. Electrocautery should be set to the lowest effective setting and a smoke evacuator used if available.
   b. Chest tubes and surgical drains are all potential sources of aerosolized droplets, and enhanced precautions should be taken during placement, manipulation, or removal.
3. Laparoscopy and Endoscopy: Aerosol generation during laparoscopy can be minimized through scrupulous management of access sites, pnuemoperitoneum, and through ultrafiltration of aerosolized particles in released CO_2.(203)
   a. CO_2 insufflation should be set to the lowest effective pressure, and a filtration device should be used for CO_2 release if available.
   b. Release all pneumoperitoneum via filtration device (if available) prior to specimen removal, port removal, or converting to open surgery.
   c. Avoid venting insufflation from the ports during surgery.
   d. Aerosol generation during endoscopy may be difficult to control, therefore performance of these procedures should be carefully considered and engineering controls and PPE optimized to reduce the risk of personnel exposure.

Trauma and Surgical Combat Casualty Care. (204)

1. Deployed medical/surgical capability is a limited and mission-critical asset that must be preserved to reduce risk to the force and mission. To that end, all reasonable attempts should be made to preserve medical and surgical capability on the battlefield.
2. In the deployed setting, when possible, designate a single OR for PUI/COVID-19 positive surgical care and minimize unnecessary supplies and equipment in that room. This surgical suite should undergo terminal cleaning after each case.
3. All trauma/injured patients should be presumed positive/PUI in the downrange setting until they can be ruled out (by testing or risk factor assessment).
   a. Trauma team members should all wear airborne and contact precautions, including eye protection for PPE until the patient is ruled out for COVID-19.

b. Unnecessary individuals in the trauma bay should be minimized.
c. Individuals should remove all PPE (except N95 mask) prior to exiting the resuscitation area.
    - Any clothing worn in the resuscitation bay/ATLS area should be removed after PUI patient contact and immediately cleaned
    - Commanders should modify uniform requirements as necessary to allow for multiple rapid clothing changes to avoid cross contamination.
d. All equipment in the resuscitation bay and ATLS area (i.e. x-ray, ultrasound, instrument packs, etc.) must be terminally cleaned after every PUI encounter.
e. Non-intubated patients who cannot be ruled out for COVID-19 should have a surgical mask applied during transport between the resuscitation bay and CT scanner and during any transit within the facility. Patients requiring oxygen should have a non-rebreather mask applied instead of a simple face mask.
f. All PUIs requiring admission should be kept in isolation rooms (if available) until ruled out or ready for discharge (to quarantine facilities).

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

OPERATIONAL CONSIDERATIONS FOR COVID-19: PLANNING AND PREPARATION

Providing safe and effective care in the deployed setting during an infectious disease pandemic is particularly challenging given limited resources, close living conditions, and delays in test results and supply arrival. The DOD GCP PI & ID 3551-13 provide a wealth of information, guidelines, and mitigation strategies for a pandemic, but are not tailored to the risks, needs and nuances of COVID-19. This section focuses on the unique aspects of dealing with the COVID-19 pandemic in the deployed environment. Collaboration between base commanders and medical teams is an essential component of pandemic response to limit infection spread while caring for the ill and injured. Additionally, coordination with TRANSCOM is essential as some Geographic Combatant Commanders (GCC) have published orders indicating all COVID positive service members will be transported out of theater while others have maintained treatment in place unless the patient exceeds the capability of the treating facility.

Division of Labor for Quarantine and Isolation.

1. Quarantine: This is a *medically-supported command function* to separate high risk individuals from the general population following a potential exposure. Commanders are responsible for establishing and maintaining quarantine facilities within their area of responsibility (AOR), and each unit is responsible to identify at-risk personnel based on best medical guidance. Quarantine has also been advocated for those units who are mobilizing to a base where there are no reported cases of COVID in an effort to maintain the bases status. In these case units mobilizing to those bases should do a formal quarantine either prior to arrival or prior to interacting with anyone on the base. If the 14 day quarantine is done prior to arrival the unit cannot interact with anyone as there is risk of transmission from an asymptomatic carrier.
2. Isolation: This is a *command-supported medical function* to care for those with infection. These patients are identified by symptoms (i.e. fever, cough, dyspnea, diarrhea, etc.) following an exposure (typically within the past 14 days), and may be identified de novo or from quarantine. The duration of isolation is can vary based upon the duration of symptoms or the results of testing (see below). Because service members are not deployed with a family, even mildly symptomatic patients, who would typically be returned to the care of their family in the garrison setting, become the responsibility of the medical team.

Physical Requirements and Logistics of Quarantine and Isolation.

1. Quarantine: Quarters must be provided for persons suspected of having exposure to COVID-19 in an effort to prevent spread of the disease to other service members (SM) and civilians on base. These quarters must be separate from the general population and must have their own dedicated toilet and shower facilities. Meals must be provided to quarantined individuals, and they must be checked regularly (i.e. via telephone or in person) to ensure they remain asymptomatic. If symptoms develop, medical personnel should be notified to arrange evaluation and potential transfer to medical isolation. Quarantined individuals should remain in their designated quarters unless directed otherwise, however, quarantined individuals should be allowed to go outside and exercise in wide open areas to promote mental and physical health. Personnel should be designated to do laundry for quarantined individuals. Dirty laundry should be placed in a sealed disposable plastic bag by the quarantined member and then handled with gloves by laundry personnel. Laundry should be placed in the washing machine without handling the clothes, and the bag discarded in an appropriate receptacle. Persons in quarantine should remain in quarantine for the allotted 14 days unless it is determined that the person they were suspected of being exposed to is determined not to be infected with COVID-19. The 14 day quarantine resets if any person in the same living quarters develops symptoms, has a positive test result, or if a new person is added to the quarantine group living quarters. To avoid excessively prolonged quarantines, every effort should be made to keep quarantined individuals in the smallest possible groups; individual quarters are the ideal quarantine environment. Any personnel interacting with or evaluating quarantined individuals must wear appropriate PPE.
2. Isolation: Patients who are symptomatic or test positive should become the primary responsibility of the medical team in isolation. Medical teams will need to plan for patient monitoring, treatment, housing, meal, and hygiene facilities. Based on the demand and the size of the medical treatment unit, commanders may need to consider assigning additional non-medical personnel to assist with these tasks. Isolated patients should be classified by symptoms as asymptomatic, mild, moderate, or severe, which will determine the required level of care. Any personnel interacting or evaluating patients in isolation must wear appropriate PPE.
    a. Asymptomatic/Mild Symptoms: In CONUS locations these patients may be sent home for self-care and outpatient follow-up. In the deployed setting family support is absent and self-isolation is not feasible, so medical teams should coordinate with command to establish appropriate isolation housing with routine medical oversight and documentation. Symptom progression should result in medical reevaluation. There must be a clear and universally-accessible communication plan for notifying the duty medical personnel of a change in patient condition.
    b. Moderate Symptoms: These patients require hospital ward admission. These facilities may be located within the MTF or established separately near the MTF; if available, negative pressure facilities should be reserved for aerosol producing procedures. A COVID-19 positive patient should not share a room with a non-COVID-19 patient.
    c. Severe Symptoms: These patients require ICU admission for hemodynamic monitoring/treatment or severe respiratory symptoms. ICU care should be performed where the greatest medical capability exists, but these patient should not be placed in the same facility as trauma patients or medically sick patients. Negative pressure facilities should be used (if available) during aerosol producing procedures. If negative pressure facilities are not available then a stand-alone well-ventilated tend or building can be used. Oxygen generating capability will need to be established along with continuous patient monitoring and nursing. This level of care can be resource intensive and medical teams will need to work with TRANSCOM on possible patient transfer if they do not have adequate resources.
    d. Discharge: Patient placed in isolation should be classified as patients under investigation (PUI) while awaiting their test results. They will need to remain in isolation for 7 days and until their symptoms have resolved for 72 hours off antipyretics if the test positive for COVID. Alternatively, they can be released from isolation if they have two negative COVID tests after their positive test. If their initial COVID test is negative they should remain in isolation for at least 7 days unless an alternative diagnosis can be rendered for their symptoms (ie community acquired pneumonia, lymphoma, rhabdomyolysis).

Unique Limitations in the Austere Environment

1. Ventilator: COVID-19 may result in ARDS which can be challenging to manage even with the best facilities and equipment; in the deployed setting, providers may only have transport ventilators with limited capabilities. It is important to recognize this limitation and prepare accordingly. Medical teams should train and exercise protocols for prone positioning and pharmacologic paralysis which have proven mortality benefit if used early in ARDS.
2. Medications: At present, there is no specific treatment for COVID-19. Deployed providers may not have access to compassionate use or trial medications, and should be familiar with the supportive care measures described elsewhere in this document. Additionally, the Society of Critical Care Medicine, ARDSNet, and other professional societies provide continuously updated guidelines on their websites. Providers should work closely with pharmacy and logistics leadership to ensure adequate stocks of all commonly required medications, including antimicrobials, sedation, and paralytics.
3. PPE: Supply chain challenges have led to PPE shortages worldwide. Fortunately most units are deployed with CBRNE equipment which can be used for filtration and staff protection. Staff must be proficient at proper donning, doffing, and cleaning techniques.
4. Hygiene: The austere environment lends itself to rapid spread of infectious disease. Commands should emphasize the importance of handwashing/sanitizing, cleaning quarters, and appropriate social distancing.
5. Testing: Epidemiologic data is critical for command decision making, therefore commanders may need to divert resources to ensure rapid case identification and intervention. MTFs should not use non-DOD laboratories for testing unless approved by their AOR HQ.
6. Transportation: Units must coordinate with PMC to ensure safe and efficient movement of patients and/or testing samples around theater. Patients can be treated in place unless their clinical condition necessitates a higher level of care or if command directs movement of COVID-19 positive patients. Unnecessary patient movement should be avoided to minimize personnel and resource exposure and transmission risk. TRANSCOM has developed 3 categories for patients based on their oxygen requirement to facilitate planning for safe medical evacuation of patients.
    a. Category A: intubated or O2 sats <85% on RA and <92% on 5 L/m O2
    b. Category B: O2 sats <90% on RA or sats >92% on 4 L/m O2
    c. Category C: O2 sats >92% on RA
7. Housekeeping and Cleaning Services: Cleaning protocols must be established to ensure adequate sanitization occurs in quarantine, isolation, and medical facilities, as well as workspaces and quarters of those moved to quarantine/isolation status. PPE should be worn by cleaning personnel and disposed of in a manner that avoids the potential for cross-contamination.
8. Mortuary Affairs and Casualty Liaison Teams: While the COVID-19 mortality rate is expected to be low in the typical deployed population, Mortuary Affairs teams should be prepared for increased demands and requirements. Casualty Liaison teams should be ready to work with commanders, medical teams and families on accurately reporting patient status.

BEHAVIORAL HEALTH AND WELLNESS IN COVID-19 CLINICAL MANAGEMENT

For Defense Health Agency COVID-19 Related Behavioral Health (BH) Resources:
https://info.health.mil/army/bhsl/Covid19/Forms/AllItems.aspx (DoD CAC Enabled only)

Pandemic conditions require medical staff to be sensitive and responsive to patient, family, provider, and leader needs. Common pandemic responses include a predictable range of distress reactions (e.g. insomnia, fear, grief), health risk behaviors (e.g. increased use of alcohol/other substances, work/life imbalance), and may also result in BH disorders (e.g. PTSD, depression, and anxiety). In response to multiple stressors, associated with quarantine or in support of critical care operations, common responses may also include anger, irritability, detachment, avoidance, impaired function, and burnout. Addressing stress responses early can mitigate enduring impacts.

General Considerations for Frontline Workers, First Responders, and Support Staff

1. Prioritize basic needs. Proper sleep, nutrition and hydration, regular exercise, regular breaks, and appreciation/gratitude can sustain performance and enhance decision-making.

2. Social distancing, infection control, and isolation present a significant barrier to our usual approach to care, requiring innovative approaches.
3. Communication – words matter now more than ever. Clear and consistent messaging from leadership, between team members, and to patients and family is vital during this crisis.
4. Anticipate fears of returning to work and provide thoughtful, transparent information.
5. Resources for leaders in support of Healthcare Workers can be found at: https://www.cstsonline.org/covid-19/supporting-healthcare-workers

General BH Care for Patients with known or suspected COVID-19

1. In accordance with HPCON, use telehealth and virtualization tools as much as possible for BH assessments and ongoing care of isolated patients. Promptly identify all COVID-19 patients with known mental illness and consult BH to assist with ongoing care.
2. Recognize isolation as a barrier to communication. Keeping patients informed as to what is happening, what is likely to happen, and next steps in their care may provide a sense of control in the midst of a stressful and confusing situation. Expand virtual approaches to care and provide regular updates to patients and families.
3. Anticipate patient concerns and misconceptions. Concerns that may be present include fears related to transmission to family members, fears related to intensive care or ventilator availability, duration and impact of isolation, or external stressors such as impact on job, housing, and finances.
4. Healthcare systems should establish easily accessible pathways for BH referrals for family members of patients admitted for COVID-19.
5. Attend to negative impacts of isolation by facilitating virtual connection with providers, family, and loved ones as much as possible. This could include providing patients with dedicated mobile devices/tablets.
6. Resources to help in caring for Patients and Families can be found at: https://www.cstsonline.org/covid-19/caring-for-patients-and-families

For Medical Staff

1. Self-care is important for providers, patients, and families.
2. Connect to a sense of unified purpose; foster hope, fortitude, and tolerance in self and others.
3. Amplify positive stories and stories about competent efforts by self and colleagues. Encourage perceptions of competence among staff, especially junior and/or less experienced colleagues.
4. Recognize and attend to signs of stress reactions or burnout in self and others (e.g. out of character sadness, frustration, irritability, isolation/disconnectedness, substance use, and lack of self-care). Usually these can be addressed with simple measures, including normalization, peer-support, and rest with expectation of rapid return to full functioning.
5. Focus on what can be controlled – checklists, routines, self-care; and accept what cannot be controlled.
6. Promote a climate where it is acceptable for team members to talk about difficult events (e.g., death, triage, errors), as avoidance and fear of such thoughts are associated with greater long-term mental health problems.
7. Establish a routine of regular team meetings as an opportunity to pass relevant information, but also as an opportunity to check in with each other and rotate duties as needed. Maintain a climate where it is okay to not be okay and offer peer support when needed.
8. Resources for Healthcare Worker Self Care can be found at: https://www.cstsonline.org/covid-19/healthcare-worker-self-care

For BH Providers

1. Provide proactive support to frontline workers where possible, and at times of peak stress, ideally, in the form of BH outreach teams with established relationships to frontline and medical staff points of contact. Consider BH team outreach routinely (e.g. during daily rounds, at shift changes).
2. Be careful not to overlook other at risk groups such as janitorial staff, transport, food service, and others who make the medical system run, and may also be at risk of exposure and are likely to experience distress.
3. Behavioral health care teams can provide both non-clinical support to frontline staff as well as be available to facilitate referral for additional BH care when needed.
4. Tailor resources and support as much as is feasible – and plan on changing/adapting resources with the unfolding realities of the medical mission. Flexibility is important.

5. Supportive care of healthcare workers is different from usual clinical care, and includes:
   a. Check in with the physicians, nurses, technicians, and support staff, and get to know their mission and challenges in a non-intrusive manner.
   b. Link with support services, such as Red Cross, providing food and beverages.
   c. Provide information on normal stress reactions and adaptive responses.
   d. Promote positive peer support and facilitate connections.
   e. Make connections during a calm time. Do not interrupt urgent patient care or sign-out.
   f. Offer combinations of simple supportive non-clinical strategies, as well as clinical triage when appropriate (e.g. find a quiet space to talk when things are chaotic).
   g. Ensure individuals have access to safe spaces and emotional/spiritual support.
6. Unique issues to consider when supporting frontline workers:
   a. Be aware of the potential for distress related to ethical issues in providers making difficult and potentially life or death triage and management decisions.
   b. Be aware of potential concerns of individual front line workers, including single parents, dual healthcare worker families, families with serious medical issues, workers living separate from their families, and individuals facing the community stigma of being "infected.
7. Resources for Patients can be found at: https://www.cstsonline.org/covid-19/mental-health-support

For additional COVID-19 Related Behavioral Health (BH) Resources:
https://www.cstsonline.org/
https://asprtracie.hhs.gov/COVID-19

REHABILITATION CONCERNS FOR PERSONS WITH COVID-19

Rehabilitation of COVID-19 Patients and PUIs

Overview.

1. This document is intended to provide guidance and planning considerations for the provision of acute and critical care rehabilitation for hospitalized patients by practicing acute care Physical Therapy (PT) and Occupational Therapy (OT) providers and augmented staff dedicated to support the COVID-19 response.
2. The goal of acute care inpatient rehabilitation is to improve mobility in order to reduce mortality, decrease hospital length of stay (LOS), decrease ICU and ventilator days, streamline patient throughput, and decrease the burden of acute rehabilitation after discharge.
3. Early rehabilitation involvement in the facility's COVID-19 planning team is recommended to anticipate rehabilitation needs.
4. Rehabilitation personnel should be dedicated to either COVID-19 patients or non-COVID-19 patients to minimize potential exposure.
5. Pool staff resources as able and maximize distancing. Maintaining appropriate work/rest cycles.
6. Screening tools should be used to quantitatively determine a patient's need for therapy intervention.

ICU and Critical Care Staffing ratio recommendations when respiratory rehabilitations is a primary intervention

1. ICU recommendations: 4 therapy providers for the first 22 ICU beds. One FTE for each 4-bed increase.
2. Acute Care Recommendations: therapy provider FTE for the first 11 beds and a potential increase of 2 per additional 11 beds.
3. Subacute and Acute Inpatient Rehabilitation Unit (if present): 2.5 FTEs per 11 beds.
4. Staffing ratios may be lower when rehabilitation interventions are the primary focus rather than on respiratory rehabilitation

Personal Protective Equipment

1. Prior to working with patients with COVID-19, therapy staff should have comprehensive training on the use of PPE.

Treatment Guidelines

1. Positioning: Rehabilitation staff may be involved in prone positioning with COVID-19 patients due to their expertise in safely and optimally performing this task.-

2. Rehabilitation should progress to active movement as soon as possible.
3. Provide patient specific exercise programs and handouts.
4. Partner with nursing for patient active participation in care and exercise.
5. Interactions with COVID-19 patients will be limited to a contained environment where airborne precautions can be maintained.
6. Therapy staff must have advanced understanding of medical implications of COVID-19
7. Emphasize treatment of non-COVID-19 patients for quick discharge to decrease risk of exposure.
8. Attend to the well-being of the whole patient by promoting orientation and communication with patient during therapy sessions.

Discharge Planning

1. Goal should be safe patient discharge to home from the acute hospital setting whenever possible.
2. Therapists should participate in multidisciplinary rounding/discharge planning to ensure necessary patient supports are in place for discharge.
3. Electronic communication with spouses and other care providers should be completed to promote patient and family confidence in the discharge plan

More information on Rehabilitation Guidelines can be found in the DHA Patient and Caregiver COVID-19 Rehabilitation Guide as well as the following sites: Allied Health Folder in https://www.milsuite.mil/book/groups/covid-19-clinical-operations-group or https://www.milsuite.mil/book/groups/acute-and-critical-care-physical-therapy

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 delivered through two primary manners
   a. Direct-to-patient VH. Services delivered in this manner require credentialing and privileging IAW DHA PM 6025.13 using the centralized privileging by proxy for telemedicine (TPbP) through the Virtual Medical Center. A provider or a patient can be in the home for a telemedicine visit. Direct-to-Patient VH is most appropriate when a provider is directly evaluating a patient, and requires documentation of the encounter in the electronic health record (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:
   a. Phone calls can be used for a majority of patient encounters during the COVID Pandemic. The need for clinical video versus telephone and/or secure messaging will be based upon the provider's individual judgement, and will take into consideration the specific patient complaint evaluated.
   b. Clinicians engaging in telemedicine (especially forums 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 when possible.
4. All care provided through telemedicine should be documented in the appropriate EHR. If the provider is delivering care from outside of the MTF, the DHA Application Virtualization Hosting Environment (AVHE) can be utilized to access the EHR.

a. AVHE can be accessed from a computer with a CAC-card reader through the following URL: https://avhe.health.mil.
b. Make sure to select your email certificate

5. There are several use-cases for telemedicine during the COVID-19 Pandemic. Each require planning and practice to be successful.
6. Use cases for which currently available MHS approved solutions exist include:
   a. Screening and Initial Evaluation (e.g. Virtual Clinics)
      i. Phone calls can be used for a majority of patient encounters during the CoVID Pandemic. The need for clinical video versus telephone and/or secure messaging will be based upon the provider's individual judgement, and will take into consideration the specific patient complaint that is being evaluated.
      ii. 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). Some examples of online tools are listed below, although none are created or owned by the DOD:
         a) https://c19check.com/start. Site hosted by Emory University Medical Center, which provides likelihood of CoVID infection based on answering series of online questions.
         b) https://penn-chime.phl.io/ Site hosted by Penn State Medical Center, Predictive Healthcare Team, which provides patient volume projections during the pandemic.
      iii. 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.
      iv. 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.
      v. 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.
      vi. Synchronous video to the patient's location can be accomplished through several mechanisms. The preferred and supported solutions are Adobe Connect and Cisco Meeting Server (more below).
   b. Inpatient Wards (non-ICU)
      i. 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.
      ii. 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
      i. 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.
      ii. 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.
      iii. MTFs that are not enrolled in the JTCCN that (1) do not have sufficient critical care expertise, and (2) cannot transfer critically ill patients, may be forced to care for these patients. In this situation, tele-consultation is available to support clinicians.
      iv. Tele-consultation can be obtained through either:
         a) 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 a 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.

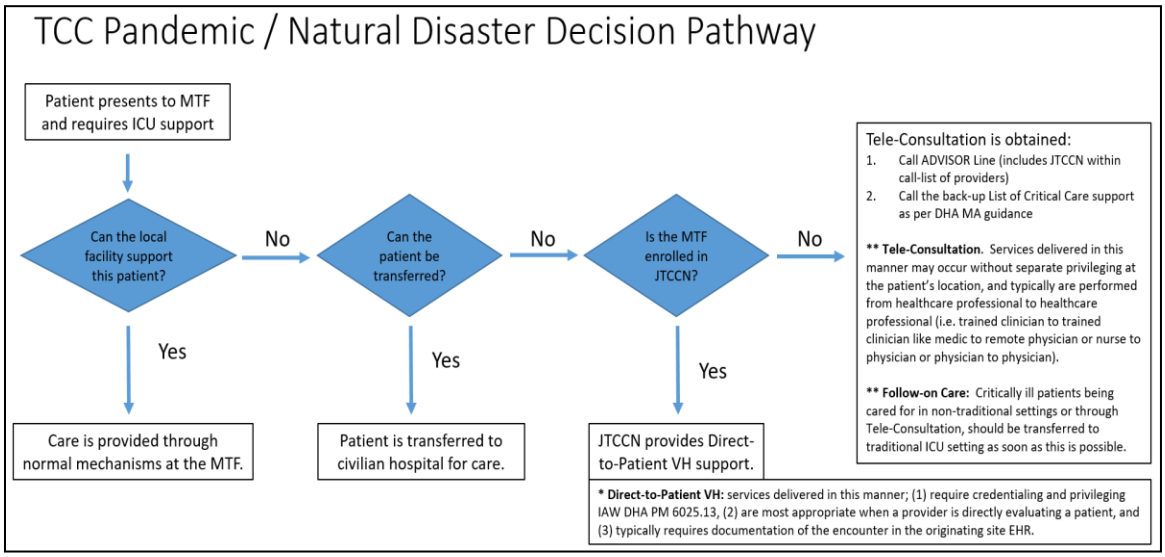


Figure 11. Telecritical Care Pandemic/Natural Disaster Decision Pathway

b) Contact the following MTFs for Critical Care consultations:

- Walter Reed National Military Medical Center, MD. (301) 295-4611, option 4 Command Duty, Quarterdeck or (301) 295-4810, Emergency Room (ER).
- Madigan Army Medical Center, WA. (253) 968-1110 Information Desk.
- Brooke Army Medical Center, TX. (210) 916-0808 ER.
- Naval Medical Center Portsmouth, VA. (757) 592-5473 Critical Care, (757) 953-1365 ER.
- Eisenhower Army Medical Center, GA. (706) 787-6938/6019 AOD or (706) 787-6039 ER.
- Travis Air Force Base Medical Center, CA. (707) 423-3040 ICU, or (707) 423-3825 ER.
- Tripler Army Medical Center, HI. (808) 433-6661 Information Desk, (808) 433-4032 ICU, (808) 433-3707 ER.
- 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 ER.

c) Contact the following MTFs for Infectious Disease (ID) Consultation:

- Walter Reed National Military Medical Center, MD (301) 295-4611, option 4 Command Duty Officer/Quarterdeck, ask for ID on call. (301) 295-4810, ER, ask for ID on call
- Naval Medical Center San Diego, CA. (619) 532-8274 ER, ask for ID on call
- Madigan Army Medical Center, WA. (253) 968-1110 Information Desk, ask for ID on call
- Brooke Army Medical Center, TX. (210) 916-0808 ER, ask for ID on call
- Naval Medical Center Portsmouth, VA. (757) 953-1365 ER, ask for ID on call
- Eisenhower Army Medical Center, GA. (310) 634-3509 ID on call pager.
- Tripler Army Medical Center, HI. (808) 433-6661 Information Desk, ask for ID on call
- Womack Army Medical Center, NC. (910) 907-6559 ER, ask for ID on call
- William Beaumont Army Medical Center, TX. (915)892-6880 House Supervisor, ask for ID on call
- Travis Air Force Base Medical Center, CA. (707) 423-3040 ICU, ask for ID on call

- Keesler Air Force Base Medical Center, MS. (228) 376-0500 ER, ask for ID on call

d. Virtual Health to Patient Location (e.g. home)
   i. The CDC recommends providing outpatient care where/when possible through telemedicine to minimize infectious exposure in MTFs for at risk patients and staff.
   ii. Virtual health to patient location can be established through several mechanisms.
      a) Secure Messaging (e.g. Relay Health, MHS GENESIS Patient Portal).
      b) Establishing a clinic cell phone with texting services and publishing the number
      c) Using phone calls to discuss patient problems/symptoms as indicated.
      d) Conducting Synchronous Video Visits can be performed through either Adobe Connect or Cisco Meeting Server (preferred solutions), or through several non-public facing communication platforms.
         - Adobe Connect accounts can be requested from the VMC Front Office at: https://info.health.mil/army/VMC/IT/Lists/AdobeConnectRequest/Item/newifs.aspx?Source=https://info.health.mil/army/VMC
         - Online VH training must be completed prior to Adobe Connect account creation. The DHA Virtual Health Provider Training (US444) can be found on the JKO training website: https://jkodirect.jten.mil.
         - Additional guidance will be forthcoming IRT the Cisco Meeting Server capability. The capability being established by DHA J6 will have several interconnected servers spread across the enterprise.
         - The following non-public facing communications tools are authorized for provider-patient medical interactions, however these technologies are not supported by the DHA or DOD.
            - Apple FaceTime
            - Google Duo
            - Microsoft Skype

e. OCONUS MTFs may utilize existing asynchronous virtual health platforms (PATH for INDOPACOM, HELP for EUCOM, AFRICOM, and CENTCOM) to obtain teleconsultation subspecialty consultation.

7. Documentation, Billing, and Coding (See **Appendix N**)
   a. When direct-to-patient telemedicine is performed, encounters should be documented in the appropriate electronic medical record (AHTLA or Genesis for outpatients, Essentris of Genesis for inpatients).
   b. If the Military Medical Treatment Facility (MTF) is open and conducting normal clinical operations, no change in coding is necessary.
   c. If the MTF is open, but is restricting access for patients who can be treated virtually, the processes are as follows:
      i. By telephone only:
         a) Document as normal for the appropriate encounter type (not in t-con module) to include history, any counseling, assessment and plan, and disposition. Include time spent during the encounter, if required, by service performed.
         b) Assign the diagnoses, as appropriate.
         c) Assign G2012 in the procedure (Healthcare Common Procedure Coding System [HCPCS]) code section.
         d) Assign E/M 99499 or leave blank.
      ii. By synchronous visual and audio telecommunications:
         a) Document as normal for the appropriate encounter type to include history, exam if done, any counseling, assessment and plan, and disposition. Include time spent during encounter if required by service performed.
         b) Assign the diagnoses, as appropriate.
         c) Assign any procedures performed and documented (e.g., psychotherapy, PHQ-9, etc.)

d) Assign appropriate Evaluation and Management (E/M) service, if performed; otherwise assign 99499 or leave blank.

e) Apply virtual encounter modifier to encounter (GT=MTF to MTF or 95=provider to patient location other than an MTF).

8. Other Considerations:
   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 a new application of telehealth, 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:
      i. Who will use your solution?
      ii. Why would they use your solution?
      iii. When would they use this solution?
      iv. Where will they use the solution (in a patient room, at a nursing station, from a home/office, to a home/office, etc.)?
      v. What combination of hardware, software, and network will be used?
      vi. How will they use it (training, how-to guides, etc.)
         1. How will they document care?
         2. How will you maintain patient regulation (admission/discharge/transfer)?
         3. How will you maintain team-based care as necessary?
   d. PRACTICE your solution on a small scale before deploying more broadly.
   e. 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.
9. 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 MEDICAL SERVICES (EMS) AND GROUND TRANSPORT OF PERSONS WITH COVID-19

Dispatch Screening for COVID-19

1. Persons assigned to EMS and first responder dispatch function should complete key question interrogation and dispatch resources accordingly. Dispatchers should reference the EMS COVID-19 questionnaire when obtaining information from 911 callers (Table 9). EMS systems may become strained due to an influx of 911 calls regarding known or suspected COVID-19 transmission or infection. In areas where EMS resources are overwhelmed by 911 call volumes, the following should be considered:
   a. EMS and/or Fire Dispatch should triage 911 calls and prioritize responses accordingly (e.g. if a patient calls reporting signs and symptoms consistent with COVID-19, but denies respiratory distress and other complaints suggestive of a life-threatening condition (i.e. chest pain, etc.), ambulance services should be directed to an alternative, higher-acuity call.

b. If EMS arrives on scene and determines that a patient does not have a life-threatening condition relating to the potential exposure to, or signs and symptoms of, COVID-19, EMS crews should contact On-line Medical Control to discuss non-transport and/or alternative transport destinations. If non-transport is approved, EMS Dispatch should direct the EMS crew to a higher-acuity 911 call. Refusal of Transport /Treat and Release should be coordinated with local On-line Medical Control

c. Callers using the 911 system for questions or concerns regarding COVID-19 testing (e.g. sites, locations, and decisions regarding testing criteria) should be diverted to established local, county, or state COVID-19 call centers. Installations and facilities should consult with their local EMS Medical Directors regarding protocols and policies pertaining to call diversion for information-only requests from 911 callers.

Pre-Arrival Screening or Initial Patient Assessment of Suspected COV-19 Patients. *(For utilization by EMS/Fire Department Dispatch OR Responding Crews)*

1. 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. With widespread COVID-19 prevalence, all patients should have a surgical-type mask on the patient (best) [or other mask type, e.g., cloth (better)].
2. If the patient's condition allows, to minimize the risk of exposure, one individual should approach the patient, placea surgical-type mask on him/her, and complete the COVID-19 screening questionnaire/ initial assessment. Additional EMS/Fire personnel should be contacted for support only as required.
3. If EMS personnel are first on-scene, and it is determined that the patient has symptoms of a respiratory illness (Box 1) and risk factors for COVID-19 (Box 2), Dispatch should be contacted to minimize response by additional units (Fire and Law Enforcement) to reduce the risk of exposure.

EMS Non-Transport/Treat on Scene

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

Table 9. Emergency Medical System/First Responder Pre-Arrival Screening for COVID-19

Does the patient have:		
BOX 1 • Fever (or are they hot to the touch) • Cough • Shortness of Breathing or Difficulty Breathing • Other flu-like symptoms (sore throat, runny nose, body aches, chills, nausea, vomiting, diarrhea, or anosmia/dysgeusia)	**AND**	**BOX 2** • Are they currently under investigation or isolation for COVID-19 by public health or other medical professionals? • 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?

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

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

Table adapted from the Southwest Texas Regional Advisory Council (STRAC); EMS Pre-Arrival Screening for Coronavirus 2019-nCOV - V1.2, issued 02/28/2020.

Table 10. Emergency Management System Patient Considerations for Non-Transport in COVID-19

PATIENT CONSIDERATION FOR NON-TRANSPORT:

INITIAL ASSESSMENT WITH VITAL SIGNS

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

· Temp < 39.4°C (103°F) · GCS 15, Alert & Oriented · HR < 100 bpm · SpO2 > 90% · Respiratory Rate 10-30
· Well appearing, speaks in full sentences, ambulatory · Viral sx: cough, sore throat, body aches, nasal/chest congestion

PATIENT MEDICAL HISTORY & PRESENTATION

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

LIVING ARRANGEMENTS

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

IF THE PATIENT IS IN A PUBLIC LOCATION

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

Pre-hospital personal should continue to reference current CDC guidance regarding PPE and Transport of PUIs or Patients with Confirmed COVID-19: https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html

EMS Transport in Resource-Limited Environments.

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

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

BETTER		
If the patient:	***Crew (in addition to the EMT/NRP driver):***	***References:***

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

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

2. Additional considerations for interfacility transport include:
   a. On-line Medical Control. On-line Medical Control must be available to transport critically ill patients.
   b. Training. Personnel involved in interfacility transports should be trained on ambulances, facility transport ventilators, infusion pumps and all required equipment. Additionally, NRPs with critical care training: Critical Care Paramedic Program (CCEMT-P), Certified Critical Care Paramedics (C-CCPs), Certified Flight Paramedics (FP-Cs), or individuals with previous critical care experience should be tasked as primary transport personnel given their increased education/experience.
   c. Ventilators. NRPs and RNs should be deemed proficient in ventilator operation and management by the local EMS Medical Director prior to performing patient transport. Ventilated patients should be transported with physician documented orders which detail ventilator settings. All patients will be monitored with wave-form capnography. If a BVM is utilized for transport, or if use of the BVM becomes necessary during transport, a positive-end expiratory pressure (PEEP) valve must be applied and dialed to the ventilator PEEP setting. Ventilators and BVMs should be equipped with HEPA filters.
   d. Intravenous/intraosseous Infusions. Many pre-hospital NRP infusions are currently delivered without the use of an infusion pump (epinephrine, norepinephrine, dopamine, amiodarone, and magnesium sulfate), however any infusion for an interfacility transfer should be on an infusion pump. Medications not detailed in the formulary outlined by EMS protocols are authorized with a written physician order. Orders should specify the name of the medication, the drug concentration, and the infusion rate. Infusions must be initiated by the sending facility. Infusions will be maintained at the physician-prescribed dosing regimen. Alterations to dosing regimens require authorization from a physician, preferably, On-line Medical Control. Rapid deterioration in patient clinical status negates the requirement for physician authorization (e.g. vasopressor titration).
   e. Prior to placing a transport request, MTF in-patient units should communicate with local EMS Medical Directors or attending Emergency Department physicians to determine transport capabilities. If possible, patient documentation (to include compact discs containing images) should be prepared prior to transport crew arrival.
3. Prior to placing a transport request, MTF in-patient units should communicate with local EMS Medical Directors or attending Emergency Department physicians to determine transport capabilities. If possible,

patient documentation (to include compact discs containing images) should be prepared prior to transport crew arrival.

4. If trained healthcare personnel are severely limited, local Medical Directors should partner with MTF and Logistics leadership to discuss the use of licensed drivers/ government owned vehicles to transport of low acuity patients.

EMS Personnel Precautions for Procedures.

1. See CDC guidance for aerosol generating procedures: https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html.
2. If patient presentation allows, EMS personnel providing care to a patient suspected of having COVID-19 should contact Medical Control and/or follow protocol before initiating an aerosol-generating procedure.
3. Nebulized medications for known or suspected COVID-19 patients should be limited given the risk of virus transmission. It is recommended that local Medical Directors work with MTF leadership to obtain single-use albuterol metered-dose inhalers with spacers for prehospital use. If an aerosol-generating procedure is required/recommended, the doors to the patient compartment of the ambulance should remain open to allow ventilation of the area during these procedures. If the ambulance is equipped with an HVAC system it should remain on during patient transport.
4. If used, BVMs, SGAs, and ET tubes should have a HEPA/viral 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/viral filters.

Mechanical CPR.

1. The American College of Cardiology's recommendation to use mechanical CPR devices on PUIs or patients with confirmed COVID-19 who arrest (https://www.acc.org/latest-in-cardiology/articles/2020/03/19/13/14/cvd-in-the-setting-of-covid-19-coronavirus-considerations-to-prepare-patients-providers-health-systems). See updated AHA ACLS and PALS Cardiac Arrest Algorithms for best practice for COVID-19 patients (April 2020). (https://professional.heart.org)
2. Local Medical Directors & EMS/Fire Leadership are responsible for ensuring personnel education of device indications/contraindications, application, and cleaning, which should be documented in training records.
3. Devices should be cleaned according to CDC recommendations for known or suspected COVID-19 patients.
4. Contact the device manufacturer for additional recommendations.

Cleaning EMS Transport Vehicles After Transporting a PUI or Patient with Confirmed COVID-19: See current CDC guidelines: https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html

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

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

EN ROUTE CRITICAL CARE CONSIDERATIONS FOR PERSONS WITH COVID-19

1. The DoD has issued a COVID-19 specific Force Health Protection Guidance (Supplement 5) to DoDI 6000.11 "Patient Movement." Attachment 1 of this supplement provides guidance for the air movement of COVID-19

patients and COVID-19 exposed persons. "Treatment in Place" remains the primary guidance. The document (https://www.whs.mil/Portals/75/Coronavirus/FHP%20Guidance%20(Supplement%205)%20-%20DoD%20Guidance%20for%20Mvmt.%20and%20Med.%20Treatment.pdf?ver=2020-04-08-142257-760) discusses procedures for obtaining an exception to policy, preferred means of transport, airframe selection, biocontainment, cabin airflow, patient placement, and infection control. It also discusses specific safety precaution considerations regarding mechanical ventilators, clinical specimen management, waste disposal, aircraft cleaning, logistical planning, and in-flight emergencies. Repeating the document is not an intent of this guidance. Medical planners and clinicians are strongly encouraged to review FHP 5 when considering transport for patients with COVID-19.

2. The following suggested treatment plans exist for Critical Care Air Transport (CCAT) teams transporting critically ill COVID-19 patients under an ETP. This section highlights considerations for flight. CCAT team members should review the relevant critical care topics elsewhere in this PMG.
3. **Biocontainment**: Civil Aviation Assets (e.g., Phoenix Air Group) should be the primary means of patient movement if capable. For USAF CCAT or aeromedical evacuation (AE) teams tasked to transport patients on USAF aircraft, the best practice is to use a biocontainment module like the DoD's transport isolation system (TIS), followed by transport in open aircraft. AMC has issued AMC COVID-19 PMP, which discusses best practices for transport in open aircraft and offers guidance on appropriate PPE measures. FHP Supplement 5 discusses these measures as well.
4. **Initial assessment**: The pre-evacuation assessment requires additional time due to the complexity of these patients. Consider continuing to treat in place those not requiring mechanical ventilation or depleting local resources in austere locations. In environments with fewer resource constraints, consider allowing patients to declare themselves on the ground to require mechanical ventilation before transport. Teleconsultation over time may assist in the management of non-ventilated patients and help determine the need for mechanical ventilation before transport.
5. **Neurologic:** Sedation can be challenging in the controlled environment of the ICU and even more complicated in flight. Adjust management to conserve common medications in short supply. Reports indicate a ceiling dose of propofol (30 mcg/kg/min), with little effect of increasing infusions. Consider combinations of acetaminophen (IV/PO), opiates (gtts/IVP/PO), propofol (gtts), atypical antipsychotics (IV/IM/PO), and sub-dissociative ketamine (IV) for a multi-modal approach to patient analgesia/sedation. Use caution with dexmedetomidine due to reports of significant bradycardia. Utilize low dose benzodiazepines (IVP) as a last resort due to their association with delirium and prolonged mechanical ventilation. Continue the same or a more aggressive analgesia/sedation strategy for flight if a patient is receiving neuromuscular blockade.
6. **Pulmonary:** Anecdotal evidence suggests a subset of COVID-19 patients whose hypoxia rapidly corrects with awake proning and supplemental oxygen. Additionally, anecdotal evidence indicates some patients fare poorly with early intubation. Therefore, the traditional CCAT practice of intubation solely for the flight may not be appropriate. CCAT team leads must consider the difficulty in predicting when COVID-19 patients will deteriorate, and anticipate a need for in-flight intubation. Plan patient placement and airflow characteristics on the aircraft to minimize aircraft/crew exposure in case of in-flight intubation. Patients with persistent respiratory distress, complaints of dyspnea, persistent hypoxia with SpO_2 <92%, or a pH of <7.2 despite preflight proning and conventional supplemental oxygen likely indicate a need for intubation. Careful observation during flight and avoiding intubation may be appropriate for patients whose symptoms improve with awake proning and supplemental oxygen. Consider using the low PEEP table for intubated patients with a low driving pressure (Pplat – PEEP) and 6-8 ml/kg IBW tidal volume. Conversely, for patients with moderate to severe ARDS and less compliant lungs with a higher driving pressure, consider using the high PEEP table.

   Cabin Altitude Restriction (CAR): Consider a CAR when transporting non-intubated patients requiring supplemental oxygen or intubated patients on high PEEP or high FiO_2 in anticipation of potential in-flight patient decompensation. During pre-mission planning, the CCATT lead should discuss a CAR with the TPRMC validating flight surgeon. A lower CAR is associated with a longer duration of the flight. A sea-level CAR can provide an increased safety buffer if the aircraft is capable.

Prone Positioning: Strongly consider lung team consultation before transporting intubated patients in the prone position or patients requiring PEEP >14, FiO_2 >60%. For intubated patients that are to be transported in the prone position, initiate prone positioning preflight with adequate time (i.e., >4 hours or physician discretion) to verify patient stability and adequate ABG. After proning, wean FiO2 to maintain SpO2 >92%. Ideally, design a patient load strategy allowing access for bilateral chest tubes placement, particularly when utilizing high PEEP. Prone positioning complicates the treatment of cardiac arrhythmias, cardiac arrest, pneumothorax, and shock. Before proning, consider placing cardioversion pads for dysrhythmia treatment. Leave the patient on the ventilator to avoid additional aerosolized particles during cardiac arrest. Consider CPR in the prone position during cardiac arrest (see AHA 2010 guidelines). Avoid rotation (proning/reversal) of intubated patients during flight. Refer to **Appendix C** for further discussion of prone positioning. It highlights the need for thorough patient handoff preflight. Be aware prone positioning requires frequent repositioning and padding to prevent pressure wounds. Prone-positioned patients may have intermittent scheduled times in a supine position. Cautiously consider patient movement during the supine period, as FiO_2 requirements usually increase upon supination and may continue to increase throughout the supine period.

Refer to **Appendix H** for a demonstration of the transport ventilator setup.

Table 11 shows the required FiO_2 to maintain a constant PaO_2 at different altitudes. It may be useful when assessing stability for flight and the need for cabin altitude restriction.

Table 11. Altitude Physiology Table

Altitude (ft)	*Barometric Pressure (mmHg)*	*FIO_2 Required to Maintain Constant PaO_2*[1]									*PIO_2 While Breathing:* 0.21	0.40	0.60	0.80	100	*Gas Volume Expansion (% at Sea Level)*
16000	412	0.41	0.59	0.78	0.98						76	146	219	292	365	184
14000	446	0.37	0.53	0.71	0.89						83	160	239	319	399	170
12000	483	0.34	0.49	0.65	0.81	0.98					91	174	262	349	436	157
10000	523	0.31	0.45	0.60	0.75	0.90					100	190	286	381	476	145
8000	564	0.29	0.41	0.55	0.69	0.83	0.96				108	207	310	414	517	135
6000	609	0.27	0.38	0.51	0.63	0.76	0.89				118	226	337	450	562	125
4000	656	0.24	0.35	0.47	0.58	0.70	0.82	0.94			127	244	365	487	609	116
2000	707	0.23	0.32	0.43	0.54	0.65	0.76	0.86	0.97		138	264	396	528	660	107
Sea Level	760	0.21	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0	149	285	428	570	713	100

7. **Cardiovascular:** Optimize electrolytes (e.g., Ca, Mg, and K) preflight due to the incidence of tachydysrhythmias. Consider requesting electrolyte supplementation preflight due to the allowance standard limitations. Review the EKG. Consider holding QTc prolonging medications (e.g., chloroquine derivatives, antipsychotics, etc.) if the QTc >500 ms. Due to the incidence of cardiomyopathy, obtain an echo preflight to inform treatment if in-flight shock develops. For intubated patients, place a CVC preflight, in case a vasopressor requirement develops during the flight.
8. **Renal:** AKI is common in COVID-19 patients. Renally adjust medication dosage and convert renally metabolized medications as appropriate (e.g., morphine -> dilaudid, or lovenox -> heparin).
9. **Gastrointestinal**: Continue stress ulcer prophylaxis. Continue post-pyloric enteric feeds, as suggested in **Appendix K**. OGT should be placed preflight and on intermittent suction.
10. **Fluids:** Euvolemia is the goal. If hypovolemia is suspected, consider low volume (250–500ml) boluses of balanced crystalloid solutions. Anticipate K and Mg replacement need if patient diuresis is ongoing. Recall potassium is not in the CCATT allowance standard.
11. **Heme:** Ensure administration of DVT prophylaxis. Anecdotal evidence suggests some COVID-19 patients are affected by pulmonary microvascular thrombosis. Guidance for treatment is not within the realm of this section of the PMG. Recommend discussion with sending/receiving critical care specialists to determine the dose of prophylactic anticoagulation.
12. Non-COVID-19 patient transports may continue within the PM system. Utilize standard transmission-based precautions in accordance with AFI 48-307. Movements should be requested when it is essential to provide appropriate care while minimizing opportunities for transmission of pathogens within and between theaters and countries.

PUBLIC HEALTH CONSIDERATIONS AND RESPONSE

1. **Public Health Emergency Management (PHEM)**
   a. Primary reference: DoDI 6200.03 (Public Health Emergency Management (PHEM) within the DoD); March 28, 2019.
   b. The Public Health Emergency Officer (PHEO). PHEOs provide military commanders with guidance and recommendations on preparing for, declaring, responding to, mitigating, and recovering from public health emergencies. PHEO responsibilities fall into 10 major categories, including: advising the military commander regarding the declaration of a public health emergency and the implementation of emergency health powers, assisting in public affairs risk communications, including dissemination of health protection measures detailed in the Health Protection Condition (HPCON) framework in coordination with the Public Affairs Officer, coordinating with other DoD Components, civilian state, legal, tribal, and territories (SLTT), other federal agencies, and others.
   c. Declaring a Public Health Emergency (PHE): Commanders must be prepared to make timely decisions in order to protect lives, property, and infrastructure and enable DoD installations and/or military commands to sustain mission-critical operations and essential services. Declaration of a PHE allows the installation commander access to the medical emergency powers described in DoDI 6200.03, including restriction of movement (ROM), directing examinations and testing, and controlling or restricting the distribution of commodities, and others. The process by which the Commander makes decision to declare a PHE is summarized in the DoDI.
   d. Health Protection Condition (HPCON) levels are used during a health emergency to communicate what health protection measures are currently being used to prevent the spread of disease in the population. The decision to adjust HPCON posture is not based on strictly objective criteria - rather, it is based on a constellation of factors. These factors are similar to deciding whether to declare a Public Health Emergency. The decision to adjust HPCON levels may be more political than one driven by public health statistics. If the public health recommendations are being mostly followed with few exceptions, and the command continues to support public health interventions as they are needed, then the specific HPCON level is less (from a strictly public health perspective) relevant. For example:
      i. Evidence of repeated noncompliance with public health guidance among the installation community.
      ii. Difficulties in getting supervisors and/or employees to follow public health guidelines for example, regarding guidance on returning to work.
      iii. Any difficulties encountered by public health personnel in conducting duties required to investigate a public health threat, e.g. a case investigation and contact tracing.
      iv. A sense from commanders that the installation community is panicking, or is on the verge of panic.
   e. Further information on HPCONs can be found in the DODI and at: https://phc.amedd.army.mil/topics/campaigns/covid19/Pages/HPCON.aspx
   f. PHEM training courses (which is required by DoDI 6200.03) and POCs can be found at: https://www.health.mil/Training-Center/Defense-Medical-Readiness-Training-Institute/Public-Health-Emergency-Management-Course
2. **Non-pharmaceutical interventions (NPIs)** are critical when no vaccine or therapeutic is available to mitigate a public health threat. NPIs directed towards control of COVID-19, for example, were largely based on the CDC's "Community Mitigation Guidelines to Prevent Pandemic Influenza—United States, 2017," at: https://www.cdc.gov/mmwr/volumes/66/rr/rr6601a1.htm. These include:
   a. Personal Protective Measures (PPMs) for Everyday Use
      i. Voluntary home isolation (i.e., staying home when ill or self-isolation)
      ii. Respiratory etiquette
      iii. In health care settings, screening for respiratory symptoms immediately upon entry.
      iv. Hand hygiene
   b. Personal Protective Measures (PPMs) Reserved for Pandemics. During a pandemic, the PPMs described above should be strengthened and augmented with additional measures:

i. Active, rapid identification of persons having symptoms consistent with COVID-19, followed by referral for testing and home isolation.
ii. Identification and home quarantine of non-ill household members or other close contacts of persons with COVID-19. See "contact tracing" section below.
iii. Use of face masks or cloth face coverings by well persons. IMPORTANT NOTE: respirators (e.g. N95, PAPR) are medical supplies and are reserved for use by at-risk medical providers. See information differentiating masks and respirators at: https://phc.amedd.army.mil/topics/campaigns/covid19/Pages/healthcare.aspx
iv. Preemptive or reactive school and work closures/dismissals.
v. Elimination or reduction of other mass gatherings.
vi. Social/physical distancing measures to no less than 6 feet separation.
vii. Environmental surface cleaning measures in all settings.

3. **Contact tracing** (also called contact investigation): When a person gets sick, they are interviewed by public health personnel to make a contact list of other individuals who they might have exposed. The steps include:
   a. Contact identification: Each case of COVID-19 is interviewed to identify contacts (people) and activities starting 2 days before symptoms started.
   b. Contact notification: All contacts are notified that they may have been exposed to COVID-19.
   c. Contact follow-up: Regular follow-up may be needed with all contacts to monitor for symptoms and provide additional information about COVID-19.

   PLEASE NOTE! Contact tracing is very time consuming and requires large amount of man power! Therefore, force multiplying protocols were developed to train nonmedical individuals to assist in the process. Additional information on contact tracing, including a toolkit for contact tracing, can be found at: https://phc.amedd.army.mil/topics/campaigns/covid19/Pages/healthcare.aspx
4. **Risk assessment for potential COVID-19 exposures:**
   a. Travel exposures: Includes travel from a country with widespread ongoing transmission (currently includes all countries), or travel on cruise ship or river boat. Public health actions include (https://www.cdc.gov/coronavirus/2019-ncov/php/risk-assessment.html): (1) Stay home until 14 days after arrival and maintain a distance of at least 6 feet (2 m) from others; (2) Self-monitor for symptoms and check temperature twice a day; (3) Avoid contact with people at higher risk for severe illness; and (4) Follow CDC guidance if symptoms develop.
   b. Community-based exposures (https://www.cdc.gov/coronavirus/2019-ncov/php/public-health-recommendations.html):
      i. Applies to: Household members, intimate partners, individuals providing care in a household without using recommended infection control precautions, and Individuals who have had close contact (< 6 feet) for a prolonged period of time
      ii. Exposure to: Person with symptomatic COVID-19 during period from 48 hours before symptoms onset until meets criteria for discontinuing home isolation
      (can be a laboratory-confirmed disease or a clinically compatible illness in a state or territory with widespread community transmission)
      iii. Public health actions: same as under "travel exposures" above
   c. Health care worker exposures (https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-risk-assesment-hcp.html). Healthcare facilities should consider foregoing contact tracing for exposures in a healthcare setting in favor of universal source control for all healthcare personnel and screening for fever and symptoms before every shift. Proper adherence to currently recommended infection control practices, including all recommended PPE, should protect HCP having prolonged close contact with patients infected with COVID-19. However, to account for any inconsistencies in use or adherence that could result in unrecognized exposures, HCP should still perform self-monitoring with delegated supervision.
      i. High risk exposures refer to HCP who have had prolonged close contact with patients with COVID-19 (**beginning 48 hours before onset of symptoms**) who were not wearing a cloth face covering or facemask while HCP nose and mouth were exposed to material potentially infectious with the virus causing COVID-19. Being present in the room for procedures that generate aerosols or during which respiratory secretions are likely to be poorly controlled are also considered high risk.

ii. *Medium-risk* exposures generally include HCP who had prolonged close contact with patients with COVID-19 (**beginning 48 hours before onset of symptoms**) who were wearing a cloth face covering or facemask while HCP nose and mouth were exposed to material potentially infectious with the virus causing COVID-19. Some *low-risk* exposures are considered *medium-risk* depending on the type of care activity performed.

iii. *Low-risk* exposures generally refer to brief interactions with patients with COVID-19 (beginning 48 hours before onset of symptoms) or prolonged close contact with patients (beginning 48 hours before onset of symptoms) who were wearing a cloth face covering or facemask for source control while HCP were wearing a facemask or respirator.

iv. No identifiable risk. HCP with no direct patient contact and no entry into active patient management areas who adhere to routine safety precautions do not have a risk of exposure to COVID-19.

5. **Guidance for when to discontinue isolation.**
   a. Non-health care settings; see https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html for more information
      i. *Test-based strategy.* Exclude from work until:
         a) Resolution of fever without the use of fever-reducing medications **and**
         b) Improvement in respiratory symptoms (e.g., cough, shortness of breath), **and**
         c) Negative results of an FDA Emergency Use Authorized molecular assay for COVID-19 from at least two consecutive nasopharyngeal swab specimens collected ≥24 hours apart (total of two negative specimens)
      ii. *Non-test-based strategy.* Exclude from work until:
         a) At least 3 days (72 hours) have passed *since recovery* defined as resolution of fever without the use of fever-reducing medications **and** improvement in respiratory symptoms (e.g., cough, shortness of breath); **and**
         b) At least 7 days have passed *since symptoms first appeared*
   b. Return to work criteria for HCP: The *test-based strategy* or the *non-test-based strategy* (aka *symptom-based strategy*) above may be used with the following differences:
      i. HCP *with symptoms* may use either strategy, but if using the *symptom-based strategy*, they should be excluded from work until 10 days have passed since symptoms appeared
      ii. HCP *without symptoms* may use the *test-based strategy* or a *time-based strategy*, in which HCP are excluded from work until 10 days have passed since the date of their first positive COVID-19 diagnostic test. If they develop symptoms, then the *symptom-based* or *test-based strategy* should be used.

      See: https://www.cdc.gov/coronavirus/2019-ncov/hcp/return-to-work.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhealthcare-facilities%2Fhcp-return-work.html
6. **Reporting and Surveillance:** All confirmed and probable cases of COVID-19 must be reported to design, inform, and evaluate control and prevention efforts. Cases are reported by military public health personnel to BOTH: 1) military and 2) civilian public health authorities. Military service members and other beneficiaries must be reported through military public health authorities via the Disease Reporting System internet (DRSi) in coordination with the Service-specific public health chain of command. All cases must also be reported to the supporting local or state health department according to state requirements. All DoD medical reporting entities should report cases of COVID-19 to the DRSi using the "COVID-19" and answer all event-related questions in the report. Cases must be classified according to the most recent DoD case definition for COVID-19.

WHOLE OF GOVERNMENT RESPONSE IN COORDINATION OF RESOURCES

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

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

HHS link to Resources: https://www.phe.gov/emergency/Tools/Pages/default.aspx
HHS Regional Emergency Coordinators Contact List: https://www.phe.gov/Preparedness/responders/rec/Pages/default.aspx
State FEMA Office contacts: https://www.fema.gov/emergency-management-agencies

ETHICAL CONSIDERATIONS DURING THE COVID-19 PANDEMIC

The Military Health System (MHS) has been on the cutting edge with providing healthcare services with respect to the COVID 19 pandemic. Responding to the COVID pandemic highlights the importance of medicine. But along with it can come significant questions and concerns regarding the availability of staff, resources, and equipment, particularly as we watch in the news what the private healthcare sector is experiencing. DODI Instruction 6025.27, Medical Ethics in the Military Health System, November 8, 2017, and DHA IPM DHA IPM 18-012: The DoD Medical Ethics Program (DoDMEP) in the Military Health System (MHS) - Extended, provide the framework for a medical ethics program within the MHS. Early in the nation's response efforts, private sector healthcare personnel raised concerns about the potential for the scarcity of resources and patient triage. In turn, the Defense Medical Ethics Center outlined one methodology for analyzing these issues and provided that advice to some MTFs. The MHS did not see similar concerns arise regarding resources and has consistently been able to meet all the medical resourcing needs to provide medical care to its patients. The DoD does not endorse any one specific method for addressing ethical issues that may face MTF leadership. Every situation is different and based on unique facts, circumstances and applicable law.

MHS Principles of Medical Ethics

The MHS embraces the principles of professional ethics of America's health care professions whose members are represented in the Military Services. Codes of ethics developed by health care professional organizations recognize responsibility to patients first and foremost and to society. The MHS views the responsibilities of health care personnel and military professionals as mutually reinforcing. Members of the MHS will:

1. Provide competent health care with compassion and respect for human dignity and rights. All individuals are treated with respect and tolerance. Discrimination on the basis of age, sexual orientation, gender, race, ethnicity, language, disease, disability, religion, or rank is forbidden because it is inconsistent with the ideals and principles of the MHS.
2. Uphold the standards of professionalism. Members must be honest in all professional interactions; support open and honest communication among members of the health care team and promote the utmost professionalism of all health care colleagues.
3. Advocate for the best possible health interests of patients while respecting the law and lawful military authority.
4. Respect the rights of patients, colleagues, and other health care personnel, and safeguard patient confidences and privacy within the constraints of the law.
5. Complete appropriate education and training, as necessary, and provide competent and ethical health care.
6. Support patient-centered decision-making; engaging patients, surrogate decision-makers, and members of the health care team in decisions, as appropriate.
7. Use the expertise of the health professions to minimize the incidence and severity of injuries and illnesses.
8. Consider the context of local culture, custom, capabilities, and sustainment in overseas humanitarian and disaster relief activities and use available resources to achieve the greatest good for the greatest number.

9. Uphold responsibilities under the law in caring for enemy combatants. Responsibilities include, but are not limited to:
   a. Not participating in or acquiescing to torture or cruel, inhumane, or degrading treatment or punishment in battlefield or detention setting.
   b. Reporting to appropriate authorities all suspected violations of these obligations.
10. Regard responsibility to the patient as a primary responsibility, but recognize there may be extraordinary circumstances associated with the mission or military necessity that may require additional considerations and ethical consultation.

OTHER CONSIDERATIONS RELATED TO COVID-19

Facilities.

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

1. DHA Facilities Enterprise recommends maintaining building ventilation systems in balance and compliant. Attempts to adjust without professional mechanical engineering support may cause harm and rework later.
2. Medical facilities (hospitals/clinics) or administrative facilities are recommended not to alter the HVAC system operations or filtration in any way due to the outbreak of COVID-19.
3. Building maintenance personnel should not be exposed to COVID-19 unless they are physically in the same room as an infected person or come in contact with surfaces that have not been disinfected (such as air filters). No special COVID-19 PPE is required for maintenance personnel unless they are charged with disinfecting surfaces or working where infected persons may have deposited live virus. In those cases, the maintenance personnel should follow CDC guidelines.
4. Although it is not known exactly how long the virus can survive on a surface outside the human carrier, some reports suggest up to 4 days on some materials.
5. If a maintenance worker becomes infected with COVID-19, it is recommend to clean all surfaces the worker may have been in contact with for the past 7 days. A review of all work orders completed by the infected maintenance staff will aid in discovering where and when the employee contacted other surfaces.
6. DHA Facilities Enterprise does NOT recommend increasing filter media such as changing Minimum Efficiency Reporting Value (MERV) rated filters to High Efficiency Particulate Air (HEPA) if it is being done purely in hope of stopping the spread of COVID-19. MTFs should not add higher rated filters to existing HVAC systems without proper engineering management since the HVAC system may become imbalanced which could result in loss of isolation rooms. Care must to be taken not to exceed the design performance of the HVAC as it will likely reduce equipment life with little or no positive impact.
7. The use of Ultraviolet (UV) lights in the HVAC system (e.g., AHU or ductwork) is not recommended for COVID mitigation.
8. The use of mobile or fixed air scrubber with integral HEPA or Ultra-Low Particulate Air (*ULPA*) filter may be used to increase the air changes in a room. Air scrubbers when used to create negative pressure rooms must be cautious in discharging exhaust air to the outside of the building or into the return air system. Coordination with Facilities Management, a professional mechanical engineer, Industrial Hygiene and Infection Control team to ensure virus exposures are minimized and tested prior to room use.
9. There are many new and evolving technologies coming out of industry today as a result of the COVID pandemic that claim to have outstanding results in mitigating COVID-19 viruses. Many of these systems are either experimental or have not been proven in the healthcare setting. DHA FE cannot advocate the use these systems at this time. Should a MTF wants to install a new technology, we recommend a multi-discipline support team with engineers, infection control, and industrial hygiene practitioners to review and validate the product before purchasing to ensure it meets the building's requirements, is maintainable, and can produce the desired mitigation for the MTF.

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. Du Y, Tu L, Zhu P, Mu M, Wang R, Yang P, et al. Clinical Features of 85 Fatal Cases of COVID-19 from Wuhan: A Retrospective Observational Study. Am J Respir Crit Care Med. 2020.
6. 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.
7. 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.
8. Lauer SA, Grantz KH, Bi Q, Jones FK, Zheng Q, Meredith HR, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. Ann Intern Med. 2020.
9. 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.
10. 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.
11. 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.
12. 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.
13. American Academy of Otolaryngology-Head and Neck Surgery Coronavirus Disease 2019: Resources 2020 [Available from: https://www.entnet.org/content/coronavirus-disease-2019-resources.
14. Cheung KS, Hung IF, Chan PP, Lung KC, Tso E, Liu R, et al. Gastrointestinal Manifestations of SARS-CoV-2 Infection and Virus Load in Fecal Samples from the Hong Kong Cohort and Systematic Review and Meta-analysis. Gastroenterology. 2020.
15. 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.
16. Breslin N, Baptiste C, Miller R, Fuchs K, Goffman D, Gyamfi-Bannerman C, et al. COVID-19 in pregnancy: early lessons. Am J Obstet Gynecol MFM. 2020:100111.
17. 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.
18. Di Mascio D, Khalil A, Saccone G, Rizzo G, Buca D, Liberati M, et al. Outcome of Coronavirus spectrum infections (SARS, MERS, COVID 1 -19) during pregnancy: a systematic review and meta-analysis. Am J Obstet Gynecol MFM. 2020:100107.
19. Mullins E, Evans D, Viner RM, O'Brien P, Morris E. Coronavirus in pregnancy and delivery: rapid review. Ultrasound in Obstetrics & Gynecology.n/a(n/a).
20. Della Gatta AN, Rizzo R, Pilu G, Simonazzi G. COVID19 during pregnancy: a systematic review of reported cases. Am J Obstet Gynecol. 2020.
21. 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.
22. 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.

23. 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.
24. 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.
25. 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.
26. Liu W, Zhang Q, Chen J, Xiang R, Song H, Shu S, et al. Detection of Covid-19 in Children in Early January 2020 in Wuhan, China. N Engl J Med. 2020.
27. CDC COVID-19 Response Team. Coronavirus Disease 2019 in Children - United States, February 12-April 2, 2020. MMWR Morb Mortal Wkly Rep. 2020 Apr 10;69(14):422-426. [Available from: https://www.cdc.gov/mmwr/volumes/69/wr/mm6914e4.htm.
28. Xiao AT, Tong YX, Zhang S. Profile of RT-PCR for SARS-CoV-2: a preliminary study from 56 COVID-19 patients. Clin Infect Dis. 2020.
29. 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.
30. Klok FA, Kruip M, van der Meer NJM, Arbous MS, Gommers D, Kant KM, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. Thromb Res. 2020.
31. Varga Z, Flammer AJ, Steiger P, Haberecker M, Andermatt R, Zinkernagel AS, et al. Endothelial cell infection and endotheliitis in COVID-19. Lancet. 2020.
32. 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.
33. 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.
34. Stroud C, Altevogt B, Nadig L. Crisis Standards of Care: Summary of a Workshop Series. Washington DC; 2010.
35. 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.
36. 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.
37. 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.
38. 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.
39. 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.
40. 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.
41. 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.
42. World Health Organization. WHO Checklist for Influenza Pandemic Preparedness Planning. Switzerland; 2005.
43. Wise RA. The creation of emergency health care standards for catastrophic events. Acad Emerg Med. 2006;13(11):1150-2.
44. Martland A, Huffines M, Henry K. Surge Priority Planing COVID-19: Critical Care Staffing and Nursing Considerations 2020 [Available from: https://www.chestnet.org/Guidelines-and-Resources/Resources/Surge-

Priority-Planning-COVID-19-Critical-Care-Staffing-and-Nursing-Considerations.
45. 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.
46. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Can J Anaesth. 2020.
47. Tosh PK, Burry L. Essential Institutional Supply Chain Management in the Setting of COVID-19 Pandemic 2020 [Available from: https://www.chestnet.org/Guidelines-and-Resources/Resources/Essential-Institutional-Supply-Chain-Management-in-the-Setting-of-COVID-19-Pandemic.
48. Bilben B, Grandal L, Sovik S. National Early Warning Score (NEWS) as an emergency department predictor of disease severity and 90-day survival in the acutely dyspneic patient - a prospective observational study. Scand J Trauma Resusc Emerg Med. 2016;24:80.
49. 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.
50. US FDA Emergency Use Authorization 2020 [Available from: https://www.fda.gov/emergency-preparedness-and-response/mcm-legal-regulatory-and-policy-framework/emergency-use-authorization#covidinvitrodev
51. Wang W, Xu Y, Gao R, Lu R, Han K, Wu G, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. JAMA. 2020.
52. Kim S, Kim D, Lee B. Insufficient Sensitivity of RNA Dependent RNA Polymerase Gene of SARS-CoV-2 Viral Genome as Confirmatory Test using Korean COVID-19 Cases. Preprints 2020.
53. IDSA COVID-19 Antibody Testing Primer, Updated April 29, 2020 2020 [Available from: https://www.idsociety.org/globalassets/idsa/public-health/covid-19/idsa-covid-19-antibody-testing-primer.pdf.
54. WHO. Immunity passports in the context of COVID-19 2020 [updated April 24, 2020. Available from: https://www.who.int/news-room/commentaries/detail/immunity-passports-in-the-context-of-covid-19.
55. NIH. Coronavirus Disease 2019 (COVID-19) Treatment Guidelines 2020 [Available from: https://covid19treatmentguidelines.nih.gov.
56. 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.
57. 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.
58. 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.
59. Xia W, Shao J, Guo Y, Peng X, Li Z, Hu D. Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults. Pediatric Pulmonology.n/a(n/a).
60. 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.
61. Alhazzani W, Møller MH, Arabi YM, Loeb M, Gong MN, Fan E, et al. Surviving Sepsis Campaign: Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19). Critical Care Medicine. 2020.
62. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected: World Health Organization; 2020 [13 March 2020:[Available from: https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected.
63. He HW, Liu DW. Permissive hypoxemia/conservative oxygenation strategy: Dr. Jekyll or Mr. Hyde? J Thorac Dis. 2016;8(5):748-50.
64. Hui DS, Chow BK, Lo T, Tsang OTY, Ko FW, Ng SS, et al. Exhaled air dispersion during high-flow nasal cannula therapy versus CPAP via different masks. Eur Respir J. 2019;53(4).
65. Mauri T, Spinelli E, Mariani M, Guzzardella A, Del Prete C, Carlesso E, et al. Nasal High Flow Delivered within

the Helmet: A New Noninvasive Respiratory Support. Am J Respir Crit Care Med. 2019;199(1):115-7.
66. Patel BK, Wolfe KS, Pohlman AS, Hall JB, Kress JP. Effect of Noninvasive Ventilation Delivered by Helmet vs Face Mask on the Rate of Endotracheal Intubation in Patients With Acute Respiratory Distress Syndrome: A Randomized Clinical Trial. JAMA. 2016;315(22):2435-41.
67. Patel BK, Hall JB, Kress JP. Face Mask vs Helmet for Noninvasive Ventilation-Reply. JAMA. 2016;316(14):1497.
68. Puah SHea. ATS/APSR Joint Webinar: Global Persectives of COVID 19. March 30, 2020 2020 [Available from: https://www.youtube.com/watch?v=fl-Kf3vkCwQ&feature=youtu.be.
69. Scaravilli V, Grasselli G, Castagna L, Zanella A, Isgro S, Lucchini A, et al. Prone positioning improves oxygenation in spontaneously breathing nonintubated patients with hypoxemic acute respiratory failure: A retrospective study. J Crit Care. 2015;30(6):1390-4.
70. Ding L, Wang L, Ma W, He H. Efficacy and safety of early prone positioning combined with HFNC or NIV in moderate to severe ARDS: a multi-center prospective cohort study. Crit Care. 2020;24(1):28.
71. Zuo MZ, Huang YG, Ma WH, Xue ZG, Zhang JQ, Gong YH, et al. Expert Recommendations for Tracheal Intubation in Critically ill Patients with Noval Coronavirus Disease 2019. Chin Med Sci J. 2020.
72. Mohlenkamp S, Thiele H. Ventilation of COVID-19 patients in intensive care units. Herz. 2020.
73. Gattinoni L, Coppola S, Cressoni M, Busana M, Rossi S, Chiumello D. Covid-19 Does Not Lead to a "Typical" Acute Respiratory Distress Syndrome. American Journal of Respiratory and Critical Care Medicine.0(ja):null.
74. Brower RG, Matthay MA, Morris A, Schoenfeld D, Thompson BT, Wheeler A. Acute Respiratory Distress Syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med. 2000;342(18):1301-8.
75. Guerin C, Reignier J, Richard JC. Prone positioning in the acute respiratory distress syndrome. N Engl J Med. 2013;369(10):980-1.
76. Pan C, Zhang W, Du B, Qiu HB, Huang YZ. [Prone ventilation for novel coronavirus pneumonia: no time to delay]. Zhonghua Nei Ke Za Zhi. 2020;59(0):E007.
77. Albert RK, Hubmayr RD. The prone position eliminates compression of the lungs by the heart. Am J Respir Crit Care Med. 2000;161(5):1660-5.
78. Cornejo RA, Diaz JC, Tobar EA, Bruhn AR, Ramos CA, Gonzalez RA, et al. Effects of prone positioning on lung protection in patients with acute respiratory distress syndrome. Am J Respir Crit Care Med. 2013;188(4):440-8.
79. Nyren S, Radell P, Lindahl SG, Mure M, Petersson J, Larsson SA, et al. Lung ventilation and perfusion in prone and supine postures with reference to anesthetized and mechanically ventilated healthy volunteers. Anesthesiology. 2010;112(3):682-7.
80. Guerin C, Reignier J, Richard JC, Beuret P, Gacouin A, Boulain T, et al. Prone positioning in severe acute respiratory distress syndrome. N Engl J Med. 2013;368(23):2159-68.
81. Samanta S, Samanta S, Wig J, Baronia AK. How safe is the prone position in acute respiratory distress syndrome at late pregnancy? Am J Emerg Med. 2014;32(6):687 e1-3.
82. Enforcement Policy for Ventilators and Accessories and other Respiratory Devices During the Coronavirus Disease 2019 Public Health Emergency. FDA Guidance Article. March 2020 [Available from: https://www.fda.gov/regulatory-information/search-fda-guidance-documents/enforcement-policy-ventilators-and-accessories-and-other-respiratory-devices-during-coronavirus.
83. Consensus Statement on Multiple Patients Per Ventilator. American Association for Respiratory Care, American Society of Anesthesiologists, Anesthesia Patient Safety Foundation, American Association of Critical-Care Nurses, and American College of Chest Physicians. 3/26/2020 2020 [Available from: https://www.sccm.org/Disaster/Joint-Statement-on-Multiple-Patients-Per-Ventilato.
84. CDC. COVID-19 – Ventilators 2020 [Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/ventilators.html.
85. Optimizing Ventilator Use during the COVID-19 Pandemic. U.S. Public Health Service Commissioned Corps. 3/31/2020 2020 [Available from: https://www.hhs.gov/sites/default/files/optimizing-ventilator-use-during-covid19-pandemic.pdf.
86. Bangalore S, Sharma A, Slotwiner A, Yatskar L, Harari R, Shah B, et al. ST-Segment Elevation in Patients with Covid-19 - A Case Series. N Engl J Med. 2020.
87. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting

Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA. 2020.
88. Li B, Yang J, Zhao F, Zhi L, Wang X, Liu L, et al. Prevalence and impact of cardiovascular metabolic diseases on COVID-19 in China. Clin Res Cardiol. 2020;109(5):531-8.
89. ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic. (2020, April 21) 2020 [Available from: https://www.escardio.org/Education/COVID-19-and-Cardiology/ESC-COVID-19-Guidance.
90. Kirkpatrick J, Mitchell C, Taub C, Kort S, Hung J, Swaminathan M. ASE Statement on Protection of Patients and Echocardiography Service Providers During the 2019 Novel Coronavirus Outbreak. Updated April 1, 2020. 2020 [Available from: https://www.asecho.org/ase-statement-covid-19/.
91. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth Universal Definition of Myocardial Infarction (2018). J Am Coll Cardiol. 2018;72(18):2231-64.
92. Shi S, Qin M, Shen B, Cai Y, Liu T, Yang F, et al. Association of Cardiac Injury With Mortality in Hospitalized Patients With COVID-19 in Wuhan, China. JAMA Cardiology. 2020.
93. Clerkin KJ, Fried JA, Raikhelkar J, Sayer G, Griffin JM, Masoumi A, et al. Coronavirus Disease 2019 (COVID-19) and Cardiovascular Disease. Circulation.0(0).
94. Choi AD, Abbara S, Branch KR, Feuchtner GM, Ghoshhajra B, Nieman K, et al. Society of Cardiovascular Computed Tomography guidance for use of cardiac computed tomography amidst the COVID-19 pandemic Endorsed by the American College of Cardiology. Journal of Cardiovascular Computed Tomography.
95. 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.
96. Hu H, Ma F, Wei X, Fang Y. Coronavirus fulminantmyocarditis treated with glucocorticoid and human immunoglobulin. European Heart Journal. 2020.
97. Welt FGP, Shah PB, Aronow HD, Bortnick AE, Henry TD, Sherwood MW, et al. Catheterization Laboratory Considerations During the Coronavirus (COVID-19) Pandemic: From ACC's Interventional Council and SCAI. Journal of the American College of Cardiology. 2020.
98. Edelson DP, Sasson C, Chan PS, Atkins DL, Aziz K, Becker LB, et al. Interim Guidance for Basic and Advanced Life Support in Adults, Children, and Neonates With Suspected or Confirmed COVID-19: From the Emergency Cardiovascular Care Committee and Get With the Guidelines((R))-Resuscitation Adult and Pediatric Task Forces of the American Heart Association in Collaboration with the American Academy of Pediatrics, American Association for Respiratory Care, American College of Emergency Physicians, The Society of Critical Care Anesthesiologists, and American Society of Anesthesiologists: Supporting Organizations: American Association of Critical Care Nurses and National EMS Physicians. Circulation. 2020.
99. Zheng YY, Ma YT, Zhang JY, Xie X. COVID-19 and the cardiovascular system. Nat Rev Cardiol. 2020.
100. Zhang P, Zhu L, Cai J, Lei F, Qin J-J, Xie J, et al. Association of Inpatient Use of Angiotensin Converting Enzyme Inhibitors and Angiotensin II Receptor Blockers with Mortality Among Patients With Hypertension Hospitalized With COVID-19. Circulation Research.0(0).
101. Arentz M, Yim E, Klaff L, Lokhandwala S, Riedo FX, Chong M, et al. Characteristics and Outcomes of 21 Critically Ill Patients With COVID-19 in Washington State. JAMA. 2020.
102. Cheng Y, Luo R, Wang K, Zhang M, Wang Z, Dong L, et al. Kidney disease is associated with in-hospital death of patients with COVID-19. Kidney International. 2020.
103. Kellum JA, Lameire N, Aspelin P, Barsoum RS, Burdmann EA, Goldstein SL, et al. Improving global outcomes (KDIGO) acute kidney injury work group. KDIGO clinical practice guideline for acute kidney injury. Kidney International Supplements. 2012;2:1-138.
104. Bergman P, Lindh AU, Bjorkhem-Bergman L, Lindh JD. Vitamin D and Respiratory Tract Infections: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. PLoS One. 2013;8(6):e65835.
105. Cannell JJ, Vieth R, Umhau JC, Holick MF, Grant WB, Madronich S, et al. Epidemic influenza and vitamin D. Epidemiol Infect. 2006;134(6):1129-40.
106. Holick MF. The vitamin D deficiency pandemic: Approaches for diagnosis, treatment and prevention. Rev Endocr Metab Disord. 2017;18(2):153-65.
107. Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. BMJ. 2017;356:i6583.

108. McCarthy MS, Elshaw EB, Szekely BM, Raju D. A Prospective Cohort Study of Vitamin D Supplementation in AD Soldiers: Preliminary Findings. Mil Med. 2019;184(Suppl 1):498-505.
109. Rondanelli M, Miccono A, Lamburghini S, Avanzato I, Riva A, Allegrini P, et al. Self-Care for Common Colds: The Pivotal Role of Vitamin D, Vitamin C, Zinc, and Echinacea in Three Main Immune Interactive Clusters (Physical Barriers, Innate and Adaptive Immunity) Involved during an Episode of Common Colds-Practical Advice on Dosages and on the Time to Take These Nutrients/Botanicals in order to Prevent or Treat Common Colds. Evid Based Complement Alternat Med. 2018;2018:5813095.
110. Dabbagh-Bazarbachi H, Clergeaud G, Quesada IM, Ortiz M, O'Sullivan CK, Fernandez-Larrea JB. Zinc ionophore activity of quercetin and epigallocatechin-gallate: from Hepa 1-6 cells to a liposome model. J Agric Food Chem. 2014;62(32):8085-93.
111. Prasad AS. Zinc is an Antioxidant and Anti-Inflammatory Agent: Its Role in Human Health. Front Nutr. 2014;1:14.
112. te Velthuis AJW, van den Worm SHE, Sims AC, Baric RS, Snijder EJ, van Hemert MJ. Zn2+ Inhibits Coronavirus and Arterivirus RNA Polymerase Activity In Vitro and Zinc Ionophores Block the Replication of These Viruses in Cell Culture. PLOS Pathogens. 2010;6(11):e1001176.
113. Xue J, Moyer A, Peng B, Wu J, Hannafon BN, Ding W-Q. Chloroquine Is a Zinc Ionophore. PLOS ONE. 2014;9(10):e109180.
114. Biesalski HK, Nohr D. Importance of vitamin-A for lung function and development. Mol Aspects Med. 2003;24(6):431-40.
115. Higdon J, Drake V, Angelo G, Delage B, Carr A, Michels A. Vitamin C. Linus Pauling Institute. Reviewed December 2018 [Available from: https://lpi.oregonstate.edu/mic/vitamins/vitamin-C <https://lpi.oregonstate.edu/mic/vitamins/vitamin-C.
116. Martindale R, Patel J, Taylor B, Warren M, McClave S. Nutrition Therapy in the Patient with COVID-19 Disease Requiring ICU Care. Reviewed and approved by ASPEN and Society for Critical Care Medicine. 1 April 2020 [Available from: https://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Resources_for_Clinicians_Caring_for_Patients_with_Coronavirus/.
117. 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.
118. Albright CM, Ali TN, Lopes V, Rouse DJ, Anderson BL. The Sepsis in Obstetrics Score: a model to identify risk of morbidity from sepsis in pregnancy. Am J Obstet Gynecol. 2014;211(1):39 e1-8.
119. Chebbo A, Tan S, Kassis C, Tamura L, Carlson RW. Maternal Sepsis and Septic Shock. Crit Care Clin. 2016;32(1):119-35.
120. 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.
121. Comparison of Two Fluid-Management Strategies in Acute Lung Injury. New England Journal of Medicine. 2006;354(24):2564-75.
122. American College of Radiology (ACR) COVID-19 Clinical Resources for Radiologists, updated 27 March 2020 2020 [Available from: https://www.acr.org/Clinical-Resources/COVID-19-Radiology-Resources.
123. Society of Breast Imaging (SBI) statement on breast imaging during the COVID-19 pandemic, updated 26 March 2020 2020 [Available from: . https://www.sbi-online.org/Portals/0/Position%20Statements/2020/society-of-breast-imaging-statement-on-breast-imaging-during-COVID19-pandemic.pdf.
124. American Society of Breast Surgeons (ASBrS) and ACR joint statement on breast screening exams during the COVID-19 pandemic, updated 26 March 2020 2020 [Available from: https://www.breastsurgeons.org/docs/news/2020-03-26-ASBrS-ACR-Joint-Statement.pdf.
125. Mammography Quality Standards Act (MQSA) inspection information related to COVID-19, updated 27 March 2020 2020 [Available from: https://www.fda.gov/radiation-emitting-products/mammography-quality-standards-act-and-program/mqsa-inspection-information-related-covid-19.
126. Coronavirus (COVID-19) update: FDA focuses on safety of regulated products while scaling back domestic inspections, updated 18 March 2020 2020 [Available from: https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-focuses-safety-regulated-products-while-scaling-back-domestic.

127. ACR recommendations for the use chest radiography and computed tomography (CT) for suspected COVID-19 infection, updated 22 March 2020 2020 [Available from: https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection.
128. Mossa-Basha M, Meltzer CC, Kim DC, Tuite MJ, Kolli KP, Tan BS. Radiology Department Preparedness for COVID-19: Radiology Scientific Expert Panel. Radiology. 2020:200988.
129. Rubin GD, Ryerson CJ, Haramati LB, Sverzellati N, Kanne JP, Raoof S, et al. The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society. Radiology. 2020:201365.
130. Ai T, Yang Z, Hou H, Zhan C, Chen C, Lv W, et al. Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases. Radiology. 2020:200642.
131. Bai HX, Hsieh B, Xiong Z, Halsey K, Choi JW, Tran TML, et al. Performance of radiologists in differentiating COVID-19 from viral pneumonia on chest CT. Radiology. 2020:200823.
132. Xie X, Zhong Z, Zhao W, Zheng C, Wang F, Liu J. Chest CT for Typical 2019-nCoV Pneumonia: Relationship to Negative RT-PCR Testing. Radiology. 2020:200343.
133. Oudkerk M, Buller HR, Kuijpers D, van Es N, Oudkerk SF, McLoud TC, et al. Diagnosis, Prevention, and Treatment of Thromboembolic Complications in COVID-19: Report of the National Institute for Public Health of the Netherlands. Radiology. 2020:201629.
134. Society of Interventional Radiology COVID-19 Planning, updated 23 March 2020 2020 [Available from: https://www.sirweb.org/practice-resources/toolkits/covid-19-toolkit/covid-19-planning/.
135. Wong HYF, Lam HYS, Fong AH-T, Leung ST, Chin TW-Y, Lo CSY, et al. Frequency and Distribution of Chest Radiographic Findings in COVID-19 Positive Patients. Radiology.0(0):201160.
136. Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, et al. CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV). Radiology. 2020;295(1):202-7.
137. Fang Y, Zhang H, Xu Y, Xie J, Pang P, Ji W. CT Manifestations of Two Cases of 2019 Novel Coronavirus (2019-nCoV) Pneumonia. Radiology. 2020;295(1):208-9.
138. Ng M-Y, Lee EY, Yang J, Yang F, Li X, Wang H, et al. Imaging Profile of the COVID-19 Infection: Radiologic Findings and Literature Review. Radiology: Cardiothoracic Imaging. 2020;2(1):e200034.
139. Song F, Shi N, Shan F, Zhang Z, Shen J, Lu H, et al. Emerging 2019 Novel Coronavirus (2019-nCoV) Pneumonia. Radiology. 2020;295(1):210-7.
140. Pan F, Ye T, Sun P, Gui S, Liang B, Li L, et al. Time Course of Lung Changes On Chest CT During Recovery From 2019 Novel Coronavirus (COVID-19) Pneumonia. Radiology. 2020:200370.
141. Wang Y, Dong C, Hu Y, Li C, Ren Q, Zhang X, et al. Temporal Changes of CT Findings in 90 Patients with COVID-19 Pneumonia: A Longitudinal Study. Radiology. 2020:200843.
142. Simpson S, Kay FU, Abbara S, Bhalla S, Chung JH, Chung M, et al. Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. Radiology: Cardiothoracic Imaging. 2020;2(2):e200152.
143. National Academies of Sciences, Engineering, and Medicine. Integrating clinical research into epidemic response: The Ebola experience. Washington DC: The National Academies Press; 2017.
144. 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.
145. Mo P, Xing Y, Xiao Y, Deng L, Zhao Q, Wang H, et al. Clinical characteristics of refractory COVID-19 pneumonia in Wuhan, China. Clin Infect Dis. 2020.
146. de Wit E, Feldmann F, Cronin J, Jordan R, Okumura A, Thomas T, et al. Prophylactic and therapeutic remdesivir (GS-5734) treatment in the rhesus macaque model of MERS-CoV infection. Proceedings of the National Academy of Sciences. 2020:201922083.
147. 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.
148. 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.
149. Wang Y, Zhang D, Du G, Du R, Zhao J, Jin Y, et al. Remdesivir in adults with severe COVID-19: a randomised,

double-blind, placebo-controlled, multicentre trial. The Lancet.
150. NIH Clinical Trial Shows Remdesivir Accelerates Recovery from Advanced COVID-19 2020 [Available from: https://www.niaid.nih.gov/news-events/nih-clinical-trial-shows-remdesivir-accelerates-recovery-advanced-covid-19.
151. US FDA. FDA cautions against use of hydroxychloroquine or chloroquine for COVID-19 outside of the hospital setting or a clinical trial due to risk of heart rhythm problems 2020 [Available from: https://www.fda.gov/drugs/drug-safety-and-availability/fda-cautions-against-use-hydroxychloroquine-or-chloroquine-covid-19-outside-hospital-setting-or.
152. 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.
153. Molina JM, Delaugerre C, Le Goff J, Mela-Lima B, Ponscarme D, Goldwirt L, et al. No evidence of rapid antiviral clearance or clinical benefit with the combination of hydroxychloroquine and azithromycin in patients with severe COVID-19 infection. Médecine et Maladies Infectieuses. 2020.
154. Borba MGS, Val FFA, Sampaio VS, Alexandre MAA, Melo GC, Brito M, et al. Effect of High vs Low Doses of Chloroquine Diphosphate as Adjunctive Therapy for Patients Hospitalized With Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Infection: A Randomized Clinical Trial. JAMA Network Open. 2020;3(4):e208857-e.
155. 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.
156. 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.
157. 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.
158. 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.
159. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? Lancet Respir Med. 2020.
160. Xu X, Han M, Li T, Sun W, Wang D, Fu B, et al. Effective Treatment of Severe COVID-19 Patients with Tocilizumab. 2020.
161. Tiberghien P, de Lambalerie X, Morel P, Gallian P, Lacombe K, Yazdanpanah Y. Collecting and evaluating convalescent plasma for COVID-19 treatment: why and how. Vox Sang. 2020.
162. Shen C, Wang Z, Zhao F, Yang Y, Li J, Yuan J, et al. Treatment of 5 Critically Ill Patients With COVID-19 With Convalescent Plasma. JAMA. 2020.
163. Beigel JH, Tebas P, Elie-Turenne M-C, Bajwa E, Bell TE, Cairns CB, et al. Immune plasma for the treatment of severe influenza: an open-label, multicentre, phase 2 randomised study. The Lancet Respiratory medicine. 2017;5(6):500-11.
164. Beigel JH, Aga E, Elie-Turenne MC, Cho J, Tebas P, Clark CL, et al. Anti-influenza immune plasma for the treatment of patients with severe influenza A: a randomised, double-blind, phase 3 trial. Lancet Respir Med. 2019;7(11):941-50.
165. Tanne JH. Covid-19: FDA approves use of convalescent plasma to treat critically ill patients. BMJ. 2020;368:m1256.
166. Boelig RC, Manuck T, Oliver EA, Di Mascio D, Saccone G, Bellussi F, et al. Labor and Delivery Guidance for COVID-19. Am J Obstet Gynecol MFM. 2020:100110.
167. 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.
168. ReproTox [Available from: www.reprotox.org.
169. Jeejeebhoy FM, Zelop CM, Lipman S, Carvalho B, Joglar J, Mhyre JM, et al. Cardiac Arrest in Pregnancy: A Scientific Statement From the American Heart Association. Circulation. 2015;132(18):1747-73.
170. 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.
171. Center for Disease Control and Prevention. Pregnancy & Breastfeeding: Information about Coronavirus

Disease 2019 2020.
172. 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.
173. CDC COVID-19 Response Team. Coronavirus Disease 2019 in Children - United States, February 12-April 2, 2020. MMWR Morb Mortal Wkly Report. 2020 Apr 10;69(14):422-426. 2020.
174. Royal College of Paediatrics and Child Health. Guidance - Paediatric multisystem inflammatory syndrome temporally associated with COVID-19 2020 [Available from: https://www.rcpch.ac.uk/sites/default/files/2020-05/COVID-19-Paediatric-multisystem-%20inflammatory%20syndrome-20200501.pdf.
175. COVIDView 2020 [updated 17 April 2020. Available from: https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html.
176. Paret M, Lighter J, Pellett Madan R, Raabe VN, Shust GF, Ratner AJ. SARS-CoV-2 infection (COVID-19) in febrile infants without respiratory distress. Clinical Infectious Diseases. 2020.
177. Patek P, Corcoran J, Adams L, Khandhar P. SARS-CoV-2 Infection in a 2-Week-Old Male With Neutropenia. Clin Pediatr (Phila). 2020:9922820920014.
178. National Vital Statistics System Provisional Death Counts for Coronavirus Disease (COVID-19). 2020 [Available from: https://www.cdc.gov/nchs/nvss/vsrr/COVID19/.
179. European Center for Disease Prevention and Control's Situation dashboard- COVID-19 cases in Europe and worldwide. 2020 [Available from: https://qap.ecdc.europa.eu/public/extensions/COVID-19/COVID-19.html.
180. Chiotos K, Hayes M, Kimberlin D, Jones S, James S, Pinninti S, et al. Multicenter initial guidance on use of antivirals for children with COVID-19/SARS-CoV-2. Journal of the Pediatric Infectious Diseases Society. 2020.
181. 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.
182. 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.
183. 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.
184. CDC. COVID-19 People Who Need Extra Precautions: Older Adults 2020 [updated 3/21/20. Available from: https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fhigh-risk-complications%2Folder-adults.html.
185. D'Adamo H, Yoshikawa T, Ouslander JG. Coronavirus Disease 2019 in Geriatrics and Long-term Care: The ABCDs of COVID-19. J Am Geriatr Soc. 2020.
186. British Geriatric Society. BGS statement on the COVID-10 pandemic 2020 [Available from: https://www.bgs.org.uk/bgs-statement-on-the-covid-19-pandemic.
187. Han JH, Wilson A, Vasilevskis EE, Shintani A, Schnelle JF, Dittus RS, et al. Diagnosing delirium in older emergency department patients: validity and reliability of the delirium triage screen and the brief confusion assessment method. Ann Emerg Med. 2013;62(5):457-65.
188. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. Ann Intern Med. 1990;113(12):941-8.
189. Lindroth H, Bratzke L, Purvis S, Brown R, Coburn M, Mrkobrada M, et al. Systematic review of prediction models for delirium in the older adult inpatient. BMJ Open. 2018;8(4):e019223.
190. Statement from the British Geriatrics Society. Managing delirium in confirmed and suspected cases 2020 [Available from: https://www.bgs.org.uk/resources/coronavirus-managing-delirium-in-confirmed-and-suspected-cases.
191. Hwang U, Malsch AJ, Biese KJ, Inouye SK. Preventing and Managing Delirium in Older Emergency Department Patients During the COVID-19 Pandemic. Journal of Geriatic Emergency Medicine. 2020;1(4):Supplement 1.
192. Neufeld KJ, Yue J, Robinson TN, Inouye SK, Needham DM. Antipsychotic Medication for Prevention and Treatment of Delirium in Hospitalized Adults: A Systematic Review and Meta-Analysis. J Am Geriatr Soc. 2016;64(4):705-14.

193. Farah A. Atypicality of atypical antipsychotics. Prim Care Companion J Clin Psychiatry. 2005;7(6):268-74.
194. Clinical Issues and Guidance From the American College of Surgeons 2020 [Available from: https://www.facs.org/covid-19/clinical-guidance.
195. COVID-19: Guidance for Triage of Non-Emergent Surgical Procedures 2020 [Available from: https://www.facs.org/covid-19/clinical-guidance/triage.
196. Create a Surgical Review Committee for COVID-19-Related Surgical Triage Decision Making 2020 [Available from: https://www.facs.org/covid-19/clinical-guidance/review-committee.
197. Prachand VN, Milner R, Angelos P, Posner MC, Fung JJ, Agrawal N, et al. Medically Necessary, Time-Sensitive Procedures: Scoring System to Ethically and Efficiently Manage Resource Scarcity and Provider Risk During the COVID-19 Pandemic. J Am Coll Surg. 2020.
198. Joint Statement: Roadmap for Resuming Elective Surgery after COVID-19 Pandemic 2020 [Available from: https://www.facs.org/covid-19/clinical-guidance/roadmap-elective-surgery.
199. Guidelines: Opening Up American Again 2020 [Available from: https://www.whitehouse.gov/openingamerica/#criteria.
200. The ASA and APSF Joint Statement on Perioperative Testing for the COVID-19 Virus 2020 [Available from: https://www.asahq.org/about-asa/newsroom/news-releases/2020/04/asa-and-apsf-joint-statement-on-perioperative-testing-for-the-covid-19-virus.
201. American College of Surgeons. COVID-19: Considerations for Optimum Surgeon Protection Before, During, and After Operation 2020 [Available from: https://www.facs.org/covid-19/clinical-guidance/surgeon-protection.
202. APSF. Perioperative Considerations for the 2019 Novel Coronavirus (COVID-19) 2020 [Available from: https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/.
203. SAGES and EAES Recommendations Regarding Surgical Response to COVID-19 Crisis 2020 [Available from: https://www.sages.org/recommendations-surgical-response-covid-19/.
204. JTS Management of COVID-19 in Austere Operational Environments v1.0 Clinical Practice Guideline 2020 [Available from: https://jts.amedd.army.mil/index.cfm/PI_CPGs/cpgs.

APPENDIX A : MASK GUIDANCE, PRECAUTIONS, & USE OF PPE

Mask Guidance

SURGICAL MASKS

DISCARD MASK IF:

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

EXTENDED USE:

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

REUSE:

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

Glossary

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

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

N95 RESPIRATORS

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

Use face shield over N95 respirator to reduce surface contamination.

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

DISCARD N95 RESPIRATOR IF:

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

EXTENDED USE:

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

REUSE:

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

Standard Precautions

FOR THE CARE OF ALL PATIENTS

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

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

Consideration for the use of Powered Air Purifying Respirators (PAPRs) as a COVID-19 Respiratory Protection Strategy 22 April 2020 DRAFT

NOTE: This document was adapted from UNMC - Nebraska Medicine COVID-19 PPE Guidance for Extended Use and Limited Reuse of Disposable Facemasks, Respirators and Protective Eyewear

Introduction: PAPRs are reusable respirators that are loose-fitting hoods or helmets. Caution should be applied with use of PAPRs in surgical settings due to concerns that the blower exhaust and exhaled air may contaminate the sterile field. The FDA issued an update Mar 2020 to address NIOSH-approved air purifying respirators for use in health care settings during the COVID-19 emergency available for review at the following link: https://www.fda.gov/media/135763/download. Facilities using elastomeric respirators and PAPRs are required to have up-to-date cleaning and disinfection procedures to facilitate protection against infectious agents.

Recommendations: This document provides an overview of current industry recommendations for consideration. Such recommendations are not all-inclusive, and decision–making must address the unique readiness challenges and concerns faced at each individual facility.

- Staff are required to receive training on correct use of PAPRs.
  - Training ensures HCPs are knowledgeable and proficient in the donning and doffing of PAPR and other PPE prior to engaging in patient care. In addition, during practice, HCPs and their trainers will assess their proficiency and comfort with performing required duties while wearing PAPR and other PPE.
- A trained observer is required.
  - The observer should be a dedicated and knowledgeable individual with the responsibility of ensuring adherence to the entire donning and doffing process, including disposal of used PPE. The sequence and actions involved in each donning and doffing step are critical, therefore a trained observer must read aloud to the HCP each step in the procedure checklist and visually confirm, document that the step has been completed correctly, and provide immediate corrective instruction if the HCP is not following the recommended steps.
- The following supplies are gathered in preparation for PAPR use:
  - One pair of extended cuff gloves (two pairs if practicing double gloving technique)
  - One long-sleeve gown
  - One PAPR*
  - One PAPR hood
  - One airflow indicator

*Note: The PAPR must be inspected and a function check completed in accordance with the manufacturer's instructions for use. DO NOT USE and remove from service if airflow does not reach six cubic feet/minute (CFM). Change the filters and repeat the function test. If after changing filter the function test fails, take out of service.

- PPE must remain in place and worn correctly for the duration of exposure to potentially contaminated areas. Avoid adjusting PPE during patient care. If PAPR malfunctions during patient care, the HCP must move immediately to the doffing area to assess the situation.

Donning PAPR Equipment:

- Healthcare facilities that decide to add additional PPE or modify this PPE guidance, must consider the risk versus benefit of any modification, and train HCPs on modified donning and doffing procedures.
- The practice of double–gloving provides an extra layer of safety during direct patient care and during the PPE removal process, however more than two pairs of gloves can make it more difficult to perform patient care duties.
- PAPR and all other PPE must be donned correctly in proper order before entry into the patient care area. Donning activities must be directly observed by a trained observer. The following steps for donning must be followed:
  1. Perform hand hygiene
  2. Don PAPR
     a. Don PAPR belt with assistance
     b. Position PAPR around waist
     c. Fold/tuck extra belt webbing into belt
     d. Test range of motion

   e. Power ON PAPR motor
3. Don PAPR hood assembly
   a. Place hood on head. Ensure hood fits comfortably and is positioned properly
4. Don surgical gown & secure gown over the hood shroud and hose (if possible), secure both neck & waist ties
5. Don extended cuff gloves over gown wrist cuff (if desired, may use second pair of gloves)
6. Check range of motion
7. Donning partner will inspect member for defects in PPE. Pay close attention to gown/glove junction

Doffing PAPR Equipment:

- Appropriate PAPR doffing procedures must be followed. All PPE must be removed slowly and deliberately in the correct sequence. Anytime a PAPR is used, a process checklist with a designated trained observer is required.
- The following steps must be followed for doffing:
  1. Doffing will begin in the patient's room. Doffing partner will be prepared to assist outside patient's room by performing hand hygiene and donning the surgical mask and gloves. Doffing partner will prepare the area outside the room, and gather the following supplies:
     a. Intravenous (IV) Pole
     b. Disinfectant wipes
     c. Biohazard bags
     d. Plastic bag
  2. HCP performs hand hygiene over gloves
  3. Gown is removed by pulling away from the shoulders, taking care to avoid jerking motion; may remove gloves in conjunction with the gown (if using the double–gloving technique, remove outer pair of gloves prior to removing gown)
  4. If gloves are still on, remove gloves using the "glove in glove" technique
  5. Perform hand hygiene
  6. HCP will leave the patient's room
  7. Keeping the blower motor ON, HCP will disconnect belt, and hand it to the doffing partner
  8. Doffing partner will hang belt on the IV pole
  9. HCP completes hand hygiene
  10. Doffing partner thoroughly disinfects PAPR hose and motor using approved disinfectant wipe
  11. Doffing Partner will tell HCP that the hose will be disconnected from PAPR motor
  12. Doffing partner will hold the hose and instruct HCP to lean forward and remove the hood
      a. HCP will reach under the sides of the hood and carefully remove the hood over and off head
      b. Alternative method: HCP will pinch the crown of the hood and carefully pull the hood over and off head
  13. Doffing partner will place the hood and hose into plastic bag. *Note: the hood may be reused if supplies are low
  14. HCP will complete hand hygiene and exit the area
  15. Doffing partner will perform hand hygiene
- Appropriate steps for doffing area cleanup must be performed as follows by doffing partner:
  1. Dons new pair of gloves
  2. Disinfects high-touch surfaces
  3. Disinfects the IV pole
  4. Place PAPR in biohazard bag and stores in designated area
  5. Remove regulated medical waste (RMW) bags from waste receptacles
     a. Secure bags with tape
     b. Do not express any trapped air from the bag
     c. Place bags in the designated area/soiled utility room
     d. Perform hand hygiene
     e. Replace red bag

f. Perform hand hygiene

- Steps for disinfection and storage of PAPR components including hood for re–use:
  1. Perform hand hygiene
  2. Don gloves and a procedure mask, and carry the PAPR to the PAPR processing area without allowing it to come in contact with clothing or skin
  3. Visually inspect the PAPR hood for contamination; discard and do not re-use if visibly contaminated
     a. If visible contamination is not observed and PAPR will be reused during the shift, do not disconnect any of the PAPR components
     b. Do not remove the PAPR filters from the motor unless flow test fails
  4. Disinfect the PAPR motor, belt, hose and hood using Environmental Protection Agency (EPA) approved disinfectant wipes, while observing contact time
  5. Disinfect in the following order (using a new wipe for each component):
     a. PAPR motor and filters (avoid introducing liquid into the filter holes)
     b. Belt
     c. Tubing sleeve
     d. Hood (wipe the hood inside, then the outside)
  6. Once completely dry, place the PAPR in a clean area
  7. Ensure battery is charged or place on charger in accordance with the manufacturer instructions for use (IFU)
- Steps for terminal disinfection and storage of used PAPR components:
  1. Follow the above procedure for cleaning and disinfecting PAPR with the following additional steps:
     a. Disconnect PAPR belt to disinfect separately and reattach to PAPR motor when dry
     b. Disconnect and dispose of PAPR hood
     c. Return PAPR motor with filters, belt, and tubing attached to unit storage area
     d. Plug in PAPR motor to recharge battery in accordance with manufacturer IFU

References

1. Food and Drug Administration. (2020). NIOSH-Approved Air Purifying Respirators for Use in Health Care Settings during Response to the COVID-19 Public Health Emergency. https://www.fda.gov/media/135763/download
2. Strategies for Optimizing the Supply of N95 Respirators 2 Apr 2020 Personal Protective Equipment: Respiratory Protection: Use of alternatives to N95 respirators https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/index.html
3. Guidance on Personal Protective Equipment (PPE) To Be Used By Healthcare Workers during Management of Patients with Confirmed Ebola or Persons under Investigation (PUIs) for Ebola who are Clinically Unstable or Have Bleeding, Vomiting, or Diarrhea in U.S. Hospitals, Including Procedures for Donning and Doffing PPE 30 August 2018 https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html
4. Verbeek JH, Rajamaki B, Ijaz S, Tikka C, Ruotsalainen JH, Edmond MB, Sauni R, Kilinc Balci FS. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. Cochrane Database Syst Rev. 2019 Jul 1;7:CD011621. doi: 10.1002/14651858.CD011621.pub3. PubMed [citation] PMID: 31259389, PMCID: PMC6601138
5. Chughtai AA, Stelzer-Braid S, Rawlinson W, Pontivivo G, Wang Q, Pan Y, Zhang D, Zhang Y, Li L, MacIntyre CR. Contamination by respiratory viruses on outer surface of medical masks used by hospital healthcare workers. BMC Infect Dis. 2019 Jun 3;19(1):491. doi: 10.1186/s12879-019-4109-x. PubMed [citation] PMID: 31159777, PMCID: PMC6547584

Decontamination of N95 Respirators: 24 April 2020 DRAFT

Situation and Background

COVID-19 has caused significant disruption in the manufacturing of N95 filtering facemask respirators (FFRs), subsequently generating a need for strategies to decontaminate for reuse. To ensure existing resources are leveraged effectively, and Military Medical Treatment Facilities (MTFs) are equipped to optimally care for patients in a crisis situation, an evaluation of alternative strategies is warranted.

Assessment

There are currently four strategies for decontamination of N95 FFRs. These include high–concentration hydrogen peroxide (e.g., the Battelle Decontamination System), hydrogen peroxide sterilization systems (STERRAD, STERIZONE, STERIS, and Sterilucent), heat and humidity, and ultraviolet (UV) decontamination (e.g., Xenex). The implementation of each of these strategies carries with it unique benefits and challenges, as highlighted below:

- On 28 MAR 2020, the Food and Drug Administration (FDA) issued an Emergency Use Authorization (EUA) for the Battelle Decontamination System.[1] This system can decontaminate thousands of N95 FFRs at one time with up to 20 decontamination cycles per mask. Additionally, FDA does not require masks to be returned to the same user. A unique challenge associated with this product is that implementation requires transport of the respirators to and from the decontamination site, and therefore requires logistics support.
- FDA has now issued Emergency use Authorization to four VHP sterilizer companies.[2–5] These authorizations are only for specific models and do not include all systems that various companies make. A benefit associated with these devices, is that many MTFs already have them, but the disadvantage is the decontamination capacity of each system is anywhere from 10-20 masks every 30-60 minutes depending on the system. Another disadvantage is that FDA requires single-user per masks and STERRAD and STERIZONE are only recommended for two decontamination cycles, while STERIS and Sterilucent are authorized for up to ten decontamination cycles.
- Heat and Humidity has been proposed as an option for decontamination of N95 FFRs. This method has not been authorized by FDA. Various studies have demonstrated that under the right circumstances of about 70-85 °C with relative humidity of 50-85% for 60 minutes, inactivation of SARS-CoV-2 is likely. Users are cautioned that if humidity is not maintained, viable viruses were present on the mask. The advantage of this strategy is that systems that can achieve these parameters are inexpensive and widely available, and most N95 FFRs have maintained good fit and filter performance for up to 3 cycles. The disadvantage is that mask integrity as it relates to decontamination cycles varies based on the make and model of N95 FFR, and therefore facilities must assure that the masks that are being decontaminated were studied within those parameters.
- The use of UV–C disinfection is now gaining recognition in the literature as a potentially viable strategy for N95 FFR decontamination during this crisis[6], and a number of reputable hospital systems have publicly supported the practice. ECRI has provided communications indicating this approach is acceptable as a last resort, and additional information regarding use of this method is available at the following link: https://www.nebraskamed.com/sites/default/files/documents/covid-19/n-95-decon-process.pdf Currently some MTFs have developed protocols and may already be implementing this decontamination strategy. The advantages of using this process is that many masks could be decontaminated in fairly short period of time, but numerous disadvantages should be considered when implementing this strategy:
    - The UV–C light systems are not regulated as medical devices by FDA, and therefore must be validated for appropriate output.
    - UV–C light must shine directly on all surfaces, which is difficult to accomplish with curved masks (any shadows may leave masks still contaminated).
    - UV-C light must be delivered at proper dose. This should be verified by a UV-C-specific sensor.
    - UV light degrades mask components, and determining the number of decontamination cycles depends on the amount of UV light delivered per cycle.
    - It is likely that due to kinking, straps would not receive proper amount of UV–C light. Experts recommend that decontamination of straps is conducted manually.

The following considerations must be taken into account if using any decontamination strategy:

- Decontaminated compatible N95 FFRs are not sterile, and in most cases (with exception of Battelle's method) must go back to the original wearer.
- All hydrogen peroxide systems cannot decontaminate masks that contain cellulose-based materials
- Each of the aforementioned systems have different requirements regarding the number of times they can be used.
- If any of the N95 FFRs are visibly soiled (e.g., blood, dried sputum, makeup, body fluids) they must be disposed of.
- If a good seal cannot be maintained, the mask must be disposed of.
- Any individual handling contaminated respirators must wear full personal protective equipment (PPE), including an N95 FFR and eye protection.

Recommendation

Leadership should consider hydrogen peroxide sterilization systems as a first line decontamination strategy, and avoid the use of UV light and heat and humidity strategies for decontamination until proper validation of effectiveness is achieved. If MTFs have concerns regarding an inability to maintain adequate supply of N95 respirators, the DHA IPC Tiger Team should be contacted at the following e–mail to address such concerns: dha.ncr.clinic-support.list.ipc-group@mail.mil

References

1. Food and Drug Administration. (2020). *Battelle Decontamination System Letter of Authorization*. https://www.fda.gov/media/136529/download
2. Food and Drug Administration. (2020). *STERIS Sterilization Systems Letter of Authorization*. https://www.fda.gov/media/136843/download
3. Food and Drug Administration. (2020). *STERRAD Sterilization Systems Letter of Authorization*. https://www.fda.gov/media/136884/download
4. Food and Drug Administration. (2020). *Sterilucent Letter of Authorization*. https://www.fda.gov/media/137167/download
5. Stryker. (2020). *Emergency Use Decontamination of Compatible N95 or N95-equivalent Respirators in Stryker's STERIZONE VP4 Sterilizer Using the Stryker STERIZONE VP4 N95 Respirator Decontamination Cycle*. https://www.fda.gov/media/136979/download
6. Card, K., Crozier, D., Dhawan, A., Dinh, M., Dolson, E., Farrokhian, N., Gopalakrishnan, V., Ho, E., King, E., Krishnan, N., Kuzmin, G., Maltas, J., Pelesko, J., Scarborough, J., Scott, J., Sedor, G., & Weaver, D. (2020). *UV Sterilization of Personal Protective Equipment with Idle Laboratory Biosafety Cabinets During the Covid-19 Pandemic*. https://doi.org/10.1101/2020.03.25.20043489
7. Association for the Advancement of Medical Instrumentation. (2020, April 24). *N95 Mask Decontamination and Reuse Webinar*. www.aami.org

Intubation Barrier Strategies for Use during the COVID–19 Pandemic: 23 April DRAFT

Situation and Background

Concerns have been raised over the need to implement additional strategies to prevent COVID–19 disease transmission during patient intubation. To address these concerns, a number of products and strategies have been developed by facilities and vendors. To date, there are no clear industry standards or guidance that definitively recommend one approach as more effective over another. Given the lack of clear guidance, careful review and evaluation of each method is warranted prior to consideration for implementation.

Assessment

Although there are additional prototypes and products currently in use, three primary strategies for barrier protection during endotracheal intubation include the COVID-19 Airway Management Isolation Chamber (CAMIC), the Aerosol Box, and the Intubation Shield. Each of these products/strategies maintain unique benefits and challenges with implementation, as highlighted below:

- The CAMIC is constructed primarily out of PVC pipes and a clear polyethylene bag. One unique benefit of this approach is that its flexible structure is believed to allow for improved provider mobility during intubation. Caution must be applied in setting up this system, as it is designed to be hooked to suction on one side, and air or oxygen input on the other. If both ports are accidentally hooked up to oxygen or air, there is a potential to increase aerosolization of the virus. The CAMIC is relatively inexpensive to construct, and initial testing supports this method as an effective means of reducing respiratory droplet spread during aerosol generating procedures (AGPs).[1] Understanding that the CAMIC is not intended to be disposed of after a single use, careful consideration must be made regarding the use of effective cleaning practices. Specifically, the following steps should be followed for CAMIC cleaning:
    - At the point of generation, dispose of polyethylene bag and wipe down the PVC pipe with a hospital–approved germicidal wipe.
    - Place wiped down equipment in a transport container and transport to soiled utility room.
    - Obtain 1:10 premixed bleach disinfectant and submerge pieces for 5 minutes (refer to guidelines provided as an appendix to this document regarding premixed bleach disinfectant).
    - Remove equipment and rinse, ensuring removal of any residue.
    - Dry for 24 hours in an upright position to ensure drainage of remaining water.
    - Place in peel pouch and return to clean storage.
- The Aerosol Box is constructed from acrylic or transparent polycarbonate, and is intended to serve as an additional barrier for protection while allowing the provider to insert their hands through pre–drilled holes to perform intubation.[2] As with the CAMIC, the Aerosol Box must undergo thorough cleaning prior to reuse in order to avoid inadvertent disease transmission. Aligned with developer recommendations, cleaning should be performed with an Environmental Protection Agency approved disinfectant wipe. Clean water or alcohol may then be utilized to remove any visible residue.
- The Intubation Shield is a single-use/disposable, clear plastic drape placed over the patient during intubation. The Intubation Shield can be utilized as a single–method for protection, or in conjunction with additional barrier strategies. One unique benefit of the Intubation Shield is that since it is disposed of after a single use, there are no cleaning requirements. Caution must be applied with this product, understanding that it may pose a risk of suffocation if left in place without direct supervision (clipping the sheet to an IV pole may reduce this risk). Healthcare workers must receive proper training in the use and supervision of these barriers.

Recommendation

Military Medical Treatment Facility (MTF) leadership, in collaboration with frontline providers, may consider each of the aforementioned strategies as options for implementing additional barrier precautions during AGPs such as endotracheal intubation. Healthcare workers must be trained properly on the use of these barriers, and operators should be ready to abandon their use should airway management prove difficult. Decision–making should take into account each MTF's existing resources and needs. Commanders must pay close attention that proper cleaning procedures are implemented for use these products, as well as any strategy involving reuse of materials.

References

8. Blood, T., Perkins, J., Riley, C., Ruhl, D., Wistermayer, P., Fisher, N., & Hong, S. (2020). *COVID-19 Airway Management Isolation Chamber (CAMIC)*.
9. Lai, H. Y. (2020). *Aerosol Box*. https://sites.google.com/view/aerosolbox/home
10. Protection Products Inc. (2020). *Intubation Shield*. https://p-p-i.com/intubation-shield
11. Canelli, R. (2020) Barrier Enclosure during Endotracheal Intubation. https://www.nejm.org/doi/full/10.1056/NEJMc2007589

Bleach Use for Intermediate Disinfection (of CAMIC PVC)

Preparing a 0.5–0.6% sodium hypochlorite (i.e. "1:10 bleach") solution for disinfection (refer to table for correct dilution ratios).

5.25% to 6% Sodium hypochlorite (household bleach)	Cold Tap Water
380 mL (1 cup and 5 ounces) 65 mL (2 ounces)	3.8 Liters (1 gallon) 650 mL (22 ounces)
45 mL (3 TABLEspoons) 23 mL (1.5 TABLEspoons)	474 mL (16 ounces or 2 cups) 237 mL (8 ounces or 1 cup)

- When mixing bleach, wear gloves and eye protection.
- Consider a waterproof apron or gown to avoid getting on clothing.
- Mix bleach in a well ventilated area.
- Mix bleach using cold water, as hot water decomposes it.
- Do not mix with other chemicals.
- Discard after each use.
    - If bleach is reused, mix in an opaque bottle/container and discard after each shift/day.
    - Clearly label and date the container of the bleach solution.
    - Keep diluted bleach covered and protected from sunlight, and if possible in a dark container.

Procedure for Disinfection

- Items will be cleaned with a 0.5% to 0.6% sodium hypochlorite (i.e. "1:10 bleach") solution, then thoroughly rinsed or wiped with clean water to remove any residual and then dried.
- Sodium hypochlorite solutions (mixed/diluted) will gradually lose strength, so fresh solutions must be prepared frequently.
- Diluted solutions of bleach will be replaced after each use.
- Items soaking for 5 minutes must be in a well vented room.
- Proper PPE must be worn.
    - Wear disposable gloves when cleaning and disinfecting surfaces.
    - Gloves should be discarded after each cleaning. If reusable gloves are used, those gloves should be dedicated for cleaning and disinfection of surfaces for COVID-19 and should not be used for other purposes.
    - Clean hands immediately after gloves are removed.
    - If surfaces are dirty, they should be cleaned using a detergent or soap and water prior to disinfection.
- Allow proper ventilation during and after application.
- Never mix household bleach with ammonia or any other cleanser.
- Unexpired household bleach will be effective against coronaviruses when properly diluted.

USE OF MASKS IN THE COMMUNITY SETTING

As COVID-19 extends its reach into local communities throughout the United States, the use of masks in public is now a topic of debate. The leading health organizations in the world offer mixed recommendations regarding the use of masks in the community setting. To address this topic, I will look at the components of droplet-producing events (e.g. sneezing), CDC and WHO mask recommendations, the performance of different types of masks, and finally how to care for masks in the community setting.

What's in a Sneeze?

High-speed recordings of droplets following a sneeze demonstrate turbulent clouds, with the largest droplets settling 1-2 meters away. Smaller droplets remain suspended, carrying them as far as 6-8 meters away from the individual. The lifetime of these suspended droplets, particularly in warm and moist air, could extend as much as 1000 times that of larger droplets (from seconds to minutes).[1]

Currently, both the Center for Disease Control (CDC) and World Health Organization (WHO) consider the airborne transmission of COVID-19 to be unlikely.[2,3] Both organizations encourage droplet precautions for healthcare workers and social distancing of 6 feet in the community; however, research proving that COVID is not transmissible through airborne droplet nuclei is lacking. One recent study, published in the April 16th edition of the *New England Journal of Medicine*, demonstrated the viability of SARS-CoV-2 in aerosols under laboratory conditions.[4] This does not address whether aerosolized droplet nuclei containing COVID-19 would deliver a big enough inoculum to infect another person. Ultimately, more concrete research is needed to determine the true risk to community members outside of a 1-2 meter radius.

Organizational Recommendations for Community Masks

At the time of this edition's publication, the Center for Disease Control (CDC) argues that citizens can utilize cloth face coverings in various settings, such as grocery stores, where social distancing can be more difficult. The CDC emphasizes that this measure protects those around you by limiting the spread of droplets from an otherwise asymptomatic individual. Their guidance regarding cloth face coverings include a snug fit, secured with ear-loops or ties, be multi-layered, and may be laundered without damage. Finally, the CDC cautions against placing masks on children younger than 2 or on any individual with trouble breathing or who would otherwise have difficulty removing the mask.[5]

The World Health Organization (WHO), however, recommends against the use of any type of mask in the community setting. They portend that there is no evidence that masks can prevent individuals in the community from contracting a respiratory virus. Furthermore, the WHO argues the use of masks will create complacency regarding other preventive measures. Ultimately, they recommend decision-makers keep in mind the purpose of using masks, who in the local population is at risk, characteristics of the community setting, the feasibility of producing and distributing masks, and the type of masks being recommended.[6]

So How Good are Masks?

With particles of COVID-19 measuring 60-140 nanometers (0.06-0.140 microns)[7], there is a reasonable concern regarding how effective masks, particularly cloth ones, are in blocking the virus. One recent laboratory trial assessed the effectiveness of N95, surgical masks, homemade masks, and cloth masks in filtering avian influenza virus in aerosols. Ma and colleagues found N95 masks 99.98% of the virus, while medical masks blocked 97.14%, and homemade masks (1 layer of polyester cloth with 4 layers of kitchen paper) could block 95.15%. They cautioned that cloth alone may not confer any protection from the virus.[8]

One prospective, randomized control trial from 2015 evaluated 1607 healthcare workers across seventy-four hospital wards with the use of medical and cloth masks. They found the rate of influenza-like illness was significantly higher in the cloth mask arm (RR = 13) compared to those wearing medical masks. They additionally conducted a sodium chloride filtration test, demonstrating a 97% penetration rate in cloth masks, compared to 44% in medical masks and <0.01% in N95 masks.[9]

An additional laboratory-based study assessed the filtration efficiency of surgical masks compared to masks created from various household materials. First, the investigators assessed filtration efficiency for blocking *Bacillus*

astrophageus (0.95-1.25 microns) and Bacteriophage MS2 (0.023 microns) for all materials. Cotton was 69% efficient for *Bacillus* and 50% efficient for Bacteriophage, compared to 96% and 89% respectively for a surgical mask. Next, healthy volunteers were asked to cough twice into a 0.5m^3 box. Investigators took air samples for the next five minutes, and the median colony forming units (CFUs) were measured for air and settle plates within the box. The reduction of CFUs was statistically significant for both the surgical masks and for the cloth masks; however, the surgical mask was three times better at blocking the transmission of expelled microorganisms. Davies and colleagues concluded poor fit will reduce effectiveness and that homemade masks are not only a last resort, but they would have minimal effect if not combined with hand hygiene and other preventive measures.[10]

Caring for Masks

A recent article in *JAMA* recommends that cloth masks should be washed routinely with laundry detergent or with soapy water.[11] The CDC also states these facial coverings should be washed "routinely" depending on how often they are worn. For items placed in the laundry, the warmest possible setting should be utilized.[5]

For those using surgical masks in the community, the CDC discusses several potential methods for sterilizing masks while minimizing degradation in overall fit and performance. The most practical is with moist heat, based on studies performed using microwave steam bags and microwave-generated steam.[12] Based on the need for steam temperatures of 60-65° Celsius and 80-85% humidity for only a couple of minutes, it may be reasonable for individuals at home to hold their masks in the steam from a boiling pot of water for 2-3 minutes to achieve sterilization.

Conclusion

Current recommendations that members of the community wear masks in settings where social distancing measures may be more difficult to maintain. Providers and or healthcare professionals must emphasize using the masks as a way of further limiting the spread of COVID from asymptomatic patients, rather than as a means of protecting yourself from others. Masks of any type should be form-fitting and frequently laundered or sterilized. Surgical masks should generally be reserved for healthcare personnel; however, there are some grass-roots efforts by military garrisons to produce reusable masks for service members and dependents. Finally, members of the community must understand that masks are part of a multi-faceted approach to reducing viral transmission. Frequent hand-washing, not touching your face with unwashed hands, and maintaining social distancing practices remain vital in the fight against SARS-CoV-2.

CDC webpage that includes a description with photos on how to make a mask at home:
https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html
Providence St Joseph Health webpage about making surgical facemasks:
https://psjh.blob.core.windows.net/covid/2020-%20PSJH_CLINICALFACEMASK_%20Instructions%20-%20Final.pdf

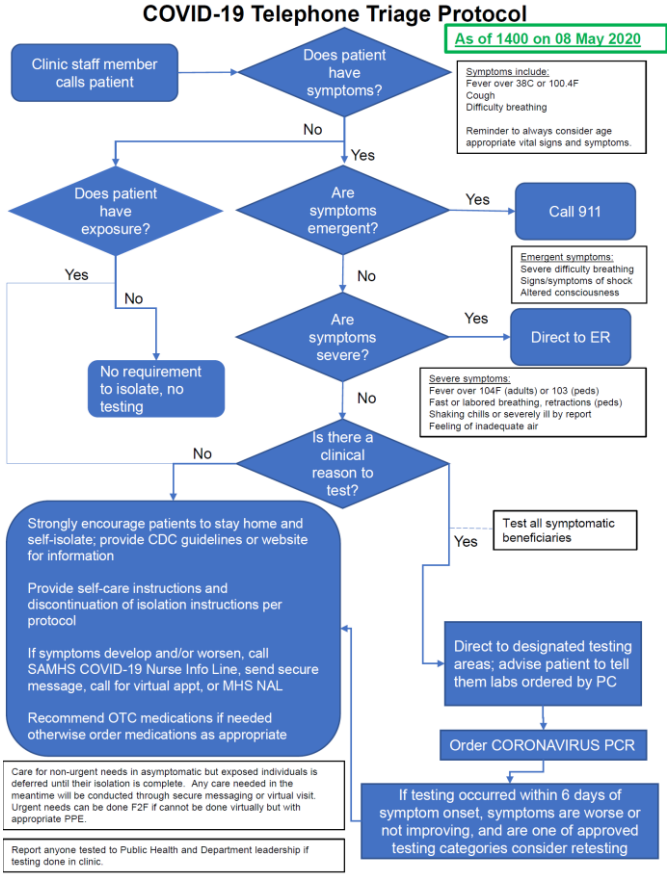
References

1. Baden LR. Images in Clinical Medicine: A Sneeze. N Engl J Med. 2016; e15.
2. CDC. Coronavirus Disease 2019: Infection Control Guidance. 2020 Apr 13. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html#adhere.
3. WHO. Modes of transmission of virus causing COVID-19: Implications for IPC precaution recommendations. 2020 Mar 29. Available from: https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations.
4. van Doremalen N, Bushmaker T, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. N Engl J Med. 2020 Apr 16;382(16): 1564-7.
5. CDC. Coronavirus Disease 2019: Cloth Face Covers. Available from: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html.
6. WHO. Advice on the use of masks in the context of COVID-19: Interim Guidance. 2020 Apr 6. Available from: https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-(2019-ncov)-outbreak.
7. Cascella M, Rajnik M, Cuomo A, et al. Features, Evaluation and Treatment Coronavirus (COVID-19) [Updated 2020 Apr 6]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554776.
8. Ma QX, Shan H, et al. Potential utilities of mask-wearing and instant hand hygiene for fighting SARS-CoV-2. J Med Virol. 2020 Mar 31 [Epub ahead of print available from: https://doi.org/10.1002/jmv.25805]
9. MacIntyre CR, Seale H, et al. A cluster randomized trial of cloth masks compared with medical masks in healthcare workers. BMJ Open. 2015 Apr 22;5(4):e006577.
10. Davies A, Thompson KA, et al. Testing the efficacy of homemade masks: Would they protect in an influenza pandemic? Disaster Med Public Health Prep. 2013 Aug;7(4): 413-8.
11. Desai AN & Aronoff DM. Masks and Coronavirus Disease 2019 (COVID-19). JAMA. 2020 Apr 17 [Epub ahead of print available from: https://jamanetwork.com/journals/jama/fullarticle/2764955]
12. CDC. Coronavirus Disease 2019: Decontamination & Reuse of Filtering Facepiece Respirators. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html.

APPENDIX B : EXAMPLE TRIAGE PROTOCOLS DURING COVID-19 PANDEMIC

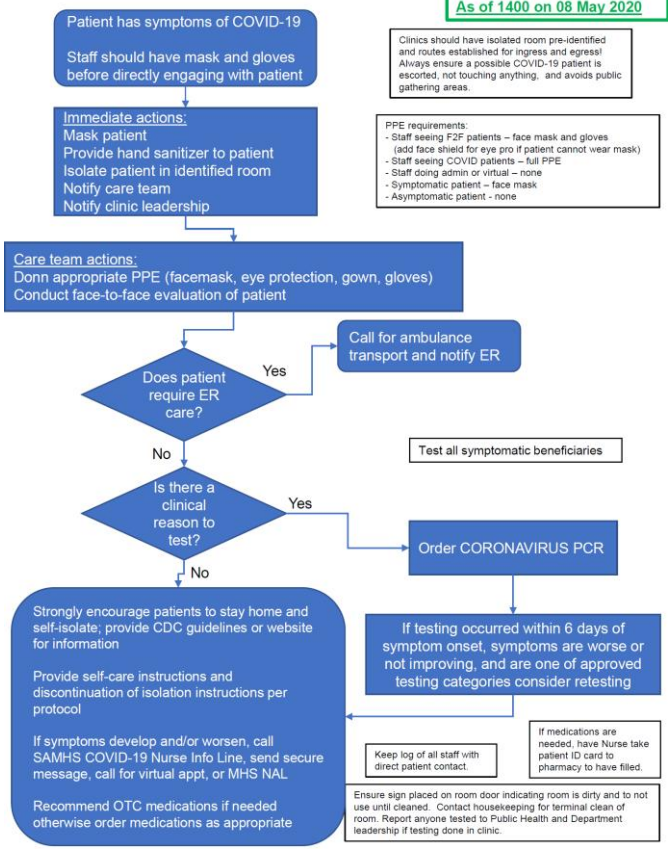
COVID-19 Telephone Triage Protocol

As of 1400 on 08 May 2020



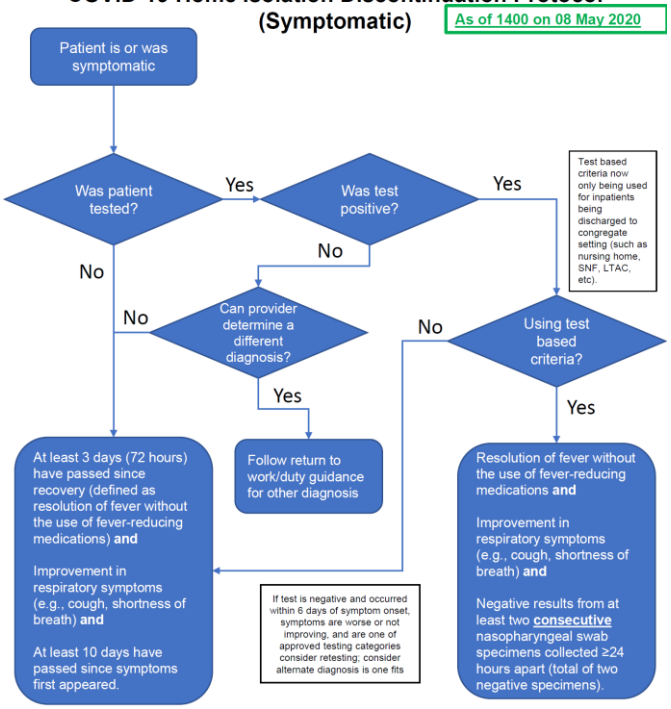
COVID-19 In-clinic Protocol

As of 1400 on 08 May 2020



COVID-19 Home Isolation Discontinuation Protocol (Symptomatic)

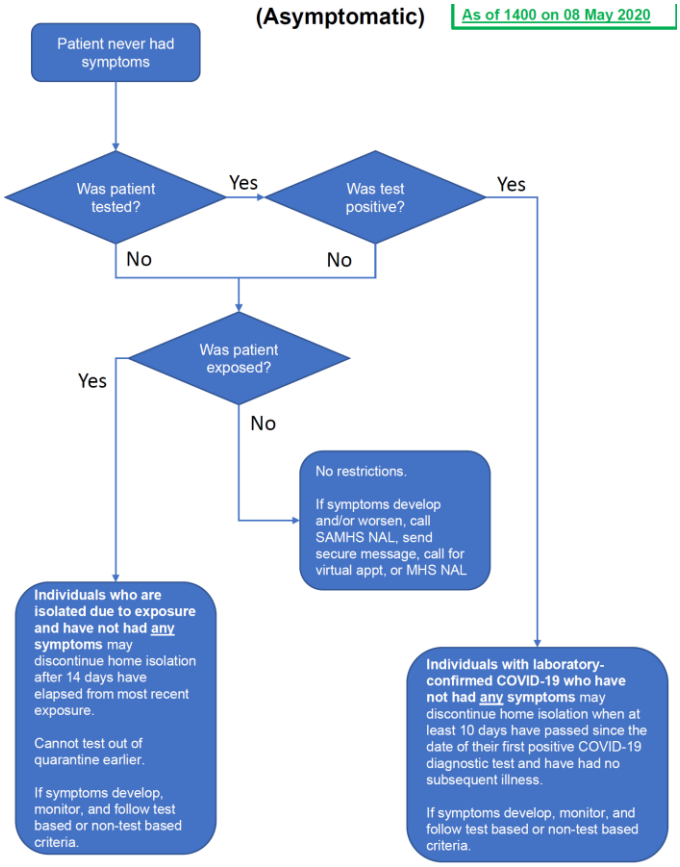
As of 1400 on 08 May 2020

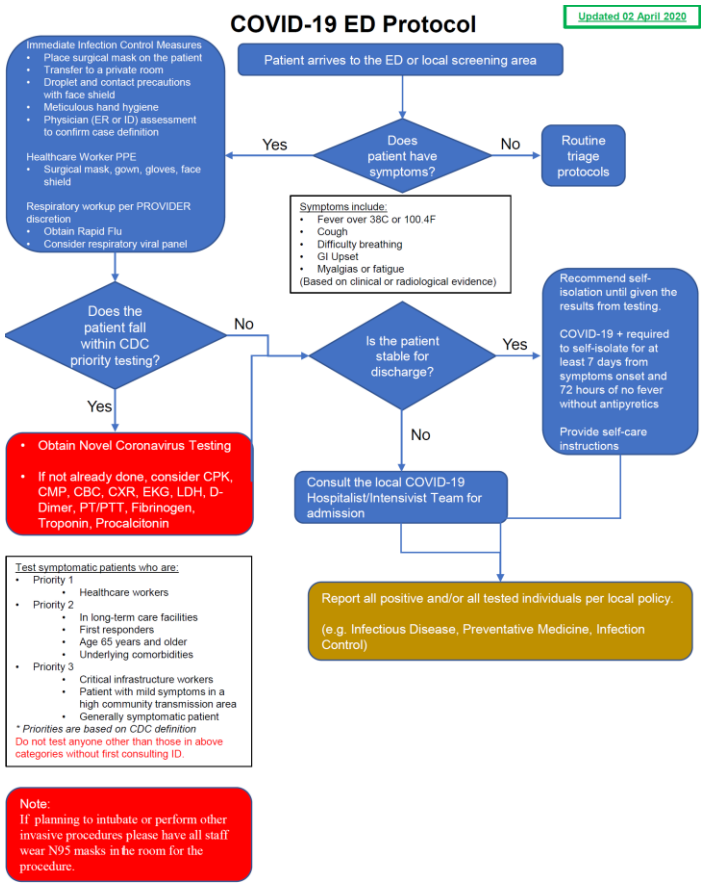


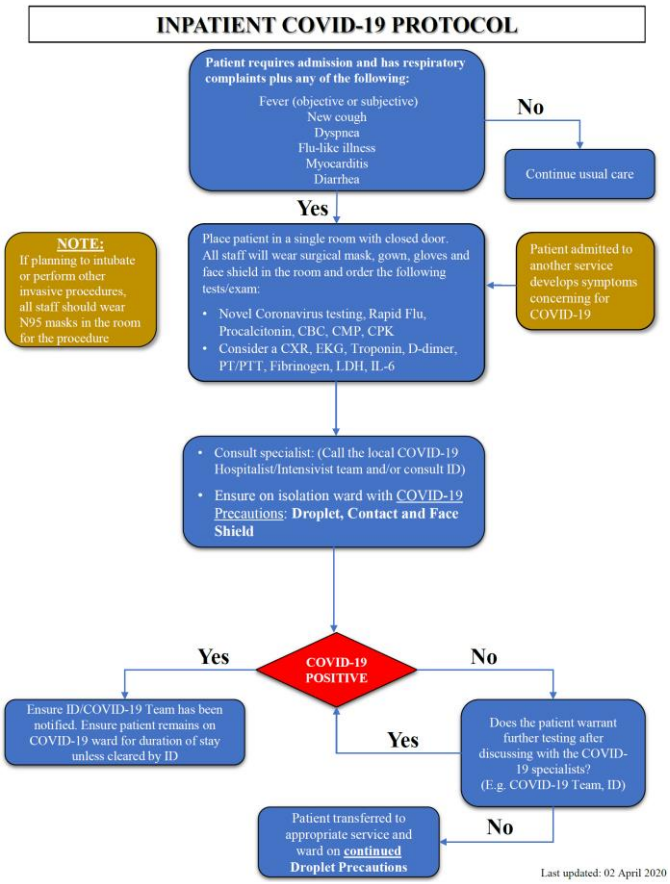
Specific guidance for **healthcare personnel** (per CDC)
After returning to work, healthcare personnel should:
- Wear a facemask at all times while in the healthcare facility until all symptoms are completely resolved or until 14 days after illness onset, whichever is longer
- Be restricted from contact with **severely** immunocompromised patients (e.g., transplant, hematology-oncology) until 14 days after illness onset
- Adhere to hand hygiene, respiratory hygiene, and cough etiquette in CDC's interim infection control guidance (e.g., cover nose and mouth when coughing or sneezing, dispose of tissues in waste receptacles)
- Self-monitor for symptoms, and seek re-evaluation if respiratory symptoms recur or worsen

(Asymptomatic)

As of 1400 on 08 May 2020







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

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

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

ROM/Quarantine

After **travel to a high risk location** or **close contact** with a COVID-19 positive patient, personnel may RTW if no symptoms develop after **14 days** since the date of departure from high risk location or, if they remain free of symptoms, the last date of high risk exposure to the infected individual. You **cannot test-out** of quarantine; you must remain in quarantine for the full 14-day incubation period.

Person Under Investigation (PUI)

A PUI is defined as an individual with symptoms consistent with COVID-19 and high risk exposure from travel or close contact; OR based on clinician's judgement. After being identified as a PUI, personnel may RTW when they meet the following criteria:

- Completion of the required 14-day ROM/Quarantine period (if placed under ROM for high risk exposure); **and**
- Negative COVID-19 test (if testing was performed); **and**
- Symptom free for at least 72 hours without the use of fever-reducing or symptom-altering medications; **and**
- At least 10 days have passed since symptoms first appeared.

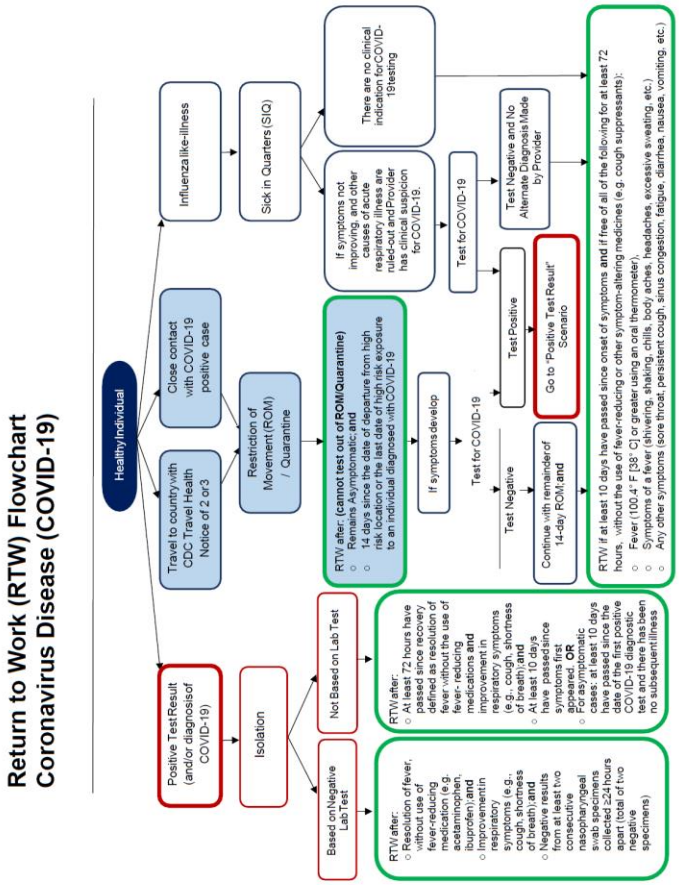
Confirmed COVID-19 Case

After being diagnosed with COVID-19, personnel may RTW using one of the following clearance criteria:

1. Using an FDA Emergency Use Authorization (EUA) approved test:
   - Resolution of fever, without use of fever-reducing medication (e.g. acetaminophen, ibuprofen); **and**
   - Improvement in respiratory symptoms (e.g., cough, shortness of breath); **and**
   - Negative results from at least two consecutive nasopharyngeal swab specimens collected ≥24 hours apart (total of two negative specimens)
2. Unable to get FDA EUA approved test (i.e. OCONUS facility using foreign national laboratories, or mild symptoms unable to obtain clearance test):
   - At least 3 days (72 hours) have passed since recovery, defined as resolution of fever without the use of fever-reducing medications **and** improvement in respiratory symptoms (e.g., cough, shortness of breath); **and**
   - At least 10 days have passed since symptoms first appeared.

Management of a Negative COVID-19 Lab Test

1. A negative COVID-19 lab test does not rule out COVID-19 infection. Persons with a negative COVID-19 test should be treated as a presumptive COVID-19 case unless a healthcare provider diagnoses another disease, and the RTW guidance for confirmed COVID-19 cases as described above should be followed.
2. If the healthcare provider determines a diagnosis other than COVID-19, e.g., flu, is appropriate, the RTW guidance for that disease should be followed.



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

2. Arm positioning:

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

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

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

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

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

4. Leg positioning:

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

5. Tilt the patient into reverse Trendelenburg:

   Goal is 30 degrees, as patient tolerates.

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

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

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

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 <u>minimum</u> 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,

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

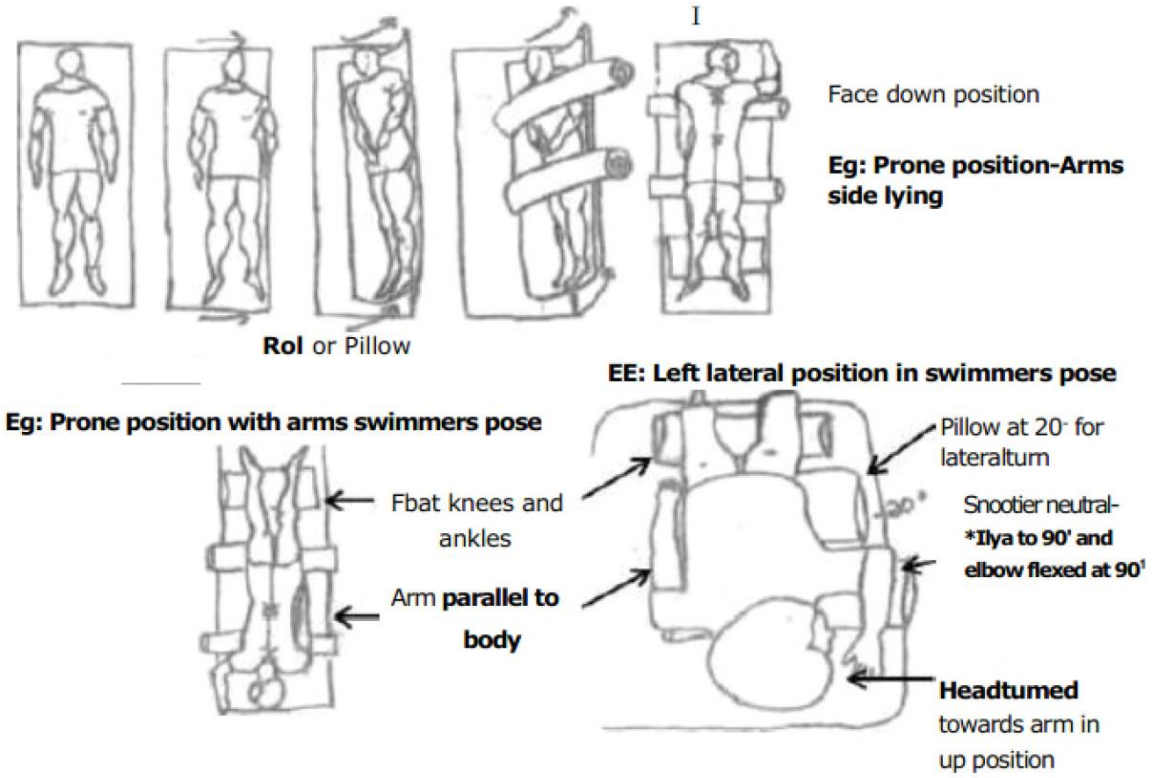
c. Discuss supine position tolerance and PaO2/FiO2 ratio in bedside report and during interdisciplinary rounds.
d. Ongoing assessment of how the patient is tolerating prone therapy and repositioning; documentation of all vital signs, capnography, patient and family education, length of time prone, patient's 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



APPENDIX D : COVID-19 INTUBATION PRE-ENTRY CHECKLIST*

For Providers:

To bring inside room:

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

☐Airway Supplies:
- ETT (7, 7.5, 8 for adults, appropriate size for children) with syringe for cuff
- Glidescope or C-MAC (facilitate intubation from a distance)
- Appropriate stylet
- Bougie
- OG tube with syringe, lube and tape
- OP/NP airway
- Colorimetric end-tidal CO_2 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 E : COVID-19 INTUBATION PROTOCOL

Plan

- Evaluate airway to ensure normal airway anatomy
- Determine whether direct laryngoscope or video laryngoscope will be the fastest method (both should be available); Sufficient muscle relaxant should be used to abolish cough reflexes
- Determine intubation medications (*Recommend:* ***Ketamine 2mg/kg***; ***Rocuronium* 1 mg/kg***) **Succinylcholine 1 mg/kg may also be used provided no contraindications (e.g. hyperkalemia)*

Position

- Optimize patient position in the "sniffing" position
- Optimize bed height
- For obese patients, the "ramped" position should be used

Pre Oxygenate

- 100% FiO2 for 5 minutes (***avoid BiPAP or bagging if possible***)
- If possible, use nasal cannula covered by filtered BiPAP mask without insufflating the BVM
- ***Alternative Pre-Ox***: Jackson-Reese bag with viral filter; NRB *over* mask; NC.HFNC *under* mask; BVM with viral filter/PEEP valve
- Prepare BVM and airway with a high-efficiency particulate air (**HEPA**) **filter** placed between the mask and the breathing circuit or the respiratory bag, and one at the expiratory end of the breathing circuit

Prepare

- IV/IO access patent
- Full cardiorespiratory monitors in place
- Pulse oximeter and BP cuff on opposite arms
- Equipment available and working (Suction, Airway and adjuncts, Back-up Plan - include cricothyroidotomy kit)
- Prepare for cardiovascular instability during intubation (availability of IVF bolus & pressors, e.g. ***Phenylephrine***)

Paralyze

- Push intubation meds **AFTER** physician to nurse order and nurse reply
- Avoid BVM, but if neccessary, bag with low tidal volume/high frequency to maintain oxygenation & reduce exposure
- If difficult intubation is encountered, use external laryngeal manipulation or bougie to improve chance of success
- If tracheal intubation fails, place a 2nd generation laryngeal mask and attempt fiberoptic bronchoscope

Post Intubation

- Inflate cuff prior to first breath and then Secure tube
- Confirm proper tube position (direct visualization, continuous waveform capnography, CXR)
- Collect all airway devices in a double-sealed bag and implement proper disinfection during disposal
- Ongoing sedation
- VAP prevention: HOB elevated, oral swab, cuff pressures 20-30, NG/OG

APPENDIX F : COVID-19 COGNITIVE AIDS FOR INTUBATION

COVID-19 Emergency Intubation Checklist

SAFE AIRWAY SOCIETY

CHECK BEFORE ENTERING ROOM

Team

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

Patient

- ❑ ECG, BP, Sats
- ❑ Pre-oxygenation
  - FIO2 100%
  - Sitting position 45˚
- ❑ IV access x 2
  - 1L fluid on pump set
- ❑ Haemodynamics optimised
  - Fluid bolus
  - Pressor

Drugs

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

Equipment

- ❑ 2 Laryngoscopes (tested)
- ❑ Tube chosen; cuff tested
- ❑ Bougie/stylet
- ❑ 10ml syringe
- ❑ Tube tie
- ❑ Lubricant
- ❑ Supraglottic airway sized to pt
- ❑ Scalpel + bougie CICO kit
- ❑ Airway trolley/bronchoscope outside room
- ❑ ETCO2
- ❑ Viral filter

FINAL CHECK IN ROOM

- ❑ Patient position optimal
- ❑ Fluid runs easily
- ❑ Suction working
- ❑ Facemask with viral filter connected
- ❑ ETCO2 trace
- ❑ O2 running at 15L.min^{-1}
- ❑ Oropharyngeal/nasal airways

❑ Airway plans:
- Plan A: Videolaryngoscopy with bougie/stylet
- Plan B: Supraglottic airway
- Plan C: Vice grip, 2-person +/- Guedel/NPA
- Plan D: Scalpel/bougie/tube

SAFE AIRWAY SOCIETY

COVID-19 AIRWAY MANAGEMENT

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

USE A 'BUDDY CHECK' FOR CORRECT PPE FITTING

Planning	Intervene early - aim to avoid emergency intubation. Negative Pressure room or Normal pressure with strict door policy. Senior clinician involvement. Is Anaesthetist needed? Early airway assessment documented by senior clinician.
Prepare	Assemble 5-6 person Airway Team (see reverse). Use COVID-19 Intubation Tray (see reverse). Ensure Viral Filter and ETCO2 in ventilation circuit. Share Airway Strategy. Use a dedicated COVID intubation checklist.
PPE	Hand Hygiene (HH). Donning: HH > Gown > Mask > Eye-protection > Hat > HH > Gloves. Spotter to perform "Buddy Check" to ensure correct PPE fit. Airway operator to consider double gloves.
Pre-Ox	45 degree head up position. Pre-oxygenate with Face Mask using 2 hands for full 5 minutes. Ensure a square ETCO2 waveform, to be confident of no leaks. Avoid Apnoeic Oxygenation techniques due to aerosolization risk.
Perform	Use VL; use the screen (indirect view) to maximise operator distance from airway. Modified RSI technique (1.5mg/kg IBW Roc OR 1.5mg/kg TBW Sux). No ventilation prior to intubation unless for rescue oxygenation. Wait 60 seconds for paralysis to take effect - avoid triggering cough.
Post-ETT	Inflate cuff BEFORE initiating ventilation and monitor cuff pressures to minimise leak. Remove outer gloves (if on), dispose of airway equipment in sealed bag. Doffing: Gloves > Gown > HH > Hat > Eye Protection > Mask > HH. Use a Spotter. Debrief and share lessons.

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

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

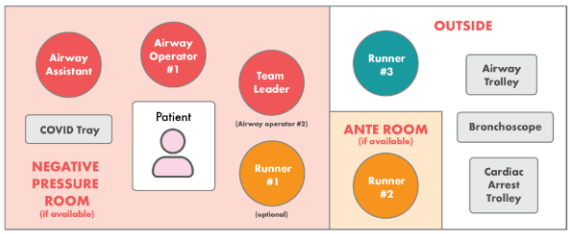
CICO Rescue
Scalpel-bougie technique to avoid aerosolization.

Collaboration between Safe Airway Society + RNS ASCAR *@SafeAirway + @RnsAscar* *v1.2 March 2020*

SAFE AIRWAY SOCIETY

COVID-19 AIRWAY MANAGEMENT

Team Members

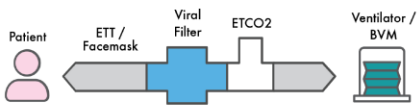


Highrisk COVID-19 PPE · Standard COVID-19 PPE · No PPE

COVID Intubation Tray

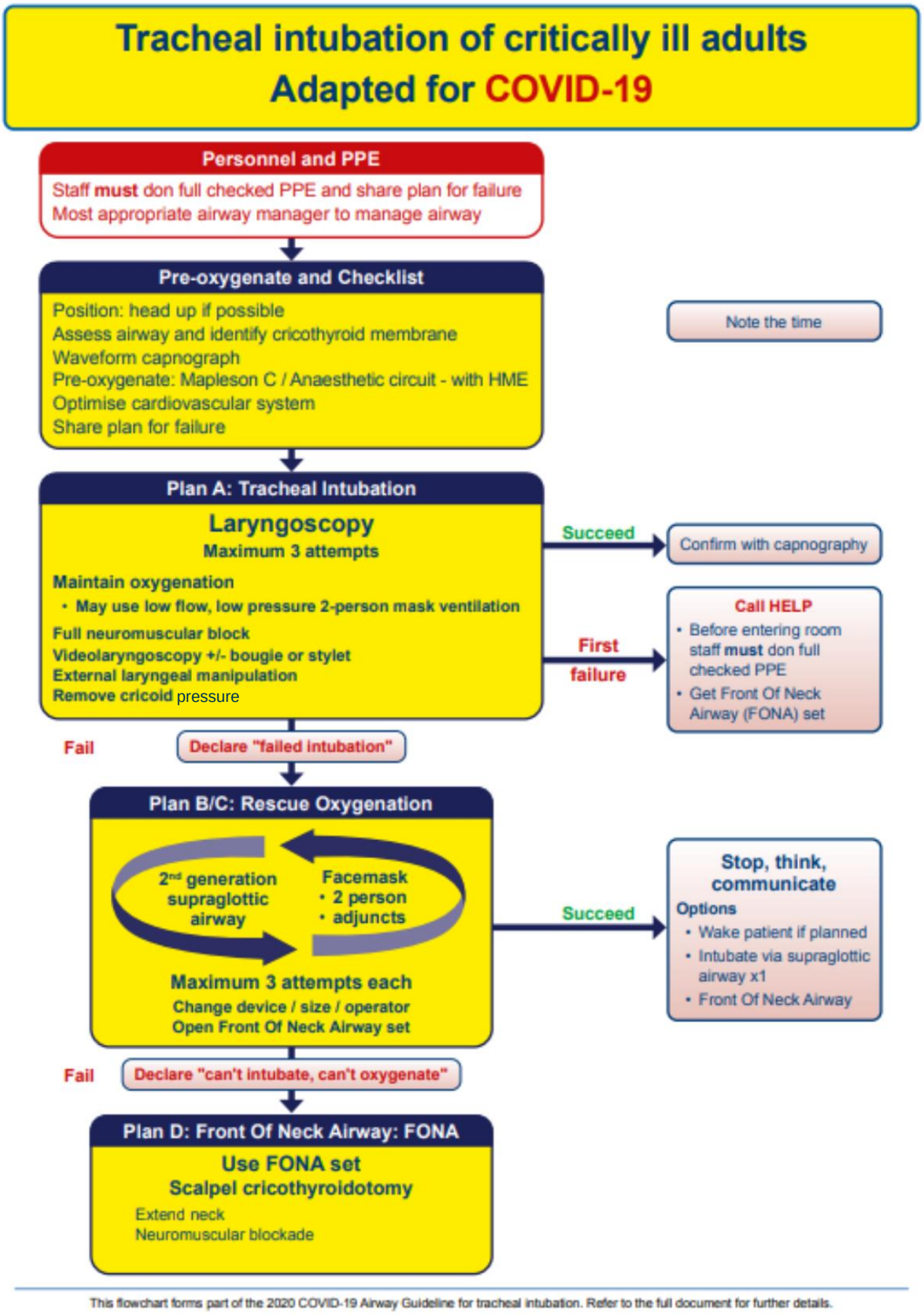
- ❑ Macintosh VL blade
- ❑ Hyperangulated VL blade (if available)
- ❑ Macintosh direct laryngoscope
- ❑ SGA (2nd generation)
- ❑ ETT (appropriate size range)
- ❑ Bougie / Stylet
- ❑ 10 mL syringe
- ❑ Tube tie
- ❑ Lubricant sachet
- ❑ Viral filter
- ❑ ETCO2
- ❑ NG tube (large bore)
- ❑ OPA + NPA
- ❑ Scalpel + bougie CICO kit
- ❑ Inline suction

Circuit Setup



Collaboration between Safe Airway Society + RNS ASCAR *@SafeAirway + @RnsAscar* *v1.2 March 2020*

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


Tracheal intubation of critically ill adults
Adapted for COVID-19
Personnel and PPE
Staff must don full checked PPE and share plan for failure
Most appropriate airway manager to manage airway
Pre-oxygenate and Checklist
Position: head up if possible
Assess airway and identify cricothyroid membrane
Waveform capnograph
Pre-oxygenate: Mapleson C / Anaesthetic circuit - with HME
Optimise cardiovascular system
Share plan for failure
Note the time
Plan A: Tracheal Intubation
Laryngoscopy
Maximum 3 attempts
Maintain oxygenation
• May use low flow, low pressure 2-person mask ventilation
Full neuromuscular block
Videolaryngoscopy +/- bougie or stylet
External laryngeal manipulation
Remove cricoid pressure
Succeed
Confirm with capnography
First failure
Call HELP
• Before entering room staff must don full checked PPE
• Get Front Of Neck Airway (FONA) set
Fail
Declare "failed intubation"
Plan B/C: Rescue Oxygenation
2nd generation supraglottic airway
Facemask
• 2 person
• adjuncts
Maximum 3 attempts each
Change device / size / operator
Open Front Of Neck Airway set
Succeed
Stop, think, communicate
Options
• Wake patient if planned
• Intubate via supraglottic airway x1
• Front Of Neck Airway
Fail
Declare "can't intubate, can't oxygenate"
Plan D: Front Of Neck Airway: FONA
Use FONA set
Scalpel cricothyroidotomy
Extend neck
Neuromuscular blockade
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 (≤ 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 G : SAMPLE PROTOCOL FOR EXTUBATION OF COVID-19 PATIENTS*

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

Guidelines for Extubation of COVID-19 patients:

- Extubations require 2 HCP's one to hold the mask while the second extubates the patient.
- Whenever possible patient should be placed in negative pressure rooms, and use cube extubation device with plastic shield
- This is considered an aerosolized procedure so proper N-95 masks should be worn, along with goggles, gowns and gloves.
- Place patient at 30 degrees and place nasal cannula on patient at 5-L/M
- Suction ETT and mouth prior to deflating the cuff
- Loosen ETT holder and place anesthesia face mask with HEPA filter attached over the patients nose and mouth leaving space for ETT exiting under the face mask
- IF anesthesia bag is used, use a low oxygen flow, consider attempting to exubate at end of expiration
- Deflate ETT cuff and extubate while maintaining face-mask seal
- Maintain two-handed mask seal until any immediate post-extubation coughing has subsided.
- Remove anesthesia mask and place procedure mask over the patient while wearing nasal cannula oxygen.

Place 5L nasal cannula on patient

Anesthesia mask without anesthesia bag over face-allowing ETT to exit under face mask

Anesthesia mask with anesthesia bag over face-allowing ETT to exit under face mask

APPENDIX H : TRANSPORT VENTILATOR SET UP GUIDE

Transport Vent Set Up Guide

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

A. A standard HME will not suffice for viral filtration. A HMEF (heat-moisture exchanger – filter) provides sufficient bacterial & viral filtration and can be used in place of an HME. If your patient does not already have an HMEF in place, place one prior to putting them on your transport ventilator. HMEFs are intended for extended use and filtration is not degraded over time. Any increase in resistance of gas flow is negligible. A HMEF that does not become visibly soiled can be used for 2-7 days.

B. If you need to exchange the HMEF or anytime there is a circuit break without a HMEF in-line, you must clamp the ET tube.

C. Whenever a circuit break is required all members in the area should be wearing full PPE with N95 mask or greater.

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

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

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

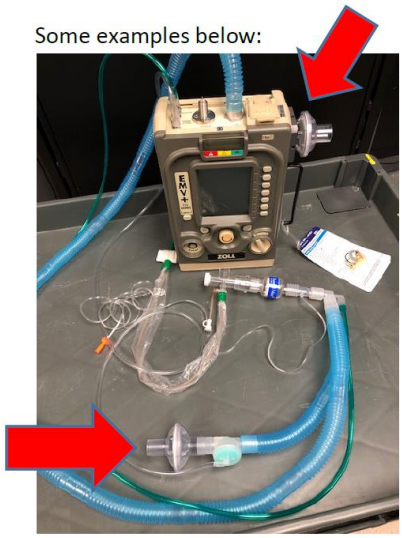
Bag Valve device with PEEP valve. HMEF is connected between ETT and bag.

Bag Valve device with PEEP valve. In-line suction is on patient side of HMEF. $EtCO_2$ is between HMEF and bag.

Vent circuit. In-line suction is on patient side of HMEF. $EtCO_2$ is between HMEF and vent circuit.

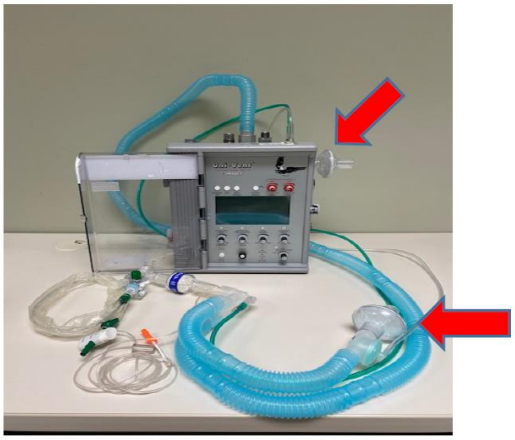
E. **In the event that HMEFs are not available**, the standard bacterial/viral vent filters will be needed. At a minimum, a filter must be placed on the port that entrains room air and the exhalation valve of the circuit. When disconnecting a patient from the ventilator without a HMEF, a standard bacterial/viral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

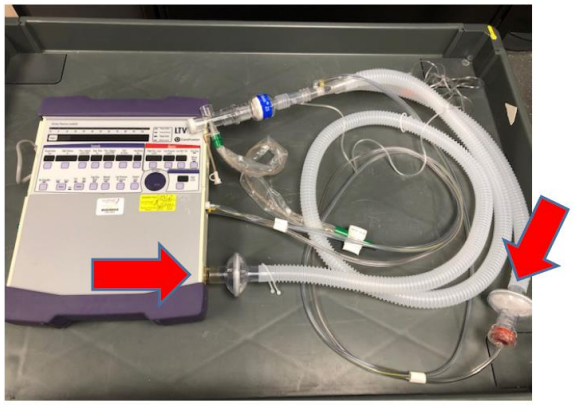
Some examples below:



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

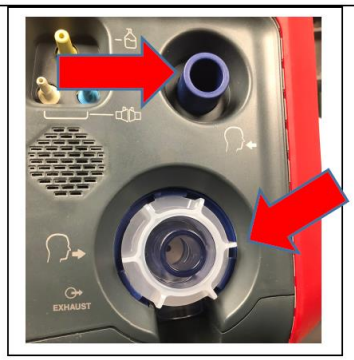
For the **Impact 754 ventilator**, place a filter on the gas intake (top arrow) and at the exhalation valve (bottom arrow). The set up for this ventilator will look identical to that of the Impact 731. The same caution must be taken when placing a filter on the gas intake due to the same risk of blocking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

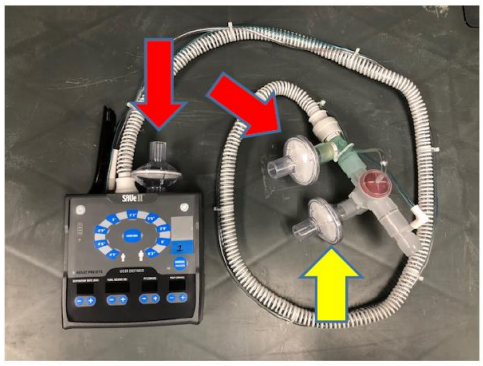




For the **LTV ventilator**, there are some important considerations. Filters should be placed as marked by the red arrows. It is important to understand that a filter cannot be placed where the vent entrains room air, instead a filter is placed between the vent and the beginning of the circuit (left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

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





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

APPENDIX I : WEIGHT-BASED HEPARIN DOSING ALGORITHM FOR VENOUS THROMBOEMBOLISM

Weight-Based Heparin Dosing for Venous Thromboembolism, anti-Xa goal 0.3-0.7	
Initial Therapy	
Bolus[a]	80 units/kg
Infusion[a]	18 units/kg/hr
Adjustments[b]	
Anti-Xa <0.2	Increase by 4 units/kg/hr
Anti-Xa 0.2-0.29	Increase by 2 units/kg/hr
Anti-Xa 0.3-0.7	No Change
Anti-Xa 0.71-0.8	Decrease by 1 unit/kg/hr
Anti-Xa 0.81-0.9	Hold for 0.5 hr; Decrease by 2 units/kg/hr
Anti-Xa >0.9	Hold for 1 hr; Decrease infusion by 3 units/kg/hr
(maximum 5,000 units), and typical initial infusion dose is 12 units/kg/hr (maximum 1,000 units/hr).	
[a]Round all doses to nearest 100 units.	
[b]Draw Anti-Xa 6 hours after STARTING therapy and 6 hours after any CHANGE in infusion rate.	
Adapted from *https://journals.sagepub.com/doi/pdf/10.1345/aph.1Q161*	

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

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

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

Determine EN Appropriateness and Beneficial Effects

- Determine if gastrointestinal tract is functional, bowel sounds not necessary[1]
- EN provides beneficial effects including decreased infection over parenteral nutrition (PN)[1]
- If patient is unable to tolerate EN due to diarrhea, nausea, vomiting, &/or abdominal discomfort, consider initiating parenteral nutrition[2]
- **Place consult to Registered Dietitian at facility, if available, or obtain telenutrition consultation**

Complete Nutrition Assessment

- Obtain accurate height and weight
- Assess for risk of malnutrition/refeeding syndrome; if present, start at 25% caloric goal (monitor serum phosphate, magnesium & potassium)[2]
- Calorie (kcal) goal: 15-20kcal/kg/day ACTUAL body weight (should be 70-80% of caloric requirements)[2]

Assess and Place Enteral Feeding Access Device

- Assess for current enteral access; using an existing nasogastric tube (NGT) or orogastric tube (OGT) is appropriate[2]
- Prefer NGT or OGT over a post pyloric feeding tube, as it is easier to place, can initiate EN more quickly, and is less likely to become clogged[2]
- Placing an enteral device may provoke coughing and should be considered an aerosol generating procedure[2]

Select Appropriate EN Formula and Dose

- For most pts with COVID-19 a standard high-protein (>20% protein) polymeric isosmotic enteral formula should be used in early acute phase of critical illness[2]
- Once patient becomes more stable and vasopressor requirements decrease, fiber should be added, if available (either switch to a fiber-containing formula or add a fiber modular)[2]
- In order to cluster care, nutritional modulars (e.g. fiber or protein) should be given once per day, if indicated through assessment[2]
- Initiate EN at 10-20 mL/hr and increase 10 mL-20 mL/hr every 8 to 12 hrs to goal rate ideally within the first 3-7 days[2]
- For pts on ECMO, recommend slow advancement to goal over the first week of illness[2]
- At a minimum, strive to maintain trophic feeds of 10-20 mL/hr to prevent intestinal mucosal atrophy[1]

Administer EN Safely and Appropriately

- Recommend early feeding (within 24-36 hrs of admission or 12 hrs of intubation) for all critically ill pts, including those on ECMO[2]
- Hang time:
  - Ready-to-hang closed system: 24-48 hrs
  - Liquid Cans/Bottles Open System: 8-12 hrs (tubing/hang sets must be changed every 24 hours)[3]
  - Powdered, Reconstituted Formula Open System: 4 hrs (tubing/hang sets must be changed every 24 hours)[3]
- Continuous infusion is preferred; however, if an infusion pump is unavailable, gravity feeds are superior to bolus feeds[2]
- Elevate head of bed (HOB) to 30-40 degrees while feeding, unless medically contraindicated
- For prone pts, elevate HOB 10-25%. Most patients in prone position tolerate EN delivered to the stomach[2]
- EN *can* be started when pt is on vasopressors; however, EN should be held if the patient requires high or increasing vasopressor support. EN may be restarted once patient is on stable vasopressor support with a sustained mean arterial pressure (MAP) of >65mmHg[2]

Monitor and Evaluate Patient

- Monitor I&Os daily
- Consider meds that provide calories & adjust tube feeding rate PRN: Propofol (1.1kcal/ml); Dextrose (3.4kcal/ml); Glycerol (4.3kcal/ml)
- If pt has diarrhea, consider using fiber-containing formula or a modular fiber product
- **Do not check gastric residual volume (GRV) routinely to monitor EN tolerance.** Use daily physical examination and confirmation of passage of stool and gas to assess feeding tolerance.[2] If feeds are not tolerated based on exam, consider use of prokinetic medications such as metoclopramide (Reglan) or erythromycin[2]
- Stress ulcer prophylaxis such as pantoprazole 40 mg IV daily should be utilized
- **If unable to initiate EN due to failed EN trial with appropriate gastric tube placement, use of prokinetic agent, and/or postpyloric tube placement, or EN is contraindicated (ileus, SBO, Mesenteric ischemia, high pressure respiratory pressure, etc.), please consult Registered Dietitian immediately for possible parenteral nutrition (PN) initiation. For pts with COVID-19, the threshold to switch from EN to PN may be lower than other critically ill patients[2]**

References:

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

APPENDIX K : SAMPLE PROTOCOLS FOR VARIOUS ICU MANAGEMENT

Intubation

Known or high suspicion of COVID-19
SpO_2 < 94% despite O_2 10 L/min NRB

Consider HHFNC or NPPV if in negative pressure room

Dyspnea improves $SpO_2 \geq 92\%$ → Monitor closely for worsening

Does not improve → **Decision to intubate**
- Elucidate code status
- Call designated Intubator
- Move to negative pressure room
- Obtain video laryngoscope
- Check premade intubation kit

- Move to private room
- Transition to comfort measures
- Palliate dyspnea (morphine)

1. PLAN
- Don N95, face shield, hat, gown, gloves
- As few in room as possible, cart outside
- Evaluate airway anatomy
- Establish fastest method
- Obtain induction/paralytic Rx (ketamine/rocuronium suggested)
- Prepare pressors (phenylephrine stick)

Premade Intubation Kit
- ETT 7.0 and 7.5 mm ID
- Glidescope blades sizes 3 & 4
- Glidescope stylet
- OP and NP airways
- Jackson-Rees BVM (green floppy bag)
- OG tube with syringe, lube, tape
- $etCO_2$ detector
- Yankauer and tubing
- Disposable stethoscope
- Viral filter
- Tube tamer

2. POSITION
- Sniffing position
- "Ramp" 30° if obese

3. PRE-OXYGENATE
- Jackson-Rees circuit with good mask seal
- HEPA filter between mask and circuit
- No or minimal bagging
- 15 L/min for **5 minutes**

4. PREPARE
- Verify good IV access, monitors, oximeter with pulse tone, BP cuff
- Verify suction, ETT cuff, stylet, Glidescope screen
- Intubating LMA or iGel and cric kit immediately outside room
- Review plan with team members
- Set a "quit" scenario and SpO_2

5. PUSH MEDS
- Push induction and paralytic Rx
- If needed, bag with low volume to maintain SpO_2

6. INTUBATE
- If difficult, use external laryngeal manipulation or bougie

Success → Secure airway; Obtain lower tracheal aspirate for SARS-CoV-2 PCR

Failure → **FAILURE TO INTUBATE**
- Attempt low-volume BVM with Jackson-Rees using good mask seal and HEPA filter

SpO_2 improves → **CAN'T OXYGENATE**
- Attempt intubating LMA or iGel and resume BVM through filter
- Prepare cricothyroidotomy kit

SpO_2 improves: Consider intubating through LMA

Failure → **SURGICAL CRICOTHYROIDOTOMY** *[Ensure cuffed tube]*

Mechanical Ventilation

Initial Settings
- Mode: VC-AC
- Rate: 16-24/min
- VT: 6 mL/kg IBW
- PEEP: 10 cmH_2O
- FiO_2: 100%

SpO_2 > 95% or pO_2 > 80 mmHg — *Above goal, reduce settings* → ↓FiO_2 by 10% q10min (≤ 95%) → Still 96-100% → PEEP 10 cmH_2O, FiO_2 40%

SpO_2 88-95% or pO_2 55-80 mmHg — *At goal, maintain settings*

SpO_2 < 88% or pO_2 < 55 mmHg — *Below goal, augment settings* → (≥88%) ↑ PEEP 2 cmH_2O q5min

Consider Prone/NMB

If Pplat > 30 cmH_2O: ↓VT (min 4 mL/kg) and/or ↑ RR (max 35) to goal Ve Or **Δ to PC**, Pi 30 cmH_2O; ✓VT to ensure 4-8 mL/kg

Harmful settings Pplat > 30 cmH_2O, VT < 4 mL/kg, Air trapping

Meeting Goals

Patient parameters
- SpO_2 88-95% or pO_2 55-80 mmHg
- Arterial pH 7.30-7.45

Ventilator measurements
- Plateau pressure ≤ 30 cmH_2O
- VT 4-8 mL/kg IBW
- RR < 35/min with I:E < 1:1

Weaning
- Goal PEEP/FiO_2 ratio 1:4-1:6; alternate ↓FiO_2 10% or ↓PEEP 2 cmH_2O q4h
- If APRV, drop-and-stretch or Δ to VC-AC
- Daily SBT when $FiO_2 \leq 40\%$ and PEEP 5 cmH_2O if awake and other issues resolved

APRV "drop-and-stretch"
- Alternate ↓FiO_2 10% and ↓P_{high} 2 cmH_2O q4h
- When P_{high} 20 and FiO_2 50%: ↓P_{high} 2 cmH_2O, ↑T_{high} 0.5 s q4h
- When P_{high} 10 cmH_2O: change to CPAP, daily SBT

APRV/IRV
- P_{high}: 30 cmH_2O
- P_{low}: 0 cmH_2O
- T_{high}: 4.5 s
- T_{low}: 0.5 s or 75% exp flow
- FiO_2 100%
- Beware ↓BP due to ↓venous return at ↑P_{high} (PEEP tamponade)
- Beware ↑pCO_2 if sedated/NMB

Rescue Oxygenation *(before or after APRV)*
- Pressure Recruitment (40/40)
- Prone position
- Paralyze (NMB)
- Pulmonary vasodilators (iNO, inhaled epoprostenol)
- Consider ECMO if no other organ failure

ARDSnet PEEP/FiO_2 Table

	30%	40%	50%	60%	70%	80%	90%	100%
Lo PEEP	5	5-8	8-10	10	10-14	14	14-16	18-24
Hi PEEP	5-14	14-16	16-20	20	20	20-22	22	22-24

Oxygenation

Ventilation

Ventilation Goals
Art pH 7.30-7.45
Ve = RR×VT, Ve×CO_2 pre = Ve×CO_2 post
(if Ve ↑20%, then CO_2 will ↓20%; easiest to Δ RR)

Decrease Ve if able
- If measured RR = set rate: ↓RR or VT (min VT 4 mL/kg)
- If measured RR > set rate: optimize sedation/NMB, ↓VT
- If RR ≤ 12 and HCO_3^- > 30: consider acetazolamide

Increase Ve if able
- ↑VT (max 8 mL/kg, max Pplat 30 cmH_2O)
- If RR = set rate: ↑RR (max 35/min, I:E < 1:1)
- If APRV, attempt to ↓ cycle to 5 s (RR 12), e.g. T_{high} 4.5, T_{low} 0.5
- If pH < 7.10: consider HCO_3^- drip

Arterial pH > 7.45 — *Above goal, reduce Ve if able*

Arterial pH 7.30 – 7.45 — *At goal, maintain Ve*

Arterial pH < 7.30 — *Below goal, augment Ve*

COVID Proning

1. ASSESS
- Secure ET tube with tape
- Confirm patency of and secure all lines and tubes
- Remove anterior ECG leads and replace on posterior torso
- Consider foam pads to anterior bony prominences and 20° wedge
- Consider fecal management system
- Prepare for ↑sedation/NMB
- Remove headboard, engage brake

2. ASSEMBLE
1. RT – airway
2. RN – lines/tubes
3. Helper 1 – torso
4. Helper 2 – legs
5. Physician

3. ALIGN
- Upper-body tubes/lines with shoulder (except chest tube)
- Lower-body lines with leg and extended off bed
- Turn toward ventilator
- RT at head, helpers toward vent

4. TURN
1. Secure all tubes/lines
2. Rotate head 45° away from vent
3. Turn patient using drawsheet to 45°
4. Lay support rolls across chest (just inferior to axillae) and waist
5. Gently rotate head away from vent
6. Place upper arm in "swimmer's pose:" shoulder neutral, abducted 90°, elbow flexed 90°
7. Complete turn until patient is prone facing toward vent and flexed arm
8. Straighten arm opposite ventilator and lay alongside patient

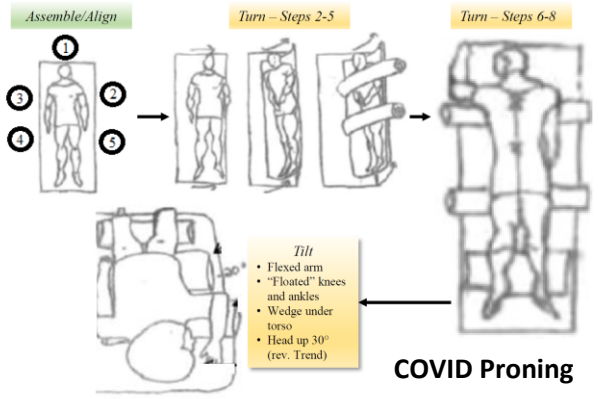
5. TILT
- Ensure rolls allow for abdomen expansion and "floating" hips
- Place pillows under flexed arm and ankles (prevent shoulder and hip hyperextension)
- Place 20° wedge under torso on flexed side
- Place in **reverse Trendelenburg** (head up) 30° as tolerated

6. TIMING
- Alternate laterality q2h, including flexed arm, rotated head, and torso wedge
- Remain prone for at least 16 hr/day if tolerated
- Return to supine position once daily up to 4 hr (ideally prior to AM shift change)
- Obtain ABG 30 min after returning to supine to re-eval need for proning
- Change ET tube tabe q12-24 hr

6. TERMINATION
Good:
- pO_2/FiO_2 > 200 on $FiO_2 \leq 50\%$ and PEEP ≤ 10 cmH_2O

Bad:
- Failed to improve or worsening gas exchange
- Hemodynamically unstable

Ugly:
- Facial edema
- Pressure ulcers
- Corneal abrasion



COVID Rapid Response Team

RRT Parameters
- HR < 40 or > 130/min
- RR < 8 or > 24/min
- SBP < 90 mmHg
- SpO_2 < 90% on supplemental O_2
- Mental status change
- Patient, staff or family concern

Inside Room

Bedside Nurse
- Don PPE (with PPE buddy), evaluate patient
- Notify Charge Nurse by Staff Assist or Vocera
- Remain in room to care for patient

Outside Room

Charge Nurse
- Vocera: "Broadcast COVID RRT"
- "COVID RRT, [floor/unit], [room number]"

Charge Nurse
- Ensures proper personnel arrive
- Minimize personnel entering room
- Ensure appropriate PPE (buddy system)
- Notify Nursing Supervisor if need for transfer

COVID ICU RN
- Determines initial intervention(s) within scope of RRT
- Enters room only if necessary

COVID RT
- Assists with respiratory issues
- Ensures adherence with appropriate utilization of AGPs (neb vs MDI, HFNC vs NPPV)

COVID Physician
- Orders add'l lab and/or imaging
- Bedside US if indicated
- Determines final disposition
- Notify COVID Triagist if needs higher level of care

Criteria to *Consider* Higher Level of Care
- O_2 requirement ↑ by 2 L/min or more, or 6 L/min or greater
- RR > 24/min (counted manually) with other signs of respiratory distress
- New or worsening lab abnormalities (CRP, lymphopenia, troponin, LDH)
- Newly ↓ LVEF on bedside US
- Age > 60 with known significant comorbidities (CAD, HTN, DM2)

[above are neither exclusive nor mandatory]

Transfer to Higher Level *(e.g. ICU)* ← *Meets criteria*

Does not meet criteria → Remain on Current Unit

COVID Code Blue - *Roles & Responsibilities*

Code Blue Activation Parameters
Pulseless, Unresponsive, or Apneic

Bedside Nurse (or First Responder)
- Immediately place surgical mask on patient
- Activate COVID Code Blue (notify Charge Nurse)
- Pulseless: start high-quality CPR
- After 30 compressions: NRB over surgical mask (15 L/min)
- Resume "compression only" high quality CPR
- Upon arrival of Code Cart, switch compressors and attach Zoll pads and ensure backboard
- Continue to alternate as compressor while also assisting ICU Nurse with crash cart and meds

After donning appropriate PPE

Ward Technician
- Assists first responder with chest compressions
- Assists with crash cart

COVID Respiratory Therapist
- Immediately gets designated video laryngoscope
- Responds to room: bring VL, Intubation kit, and RRT supplies into the room
- Intubation set up; assists Airway operator

COVID ICU Nurse
- Ensure IV access
- Manages crash cart, defibrillation, ACLS meds
- Requests for additional nursing support via Team Leader who communicates with Charge Nurse

Airway (Anesthesia)
- Determines & executes designated airway plan

Team Leader (COVID Intensivist)
- Leads the COVID Code Blue team using the normal ACLS algorithm; determines dispo
- Communicates directly with Charge Nurse

Inside Room

Outside Room

Charge Nurse
- Vocera: "Broadcast COVID Code Blue" then state "COVID Code Blue, [floor/unit], [room number]" and repeat
- Bring crash cart to door outside room; remove contents from bottom two drawers and place on nursing/PPE cart nearby
- Call Anesthesia to notify about intubation for COVID patient
- Contact Backup Personnel per request of COVID Team Leader

PPE Buddy
- Stands at doorway
- Ensures appropriate and expeditious donning of PPE (Modified Checklist)
- Assists Charge Nurse with monitoring doorway traffic

Runner (Ward RN)
- Assists Charge Nurse with equipment or med request
- Enters room only if necessary

Pharmacy
- Brings Pharmacy-specific Code med box
- Draws up add't meds outside the room
- Passes necessary meds to personnel via doorway

Backup Personnel
- Charge Nurse will contact directly as ordered by the COVID Team Leader
- COVID Triagist, COVID Hospitalist, Surgeon, Nursing Supervisor

Transport to Higher Level of Care (COVID ICU)
- Charge Nurse to Notify: PMO (clear route), COVID Triagist, Nursing Supervisor
- COVID ICU Nurse: call report to receiving ICU Nurse
- COVID Code Team to transport in full PPE
- Intubated: BVM with viral filter; alternate options include transport ventilator if readily available and additional filter for single limb circuits

PRIOR TO COVID CODE BLUE
- **Be familiar with donning appropriate PPE**
- Ensure surgical mask available at patient bedside
- Ensure equipment availability to give O_2 15 L/min by non-rebreather mask (NRB)
- Prepared bag with BVM, PEEP valve, **HEPA filter** (goes between mask and bag)
- Position Code Cart, airway equipment, and ultrasound machine in designated areas on COVID ICUs & wards
- Ensure appropriate IV access
- Validate and update code status, e.g. DNR/DNI
- Ensure Charge Nurse understands team member roles

FULL PPE FOR CODE BLUE
"Modified Buddy Checklist for Emergencies"
1. Hand hygiene
2. Gloves (underneath gown)
3. Isolation gown
4. **N95 Mask**
   - Intubator: PAPR if available
5. Bouffant cap
6. Full face shield
7. Gloves (over gown)

CALL "COVID CODE BLUE"
- Immediately place mask on patient (if not already intubated)
- Personnel at bedside immediately notifies Charge Nurse and begins CPR
- Place NRB over surgical mask @ 15 L/min
- Apneic oxygenation until Airway Operator & airway supplies arrive
- Defer to local policy about bringing defibrillator and code cart inside room

CODE TEAM INSIDE ROOM
1. Patient's Primary Nurse
2. Respiratory Therapist
3. Medical Technician
4. Code Blue Response Nurse (ICU Nurse)
5. Airway operator / Intubation team (Anesthesia)
6. Team Leader (ICU Physician)

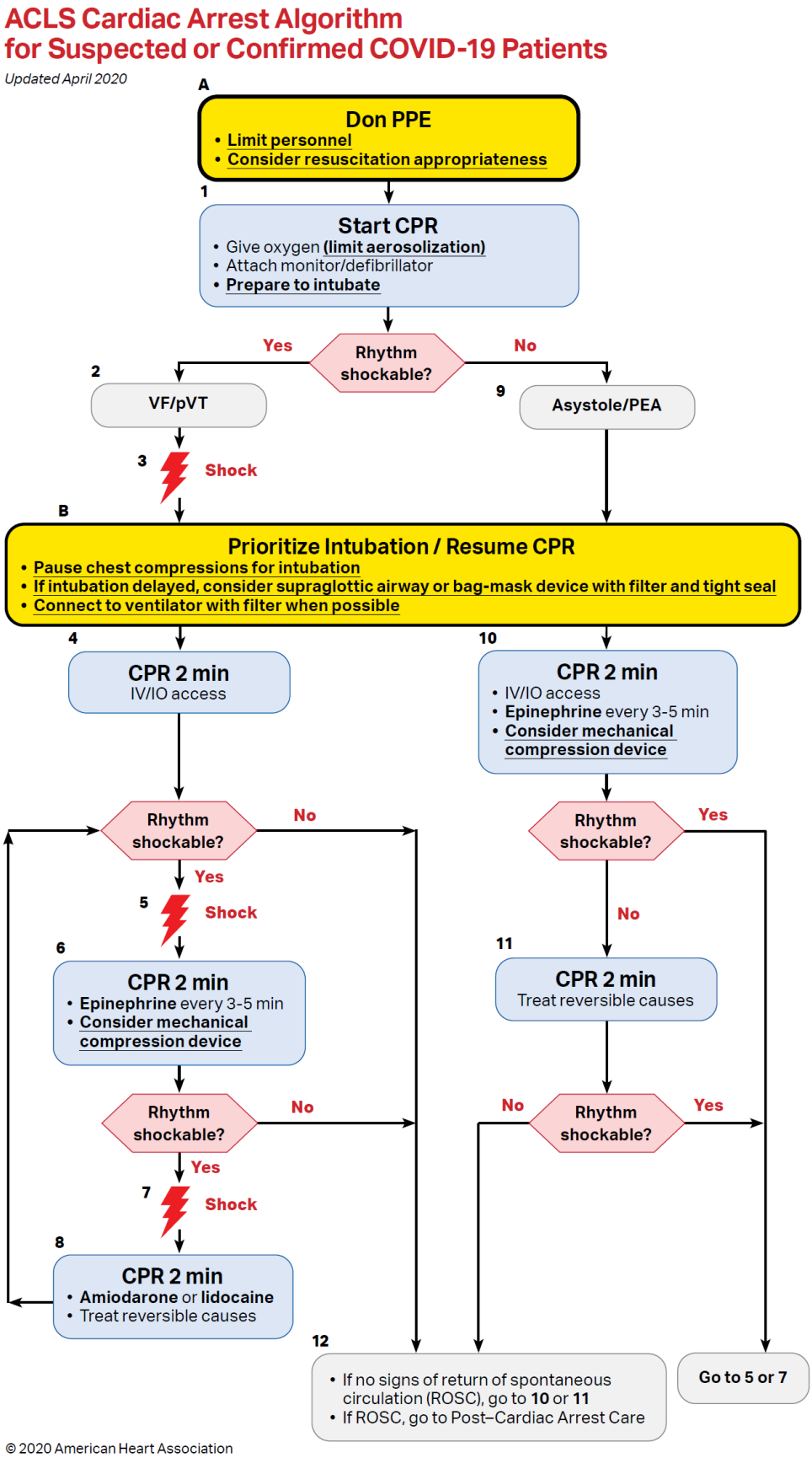
TEAM OUTSIDE ROOM
1. Charge Nurse
2. PPE Buddy
3. Pharmacist
4. Cart runner (ward RN or tech)
5. COVID Hospitalist or Triagist
6. Available upon request: Nurse Supervisor, Surgeon, Chaplain

PERFORM CPR/ACLS
- High quality CPR: rate 100-120 compressions/minute, 2
- Apply LUCAS 3 machine if available
- No bag-valve-mask ventilation unless optimal seal and viral filter on BVM (2-person technique)
- Intubated: Consider Δ vent settings to RR 10 breaths/min, PEEP ↑ to > 10 cmH_2O, FiO2 100%
- Ventilator troubleshooting ("DOPE"): Dislodged/Obstructed tube, PTX, Equipment malfunction
- Must **remove NRB mask prior to defibrillation** if indicated (contains metal and flammable O_2)
- Consider LMA or early intubation if CPR continues to minimize aerosolization
- Ensure adequate communication through the door with minimization of opening

Reversible cause identified and treatable
- Attempt reversal of cause, e.g. defib, chest tube, $NaHCO_3$, oxygenation/ventilation
- Consider cessation of CPR at 20 minutes

Irreversible (e.g. refractory hypoxia) or no cause found
- If VV-ECMO → considering converting to VA-ECMO
- Cease CPR after 10 minutes

APPENDIX L : AHA ACLS & PALS CARDIAC ARREST ALGORITHM FOR COVID-19 PATIENTS



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Advanced Airway

- Minimize closed-circuit disconnection
- Use intubator with highest likelihood of first pass success
- Consider video laryngoscopy
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.
  or
  Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

Return of Spontaneous Circulation (ROSC)

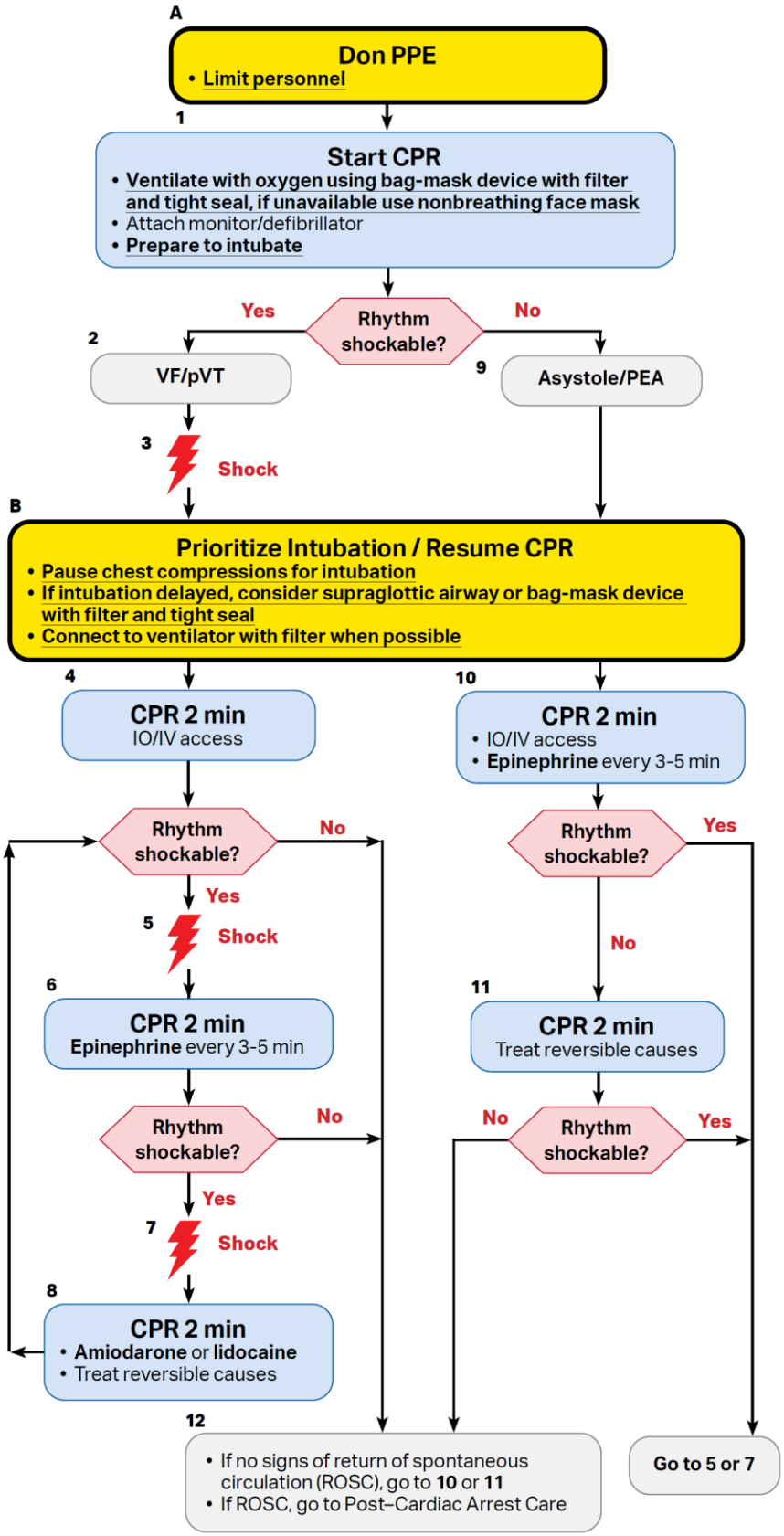
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

Pediatric Cardiac Arrest Algorithm for Suspected or Confirmed COVID-19 Patients

Updated April 2020



© 2020 American Heart Association

CPR Quality

- Push hard (≥⅓ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 15:2 compression-ventilation ratio.

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose

Advanced Airway

- **Minimize closed-circuit disconnection**
- **Use intubator with highest likelihood of first pass success**
- **Consider video laryngoscopy**
- **Prefer cuffed endotracheal tube if available**
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Drug Therapy

- **Epinephrine IO/IV dose:** 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration). Repeat every 3-5 minutes.
- **Amiodarone IO/IV dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.
  or
  Lidocaine IO/IV dose: Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy).

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypoglycemia
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

APPENDIX M : PREPARATION AND CLEANING OF ULTRASOUND ROOMS IN THE CONTEXT OF COVID-19

Reference: ISUOG Safety Statement: Safe performance of obstetric and gynecological scans and equipment cleaning in the context of COVID-19

Ultrasound units:

Preparation and cleaning of ultrasound room for all patients

The survival of severe acute respiratory syndrome (SARS)-associated viruses (including COVID-19) on dry inanimate surfaces, such as ultrasound systems, is between 48 and 96 h. The ultrasound room should be cleaned thoroughly each morning and all contents should be wiped with a compatible low-level disinfectant (LLD), including the ultrasound monitor, computer keyboard and mouse, stretcher rails, transducer holder, gel container, door handles, cabinet knobs, light switches, chairs and counter tops.

- The number of transducers connected to the ultrasound machine should be reduced to a minimum, usually one transabdominal and one transvaginal, and all other transducers should be stored safely in a clean closed cabinet and brought out as needed.
- All unnecessary accessories in the room should be removed and, where possible, stored in the cabinets.
- Fabric-covered chairs should be replaced with hard-surface chairs that can be wiped.
- Where possible, replace all washable linen, such as towels, pillow covers and sheets, with disposable covers.
- Ultrasound transducers and cables should be cleaned (as recommended below) every morning and this should also be performed after each scan.
- The patient bed or couch should be wiped with a LLD prior to replacing the disposable paper cover.
- The disposable paper cover should be removed with gloved hands and folded and disposed of immediately at the end of each examination.
- Ensure that the highly touched surfaces (e.g. keyboard, cord and screen) of the ultrasound machine are thoroughly cleaned after each examination.
- At the end of the day, soiled linen should be handled using two pairs of gloves and disposed of in the appropriate container without shaking the linen. The room and equipment should undergo terminal cleaning using a LLD. Hands should be washed for 20 sec afterwards.

Preparation and cleaning of ultrasound equipment for all patients

The transducer and ultrasound equipment must be cleaned with a compatible LLD after each patient, in accordance with local guidelines.

Preparation and cleaning of ultrasound equipment after performing an examination in a suspected of confirmed COVID-19 case

SARS coronavirus, Middle East respiratory syndrome (MERS) coronavirus and endemic human coronaviruses (HCoV) can persist on inanimate surfaces, such as metal, glass or plastic, for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 min. Other biocidal agents often used include 0.05–0.2% benzalkonium chloride (Clinell TM) or 0.02% chlorhexidine digluconate.

- Check the required contact time for each product.

Since information about COVID-19 is incomplete, additional use of high-level disinfectants is recommended; however, this advice is manufacturer-specific. High-level disinfectants include ethanol 80-95% (exposure time 30 sec), 2-propanol 75-100% (exposure time 30 sec), 2-propanol and 1-propanol 45% and 30% (exposure time 30

sec), sodium hypochlorite 0.21% (Antisapril Blu 2%, exposure time 30 sec), glutaraldehyde 2.5% (exposure time 5 min) and 0.5% (CIDEX OPA, exposure time 2 min), hydrogen peroxide 0.5% (REVITAL-OX RESERT, exposure time 1 min)6.Protective eyewear and gloves should be used when cleaning, disinfecting or sterilizing any equipment.

Preparation and cleaning of ultrasound transducer after performing an examination in a suspected or confirmed COVID-19 case

If feasible, it is recommended to have one (or more) dedicated ultrasound machine(s) for patients with suspected/probable/confirmed COVID-19 infection.

- If the patient must be scanned in the clinic, this should be done at the end of the clinic list, as the room and equipment will subsequently require a deep clean.
- It is imperative to perform hand hygiene once the gloves have been removed.

Guidelines regarding cleaning of ultrasound transducers between patients are available. Coronaviruses are enveloped viruses, which are the least resistant to inactivation by disinfection. The structure of these viruses includes a lipid envelope, which is easily disrupted by most disinfectants suitable for use on ultrasound systems and transducers.

According to the Spaulding classification system, medical devices are classified according to the infection risk they present as non-critical, semi-critical and critical (also referred to as low-risk, medium-risk and high-risk). Non-critical devices present the lowest risk for infection as they come in contact with intact skin, such as transabdominal transducers. Low- or intermediate-level disinfection is recommended, which will eradicate most bacteria (but not bacterial spores) and fungi, as well as certain types of viruses, including human immunodeficiency virus (HIV). Semi-critical devices are those that present a higher risk for infection because of contact with non-intact skin or mucous membranes. Transvaginal transducers belong to this category. High-level disinfection for destruction of all microorganisms, including COVID-19, is recommended and can be performed by means of solutions containing sodium hypochlorite or other disinfectants as detailed above. Critical devices, such as transducers used in invasive procedures, must undergo sterilization as per medical facility guidelines irrespective of whether a probe cover is used.

Preparation of the ultrasound transducer consists of two steps: cleaning and disinfection. Any products used for cleaning or disinfection must be compatible with the ultrasound equipment, as determined by the ultrasound equipment manufacturer. Certain products may damage ultrasound equipment or transducers and invalidate warranties.

1. Cleaning

This is an important first step since any remaining gel can act as a barrier to the disinfectant thus diminishing its efficacy. The USA Centers for Disease Control and Prevention (CDC) defines cleaning as ‘the removal of foreign material (e.g., soil, and organic material) from objects and is normally accomplished using water with detergents or enzymatic products’. Ineffective cleaning prior to disinfection can limit the effectiveness of chemical disinfection.

Current guidelines for cleaning transvaginal transducers recommend using running water to remove any residual gel or debris from the probe before cleansing thoroughly the transducer using a damp gauze pad, or other soft cloth, and a small amount of mild nonabrasive liquid soap (approved for use on medical instruments). The use of a small brush especially for the crevices and areas of angulation should be considered, depending on the design of the particular transducer. The transducer should then be rinsed thoroughly with running water and dried with a soft cloth or paper towel.

Based on the above guidelines, the following steps are recommended for cleaning the transducer, which should be performed wearing disposable gloves:

a. Disconnect the transducer.
b. Remove the transducer cover (if applicable) and dispose of in clinical waste.
c. Rinse the operative end of the transducer with running tap water (NOT the electronic contact end).
d. Clean the transducer with a soft brush and nonabrasive detergent.
e. Rinse the transducer with tap water.
f. Clean the transducer cable with a LLD wipe.
g. Dry with a cloth or towel (residual water can dilute chemical disinfectants, if this is the preferred method).

2. Disinfection

Always refer to your facility's infection control policies and protocols, as well as the transducer manufacturer's instruction for use and labels for use. Disinfection practices are evolving constantly, and this is the most current to date. As mentioned above, high-level disinfection is recommended for transvaginal but not transabdominal transducers. Specific product instructions must be consulted. Available methods (current at the time of publication) include:

Chemical 'wet' disinfection:

- 2.4–3.2% glutaraldehyde products (such as Cidex, Metricide and Procide).
- Non-glutaraldehyde agents (such as Cidex OPA (o-phthalaldehyde) and Cidex PA (hydrogen peroxide and peroxyacetic acid).
- Approved multistep disinfectant wipes containing chlorine dioxide, which are used extensively in the UK and Australia (Tristel Duo®).
- 7.5% hydrogen peroxide solution, which works by producing destructive hydroxyl free radicals.
- Sodium hypochlorite 0.21% (Antisapril Blu 2%).

Note that common household bleach (5.25% sodium hypochlorite) diluted to yield 500 parts per million chlorine (10 cc in one L of tap water), although effective it is not recommended by manufacturers because it can potentially cause damage to metal and plastic parts of the transducer. Mention of this disinfectant here does not imply that we consider it to be appropriate, but we are aware that it is used in some settings.

Automated high-level disinfection:

- Antigermix (Germitec, France): the transducer is placed in a closed cabinet and exposed to high-intensity ultraviolet type C radiation.
- Astra VR (CIVCO Medical Solutions, USA): automated disinfection with Cidex OPA and Metricide solutions.
- Trophon (Nanosonics, Australia): sonicated hydrogen peroxide mist.

After cleaning, store transducer in a clean closet or its case with foam inset to prevent damage and protect from contamination with dirt, if it is not going to be reused immediately.

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

QUICK REFERENCE GUIDE
Virtual Health and Telephone Encounters

DHA Defense Health Agency | MHS Military Health System health.mil

Disclaimers:

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

	Method	Virtual Health (Privileged Provider to Patient)				Virtual Health (Privileged Provider to Provider)		Audio-Only Encounters			Online Messaging Encounters
	Interaction	Virtual Video Visit (V3) **DISTANT SITE** (where provider is located e.g. MTF)		Virtual Video Visit (V3) **ORIGINATING SITE** (where patient is located e.g. MTF)		Teleconsultation at distant site (where provider is located at e.g. MTF or on a ship) for professional interpretation	Teleconsultation at distant site (where provider is located at e.g. different MTF or on ship) for diagnosis and treatment	Clinical Telephone (audio only)		T-CON	Secure Messaging
	PHA	✓		✓				✓			
	Synchronous	✓		✓				✓	✓	✓	
	Asynchronous					✓	✓				✓
	Type: Scheduled	✓		✓				✓			
	Type: Unscheduled					✓	✓			✓	✓
CHCS	Appointment	FTR	24HR, FTR, SPEC (provider discretion)	FTR	24HR, FTR, SPEC	SPEC, FTR		24HR, FTR, SPEC	24HR, FTR, SPEC	T-CON	N/A
CHCS	Detail Code	PHA and TELMED	TELMED	PHA and TELMED	TELMED	N/A	N/A	HC		N/A	N/A
E/M Code	Code	Office Visit Code		99499	99499	99451 ≥5 min consultant time including written report 99452 30 min requesting provider time in referral work	Verbal and Written Report: 99446 5-10 min 99447 11-20 min 99448 21-30 min 99449 +31 min	99499		99441 5-10 min 99442 11-20 min 99443 21-30 min	For 2019: 99444 For 2020: 99421 5-10 min 99422 11-20 min 99423 21+ min
E/M Code	Modifier	GT (patient is present at originating site e.g. clinic to clinic) or 95 (clinic to non-clinic patient location)		N/A	N/A	N/A	GQ	N/A	N/A	N/A	GQ
CPT/HCPCS	Code	96160	N/A	Q3014 (and any procedures performed at the originating site within presenter's scope of practice)		Procedures per documentation	N/A	96160 + G2012	G2012	N/A	N/A
CPT/HCPCS	Modifier	N/A	N/A	N/A	TC (if technical component of procedure/ test are completed and no interpretation and report are rendered)	26 (interpretation only; professional component)	N/A	N/A	N/A	N/A	N/A

Effective Date: 03/30/2020

APPENDIX O : EXAMPLE TRIAGE PROTOCOL FOR RESOURCE ALLOCATIONS IN TIMES OF CRISIS

TRIAGE PLANNING COMMITTEE	
Members (Minimum)	Roles
2 Senior Clinicians Senior Nursing Representative Ethics Representative Community Member Pastoral Care Palliative Care (as available)	-Planning for the greatest medical benefit to greatest number of people -Establish SOPs for conventional, contingency and crisis capacity -Provide oversight support of scarce resource allocation decisions -Maintain available representative 24/7 to triage teams and command -Seek opportunities for regionalization of resources as permissible
TRIAGE TEAM	
Members	Roles
Triage Officer (Senior Clinician) Acute Care Nurse Administrative Staff Member Ethics Representative (as available) Community Member (as available)	-Liaison with command and planning committee on resources (ICU beds, staffing, equipment) -Initial contact with clinical teams for assessment of priority scoring -Collect only information relevant to priority scoring and maintain database -Make urgent allocation decisions within 90 minutes of clinical team request -Meet twice daily to match resources to patient needs and -Reassess patients every 72 hours (Minimum) -Report conflicts or requests for appeal/oversight to Planning Committee representative

Figure 1: Example of Triage Team Composition and Roles

Example of Triage Oversight/Appeal Board (Individual to Each MTF)

Committee (≥3 for quorum)

- Chief medical officer
- Chief nursing officer
- Planning Committee Rep
- Legal counsel
- Risk management
- Chair of ethics committee
- Off-duty triage officer

Figure 2. Sample Priority Scoring Method

Priority Score (37) = SOFA score (24) + Clinical Frailty Score (9) + Comorbidity Score (4)
(Numbers is parenthesis are maximum scores)
(Calculators Below)
***For Pediatric patients use PSOFA**

Patient's Score____ = SOFA _____+ Frailty Score _____ + Comorbidity Score ___

SOFA score	1	2	3	4
Respiration PaO_2/FiO_2 mm Hg	< 400	< 300	< 200 with respiratory support	< 100 with respiratory support
Coagulation Platelets x $10^3/mm^3$	< 150	< 100	< 50	< 20
Liver Bilirubin, mg/dL (µmol/L)	1.2–1.9 (20–32)	2.0–5.9 (33–101)	6.0–11.9 (102–204)	> 12.0 (> 204)
Cardiovascular Hypotension[a]	MAP < 70 mm Hg	Dopamine ≤ 5 or Dobutamine (any dose)	Dopamine < 5 or epinephrine ≤ 0.1 or norepinephrine ≤ 0.1	Dopamine > 1.5 or epinephrine > 0.1 or norepinephrine > 0.1
Central Nervous System Glasgow coma score	13–14	10–12	6–9	< 6
Renal Creatinine, mg/dL (µmol/L) or urine output	1.2–1.9 (110–170)	2.0–3.4 (171–299)	3.5–4.9 (300–440) or < 500 mL/day	> 5.0 (> 440) or < 200 mL/day

[a] adrenergic agents administered for at least one hour (doses given are in µg/kg · min)

SOFA Score Table for Scoring below[1]

Variable	Physiologic Value	Score
PaO2 /FiO2 Ratio SaO2/FiO2 Ratio		
Platelet Count		
Bilirubin		
Blood Pressure		
Vasopressor dose	None or Agent/Dose:	
GCS		
Creatinine		
	TOTAL SOFA SCORE	

Glasgow Coma Score (used for SOFA scoring above)

Criteria	Action	Score	Criteria Score
Best Eye Response	No eye opening	1	
	Opens to painful stimuli	2	
	Opens to verbal command	3	
	Opens spontaneously	4	
Best Verbal Response	None	1	
	Incomprehensible sounds	2	
	Inappropriate words	3	
	Confused	4	
	Oriented	5	
Best Motor Response	None	1	
	Extension	2	
	Flexion	3	
	Withdraw from pain	4	
	Localizes to pain	5	
	Obeys command	6	
Total Score			

Table 1 Detailed CFS criteria

CFS	Severity	Definition
1	Very fit	People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age
2	Well	People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g., seasonally
3	Managing well	People whose medical problems are well controlled, but are not regularly active beyond routine walking
4	Vulnerable	While not dependent on others for daily help, often symptoms limit activities. A common complaint is being "sloped up", and/or being tired during the day
5	Mildly frail	These people often have more evident slowing, and need help in high older IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework
6	Moderately frail	People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing
7	Severely frail	Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~6 months)
8	Very severely frail	Completely dependent, approaching the end of life. Typically, they could not recover from a minor illness
9	Terminally ill	Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail

CFS, clinical frailty scale.

Clinical Frailty Score Criteria[6]

Clinical Frailty Score (1-9) _____

Table to use for Comorbidity Score

Examples of Major Comorbidities	Examples of Severely Life Limiting Comorbidities
• Moderate dementia • Malignancy with < 10 year expected survival • New York Heart Associate Class III heart failure • Moderate to severe chronic lung disease (COPD, ILD) • End Stage Renal Disease (age < 75) • Severe Multivessel CAD • Cirrhosis with history of decompensation	• Severe dementia • Cancer with only palliative treatment options • New York Heart Associate Class IV heart failure • Severe COPD with frailty • Cirrhosis with MELD > 20 • End Stage Renal Disease (age > 75)

2 Points for Major Comorbidities: Yes / No
4 Points for Severely Life Limiting Comorbidities: Yes / No

Pediatric SOFA[3]

Variables	Score[a] 0	1	2	3	4
Respiratory					
Pao_2:Fio_2[b] or Spo_2:Fio_2[c]	≥400	300-399	200-299	100-199 With respiratory support	<100 With respiratory support
	≥292	264-291	221-264	148-220 With respiratory support	<148 With respiratory support
Coagulation					
Platelet count, $\times 10^3/\mu L$	≥150	100-149	50-99	20-49	<20
Hepatic					
Bilirubin, mg/dL	<1.2	1.2-1.9	2.0-5.9	6.0-11.9	>12.0
Cardiovascular					
MAP by age group or vasoactive infusion, mm Hg or µg/kg/min[d]					
<1 mo	≥46	<46	Dopamine hydrochloride ≤5 or dobutamine hydrochloride (any)	Dopamine hydrochloride >5 or epinephrine ≤0.1 or norepinephrine bitartrate ≤0.1	Dopamine hydrochloride >15 or epinephrine >0.1 or norepinephrine bitartrate >0.1
1-11 mo	≥55	<55			
12-23 mo	≥60	<60			
24-59 mo	≥62	<62			
60-143 mo	≥65	<65			
144-216 mo	≥67	<67			
>216 mo[e]	≥70	<70			
Neurologic					
Glasgow Coma Score[f]	15	13-14	10-12	6-9	<6
Renal					
Creatinine by age group, mg/dL					
<1 mo	<0.8	0.8-0.9	1.0-1.1	1.2-1.5	≥1.6
1-11 mo	<0.3	0.3-0.4	0.5-0.7	0.8-1.1	≥1.2
12-23 mo	<0.4	0.4-0.5	0.6-1.0	1.1-1.4	≥1.5
24-59 mo	<0.6	0.6-0.8	0.9-1.5	1.6-2.2	≥2.3
60-143 mo	<0.7	0.7-1.0	1.1-1.7	1.8-2.5	≥2.6
144-216 mo	<1.0	1.0-1.6	1.7-2.8	2.9-4.1	≥4.2
>216 mo[e]	<1.2	1.2-1.9	2.0-3.4	3.5-4.9	≥5

1. Moreno R, Vincent J-L, Matos R, et al. The use of maximum SOFA score to quantify organ dysfunction/failure in intensive care. Results of a prospective, multicentre study. *Intensive care medicine.* 1999;25(7):686-696.
2. Wallis S, Wall J, Biram R, Romero-Ortuno R. Association of the clinical frailty scale with hospital outcomes. *QJM: An International Journal of Medicine.* 2015;108(12):943-949.
3. Matics TJ, Sanchez-Pinto LN. Adaptation and validation of a pediatric sequential organ failure assessment score and evaluation of the sepsis-3 definitions in critically ill children. *JAMA pediatrics.* 2017;171(10):e172352-e172352.
4. Faden RR, Kass NE, Goodman SN, Pronovost P, Tunis S, Beauchamp TL. An ethics framework for a learning health care system: a departure from traditional research ethics and clinical ethics. *Hastings Center Report.* 2013;43(s1):S16-S27.
5. Emanuel EJ, Persad G, Upshur R, et al. Fair allocation of scarce medical resources in the time of Covid-19. In: Mass Medical Soc; 2020.
6. Shimura T, Yamamoto M, Kano S, Kagase A, Kodama A, Koyama Y, Otsuka T, Kohsaka S, Tada N, Yamanaka F, Naganuma T. Impact of frailty markers on outcomes after transcatheter aortic valve replacement: insights from a Japanese multicenter registry. Annals of cardiothoracic surgery. 2017 Sep;6(5):532.

APPENDIX P : LIST OF CONTRIBUTORS

Contributors (*Denotes Section Editor)		
*Lt Col Wesley M. Abadie, MC, USAF	*COL Patrick Hickey, MC, USA	Lt Col Jamie Rand, MC, USAF
SMSgt Britton Adams, USAF	Mr. Roy Hirchak	MAJ Tyler Reese, MC, USA
LCDR Meilssa Amescua, USAF	Vincent B. Ho, MD, MBA	*LTC Sean Reilly, MC USA
Maj David M. Anderson, MC, USAF	Charles W. Hoge, MD	CAPT Robert Ricca, MC, USN
Col Michelle K. Anton, MC, USAF	Col Melissa Howard, USAF	COL Michael A. Robertson, USA
Maj Bracken Armstrong, MC, USAF	Col David Hsieh, MC, USAF	Daniel J. Ross, MD, DDS
COL David M. Benedek, MC, USA	*MAJ Jessica Hull, MC, USA	Col James B. Sampson, MC, USAF
*CDR John Benjamin, MC, USN	CDR Ashley E. Humphries, MC, USN	*COL Dennis Sarmiento, MC, USA
COL Janetta Blackmore, USA	Maj John Hunninghake, MC, USAF	LCDR David C. Shih, MC, USN
*LTC Matthew A. Borgman, MC, USA	MAJ Nikhil A. Huprikar, MC, USA	*Bich-Thuy T. Sim, MD
Maj Sarah Bowe, MC, USAF	Col (Ret) Mylene T. Huynh, MD, MPH	Maj Erica Simon, MC, USAF
*Lt Col Saunya N. Bright, BSC, USAF	MSgt Ashley Jackson, USAF	*COL William Smith, MC, USA
Laura R. Brosch, RN, PhD	CAPT Elliot Jessie, MC, USN	*LCDR Scott Snyder, MC, USN
Lt Col Daniel Brown, MC, USAF	CDR Shane Jensen, MC, USN	LCDR Amit Sood, USN
Robert F. Browning, MD	COL Matthew R. Jezior, MC, USA	Lt Col Derek Sorensen, MC, USAF
*COL Jessica L. Bunin, MC, USA	CDR Michael J. Kavanaugh, MC, USN	*Col Barton C. Staat, MC, USAF
*CAPT Timothy H. Burgess, MC, USN	Maj Rohin Kasuda, MC, USAF	CPT Bryan Stepanenko, MC, USA
Maj Denise Campbell, USAF	*Lt Col Jeremy Kilburn, MC, USAF	*Lt Col Ian Stewart, MC, USAF
*COL Andre Cap, MC USA	Thomas D. Kirsch, MD, MPH	Mr. Randy W. Stone, JD
LTC Vincent Capaldi, MC, USA	*LTC Lisa Konitzer, USA	*Maj Matthew Streitz, MC, USAF
Col Francis R. Carandang, MC, USAF	CDR Joseph Kotora, MC, USN	Col Richard Strilka, MC, USAF
Col Jennifer C. Chow, MC, USAF	MAJ Benjamin Krainin, MC, USA	Maj Mary Stuever, MC, USAF
Mr. David Christiansen	CAPT Mark G. Lieb	*Col Deena E. Sutter, MC, USAF
Julia Christopher, DO	CAPT Robert Liotta, MC, USN	*COL Timothy L. Switaj, MC, USA
LTC Jacob Collen, MC, USA	Maj David A. Lindholm, MC, USAF	*Lt Col Bryan D. Szalwinski, MC, USAF
*LTC Christopher Colombo, MC, USA	MAJ Adrianna Long, MC, USA	MAJ Matthew Timlin, MC, USA
Ms. Polyxeni Combs, MS	*COL Frederick Lough, MC, USA	Mary C. Vance, MD, MSc
CAPT Meghan L. Corso, USPHS	*CDR Monica A. Lutgendorf, MC, USN	TSgt Alysha Waite, USAF
*Ms. Helen Crouch, MPH, CIC, FAPIC	LCDR Donovan L Mabe, MC, USN	COL Wendi M. Waits, MC, USA
*CAPT Konrad L. Davis, MC, USN	COL James Mancuso, MC, USA	Maj Robert J. Walter, MC, USAF
*LTC Sally DelVecchio, MC, USA	CDR Frank Margaron, MC, USN	CDR Lauren A. Weber, MC, USN
COL Sean N. Dooley, MC, USA	Col Leslie Matesick, MC, USAF	James C. West, MD
*COL Jeremy Edwards, MC, USA	*CAPT Ryan C. Maves, MC, USN	Mr. Bryan T. Wheeler, JD
CAPT Eric Elster, MC, USN	Mr. Greg McFarland, PE	CAPT David Whittaker, MC, USN
CAPT Bridgette Faber, USN	CDR Sean Mckay, MC, USN	Col J. Frederick Wiedenhoefer, MC, USAF
*MAJ Emilio Fentanes, MC, USA	MAJ Michael McMahon, MC, USA	Alison C. Wiesenthal, MD
CDR Jamie Fitch, MC, USN	Maj Krista Mehlhaff, MC, USAF	Maj Thomas J. Wilson, MC, USAF
Ms. Sarah Flash	Maj Eric Meyer, MC, USAF	*CAPT Gordon Wisbach, MC USN
LTC Shannon C. Ford, MC, USA	COL Stephanie Meyer, USA	MAJ Amanda L. Wolfe, USA
MAJ Brian Foster, MC, USA	CDR Kelly Mokay, USN	*Col Leslie Wood, MC, USAF
Mr. Al Garza, PE	CAPT Joshua C. Morganstein, USPHS	COL Gary H. Wynn, MC, USA
*Lt Col Brian J. Gavitt, MC, USAF	Mr. Art Murnan, PE	Col Heather Yun, MC, USAF
Dr. James Giordano, PhD	COL Clinton K. Murray, MC, USA	CAPT Luke Zabrocki, MC, USN
Mr. Joshua Girton, JD, LLM, MBA	Ms. Lori Naumcheff	Mr. Michael J. Zleit, JD
CDR Reina Gomez, USN	CDR Phung Thien Nguyen, USN	
Mark Haigney, MD	Lt Col Jason F. Okulicz, MC, USAF	
*LTC Mitchell Hamele, MC, USA	COL Neil Page, MC, USA	
MAJ William Harner, MC, USA	COL Jeremy C. Pamplin, MC, USA	
COL Bonnie H. Hartstein, MC, USA	LCDR Melissa Parkes, USN	
Maj Alison Helfrich, MC, USAF	*LTC P. Gabriel Peterson, MC, USA	
COL Brian A. Hemann, MC, USA	LTC Wylan C. Peterson, MC, USA	
Maj Minette Herrick, USAF	Ms. Rhonda Podojil	
Mrs. Jennifer Hesch, JD	Mr. Joseph Procaccino, JD, MFS	