COMMON COUNCIL
Agenda Request Form

(Form B-01-2012)

Organizations and individuals are asked to submit a request form and supporting documents to be placed on the agenda. You will be contacted by the City confirming the date of the meeting in which your request will be heard. Please make sure that your contact information is accurate in case we need to get in touch with you. The Common Council meets on the 1st and 3rd Monday of each month at 6:00 p.m. in City Hall located at 70 E. Monroe Street.

Date Submitted:	09/16/20	**Meeting Date:**	09/21/20
Contact Information:			
Requested by:	Fire Chief Matt Culp		
On Behalf of Organization or Individual:	Fire Department		
Telephone;	317-736-3650		
Email Address:	mculp@franklin.in.gov		
Mailing Address:	1800 Thornburg Lane, Franklin, IN 46131		
Describe Request:			
Common Council Budgetary Ordinance No. 20-16 An Additional Appropriation General Fund Fire Capital 400 - $145,602.00 – For Purchase of new Zoll Cardiac Monitor Package			
List Supporting Documentation Provided:			
Budgetary Ordinance 20-16; 2 Letters from Fire Chief; Zoll Quote; Zoll Documents x 3; AHA Covid Guidelines & DOD Covid Guidelines			
Who will present the request?			
Name:	Fire Chief Matt Culp	**Telephone:**	317-736-3650

In order for an individual and/or agency to be considered for new business on the Common Council agenda, this reservation form and supporting documents must be received in the Mayor's office no later than 4:00 p.m. on the Wednesday before the meeting.

CITY OF FRANKLIN, INDIANA

BUDGETARY ORDINANCE No.: 20-16 AN ADDITIONAL APPROPRIATION ORDINANCE

WHEREAS, it has been determined that it is now necessary to appropriate money in the General Fund Fire Capital for the purchase of Zoll Defibrillators in the amount of $145,602.00.

NOW THEREFORE, be it ordained by the Common Council of City of Franklin, Indiana that for the expenses of the taxing unit the following additional sums of money are hereby appropriated out of the funds named and for the purposes specified, subject to the laws governing the same:

Fund and Line Item	**Amount Appropriated**
General Fund Fire Capital– 101 006 400	$ 145,602.00

Introduced and Filed on the _____day of _____, 2020.

DULY PASSED on this _____ day of _____, 2020, by the Common Council of the City of Franklin, Johnson County, Indiana, having been passed by a vote of _____ in Favor and _____ Opposed.

City of Franklin, Indiana, By its Common Council:

Voting Affirmative:	Voting Opposed:
_____ Kenneth Austin, President	_____ Kenneth Austin, President
_____ Melissa Jones	_____ Melissa Jones
_____ Daniel J. Blankenship	_____ Daniel J. Blankenship
_____ Robert D. Heuchan	_____ Robert D. Heuchan
_____ Anne McGuinness	_____ Anne McGuinness
_____ Chris Rynerson	_____ Chris Rynerson
_____ Shawn Taylor	_____ Shawn Taylor

Attest:

_____
Jayne Rhoades
City Clerk-Treasurer

Presented by me to the Mayor of the City of Franklin for his approval or veto pursuant to Indiana Code § 36-4-6-15, 16, this _____ day of _____, 2020 at _____ o'clock a.m./p.m.

_____
Jayne Rhoades,
City Clerk-Treasurer

This ordinance having been passed by the legislative body and presented to me [Approved by me and duly adopted, pursuant to Indiana Code § 36-4-6-16(a)(1)] [Vetoed, pursuant to Indiana Code § 36-4-6-16(a)(2)], this_____ day of _____, 2020 at _____ o'clock a.m./p.m.

_____
Stephen Barnett
Mayor

Attest:

_____
Jayne Rhoades,
City Clerk-Treasurer

Prepared by: srb

Matt Culp
Chief

Justin Lollar
Deputy Chief

CITY OF Franklin Fire Department

1800 Thornburg Lane
Franklin, In 46131
(317) 736-3650
Fax (317) 346-9885

September 15, 2020

The Franklin Fire Department is trying to upgrade our cardiac monitors so we can better monitor and treat Covid patients. We use four vehicles for first out Emergency Medical response and therefore would need to outfit all four vehicles with cardiac monitoring equipment. The main reasons for using these monitors are to access End Tidal Carbon Dioxide with waveform capnography, Temperatures, blood pressure, serial EKG changes and SPO2. These cardiac monitors would allow the Fire Department to obtain all of this information for diagnostic and treatment considerations based on individual patient symptoms. These parameters are what the Department of Defense and the American Heart Association as well as various other medical based organizations support for the care of Covid patients. Cost estimate of $145,601.64.

Sincerely,

Matt Culp

Chief

Franklin Fire Department

Matt Culp
Chief

Justin Lollar
Deputy Chief

CITY OF Franklin Fire Department

1800 Thornburg Lane
Franklin, In 46131
(317) 736-3650
Fax (317) 346-9885

September 16, 2020

The Zoll monitor is compatible with what equipment that we already use as it is an upgraded monitor to the model we currently use at Franklin Fire. We currently have hardware and supplies that in value total over $12,000 that would not be useable if we switched to a different vendor. The Zoll monitor is the only device on the market that is on the FDA PMA list that offers CPR feedback which describes whether or not you are properly during chest compressions at proper rate and depth. This is the same technology that is used when we recertify at the hospital in CPR. Zoll monitors also have the capability of recognizing if adult or pediatric defib pads are being used and adjust the CPR and based on their use, Zoll monitors allow see thru CPR technology which allows the user to see the underlying electrical heart rhythm while doing chest compressions. The final feature that is unique to Zoll monitors is remote viewing which is the doctor can view the monitor information at the receiving hospital on a real time on-going basis and not just receive a one-time snap shot as other units. The issues of compatibility and sole sourcing make the Zoll monitors unique. The monitor will come with all the features that make it useful in treating and recognizing Covid based symptoms such as temperature, end tidal CO2 with waveform, oxygen saturation, serial EKG display, and non-invasive blood pressures.

Sincerely,

Matt Culp

Chief

Franklin Fire Department

269 Mill Road
Chelmsford, Massachusetts 01824-4105
978-421-9655 (main)
978-421-0025 (fax)
www.zoll.com

August 3, 2020

To whom it may concern:

When addressing COVID-19 patients, certain parameters can help monitor these patients. According to the updated American Heart Associate Guidelines published in March, the following guidance for EMS and other first responders when dealing with a suspected COVID-19 case has been provided:

- Emergency medical dispatchers should question callers and determine the possibility that this call concerns a person who may have signs or symptoms and risk factors for COVID-19. The query process should never supersede the provision of pre-arrival instructions to the caller when immediate lifesaving interventions (e.g., CPR or the Heimlich maneuver) are indicated.
- When COVID-19 is suspected in a patient needing emergency transport, prehospital care providers and healthcare facilities should be notified in advance that they may be caring for, transporting, or receiving a patient who may have COVID-19 infection.
- EMS clinician practices should be based on the most up to date COVID-19 clinical recommendations and information from appropriate public health authorities and EMS medical direction.[1]

If a patient is suspected or determined to have COVID-19, the X Series monitor/defibrillator offer a variety of parameters to monitor this particular disease state including:

- SPO_2
- Temperature
- $EtCO_2$
- Blood Pressure
- Serial ECG Changes

269 Mill Road
Chelmsford, Massachusetts 01824-4105
978·421·9655 *(main)*
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www.zoll.com

For more information, please visit our website at www.zoll.com/products/defibrillators/x-series-for-ems or contact your local sales representative.

Sincerely,

Patricia Daggett
Associate Director of EMS Marketing

1. https://cpr.heart.org/-/media/cpr-files/resources/covid-19-resources-for-cpr training/interim-guidance-march-19-2020.pdf?la=en&hash=5A491D18BBB61795442A98A49A50C05173C77EF6

DoD COVID-19 PRACTICE MANAGEMENT GUIDE

Clinical Management of COVID-19

This Practice Management Guide does not supersede DoD Policy.

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

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

DoD COVID-19 PRACTICE MANAGEMENT GUIDE

Clinical Management of COVID-19

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

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Draft Release Date: 20 March 2020

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BACKGROUND

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

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

CLINICAL PRESENTATION & CLINICAL COURSE

1. Incubation period: ~4 days (interquartile range: 2 to 7 days).(5) Some studies have estimated a wider range for the incubation period; data for human infection with other coronaviruses (e.g. MERS-CoV, SARS-CoV) suggest that the incubation period may range from 2-14 days.
2. Frequently reported symptoms of patients admitted to the hospital: (3, 6-9)
    - Fever (77–98%)
    - Cough (46%–82%)
    - Myalgia or fatigue (11–52%)
    - Shortness of breath (3-31%)
    - GI symptoms, such as diarrhea and nausea (may approach 50%)
3. Among 1,099 hospitalized COVID-19 patients, fever was present in 44% at hospital admission, and developed in 89% during hospitalization.(10)
4. Less commonly reported symptoms: sore throat, headache, cough with sputum production and/or hemoptysis, and lower respiratory tract signs and symptoms.
5. Risk factors for severe illness are not yet clear, although older patients and those with chronic medical conditions may be at higher risk for severe illness.(11)
6. Children: Limited information is available about the clinical presentation, clinical course, and risk factors for severe COVID-19 in children. Of confirmed COVID-19 patients in China as of Feb 11, 2020, only 2.1% were aged <20 years, and no deaths were reported among those <10 years of age. From limited published reports, signs and symptoms among children with COVID-19 may be milder than adults, with most pediatric patients presenting with fever, cough, congestion, and rhinorrhea, and one report of primarily gastrointestinal symptoms (vomiting and diarrhea). Severe complications of acute respiratory distress syndrome and septic shock were reported in a 13-month old with COVID-19 in China and another was reported in a 55 day old.(12-15)
7. Prolonged detection of SARS-CoV RNA has been reported in respiratory specimens (up to 22 days after illness onset) and stool specimens (at least 30 days after illness onset).(12, 13)
8. Clinical presentation among reported cases of COVID-19 varies in severity from asymptomatic infection to mild illness to severe or fatal illness. Several reports suggest the potential for clinical deterioration during the second week of illness. In one report, among patients with confirmed COVID-19 and pneumonia, just over half of patients developed dyspnea a median of 8 days after illness onset (range: 5–13 days). In another report, the mean time from illness onset to hospital admission with pneumonia was 9 days.(3, 8)
9. Acute respiratory distress syndrome (ARDS) developed in 17–29% of hospitalized patients, and secondary infection developed in 10%. In one report, the median time from symptom onset to ARDS was 8 days.(3, 6, 7)

10. Approximately 20-30% of hospitalized patients with COVID-19 and pneumonia have required intensive care for respiratory support. Compared to patients not admitted to an intensive care unit, critically ill patients were older (median age 66 years versus 51 years), and were more likely to have underlying co-morbid conditions (72% versus 37%). (3, 7)
11. Among critically ill patients admitted to an intensive care unit, 11–64% received high-flow oxygen therapy and 47-71% received mechanical ventilation; some hospitalized patients have required advanced organ support with endotracheal intubation and mechanical ventilation (4–42%).(6, 7, 11)
12. A small proportion (3-12% of ICU patients) have also been supported with extracorporeal membrane oxygenation (ECMO).(6, 7, 11) Other reported complications include cardiac injury, sudden cardiac death, arrhythmia, septic shock, liver dysfunction, acute kidney injury, and multi-organ failure. Post-mortem biopsies in one patient who died of ARDS reported pulmonary findings of diffuse alveolar damage.(16)
13. A case fatality rate of 2.3% has been reported among confirmed cases of COVID-19 in China.(11) However, the majority of these cases were hospitalized patients, so this mortality estimate is likely biased upward. Among hospitalized patients with pneumonia, the case fatality proportion has been reported as 4–15%.(3, 6, 7) In a report from one Chinese hospital, 61.5% of critically ill patients with COVID-19 had died by day 28 of ICU admission. Among all critically ill COVID-19 patients in China, the reported case fatality proportion was 49%.(2)

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

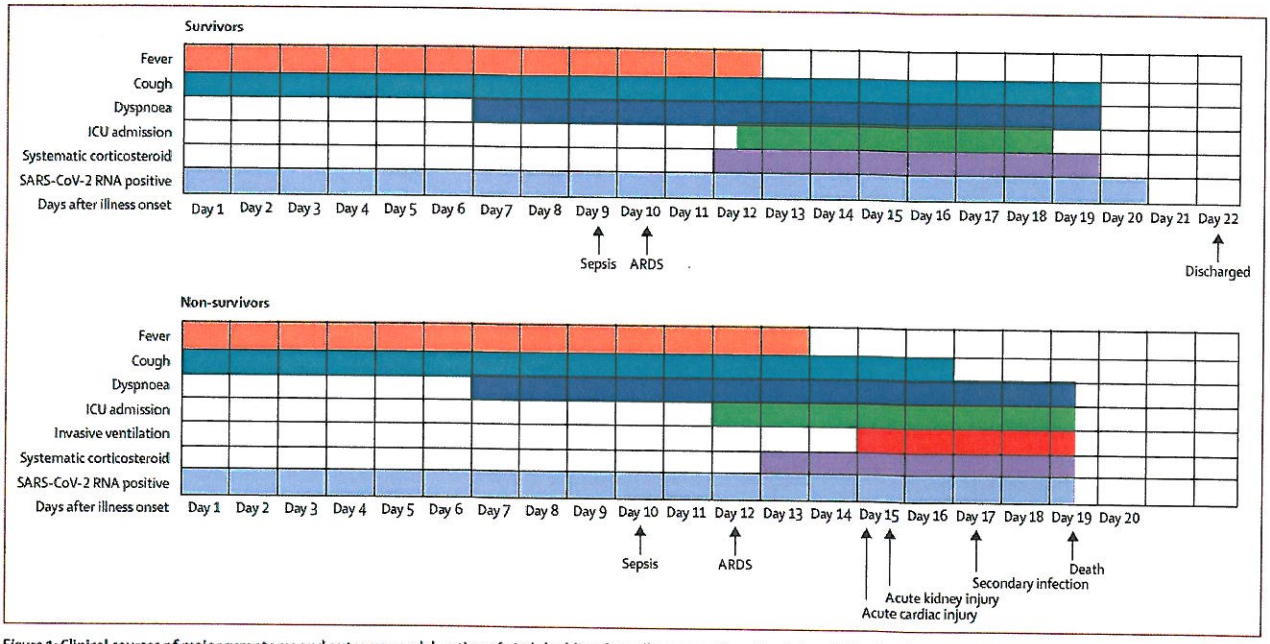


Figure 1: Clinical courses of major symptoms and outcomes and duration of viral shedding from illness onset in patients hospitalised with COVID-19
Figure shows median duration of symptoms and onset of complications and outcomes. ICU=intensive care unit. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. ARDS=acute respiratory distress syndrome. COVID-19=coronavirus disease 2019.

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

PLANNING AND PREPARATION

Facility Incident Command and Systems.

1. A command structure with clearly defined roles and lines of communication should be defined prior to a pandemic and can be part of these exercises.(17, 18) These structures should have the ability to coordinate expansion or restriction of critical care resources through implementation of Contingency and Crisis Standards of Care (CSC) in conjunction with Unit medical directors, help coordinate "just in time" training as well as regional expert consultation (i.e. tele-consultation with critical care,

infectious disease, or other specialists), facilitate the flow of critical equipment and patients, and communicate/coordinate CSC changes on both a local and regional level liaise with the community as transition depends on regional, not just local, healthcare utilization.

2. Establish and Manage Crisis/Contingency Standards of Care
    a. CSC are "a substantial change in usual healthcare operations and the level of care it is possible to deliver, which is made necessary by a pervasive (e.g., pandemic influenza) or catastrophic (e.g., earthquake, hurricane) disaster."(19)
    b. The establishment of the CSC should enable specific legal and regulatory protections for health care providers when having to operate under conditions of limited medical resources and alternate models of care. For reference, DODI 6200.02 allows for establishment of a CSC within the DoD.
    c. Design and implementation of these standards for each agency should remain flexible based on each situation and should be tiered (i.e. normal operations, contingency, crisis) and have specific triggers to engage. In general contingency when >120% typical capacity and crisis when >150-200% capacity though this may be revised down or up depending on availability of staff, stuff, and space.
    d. CSC should be developed by multi-disciplinary groups and collated by the Incident Command Center (ICC) and should in some ways be individualized to a facility. A list of topics that should be included:
        - Authority and triggers for enacting escalating CSC
        - Emergency credentialing and scope of practice changes as CSC escalate (nursing, physician, etc)
        - Alterations in practice allowed (limiting documentation, changes in work hours and locations, changes in location of patient care and monitoring requirements

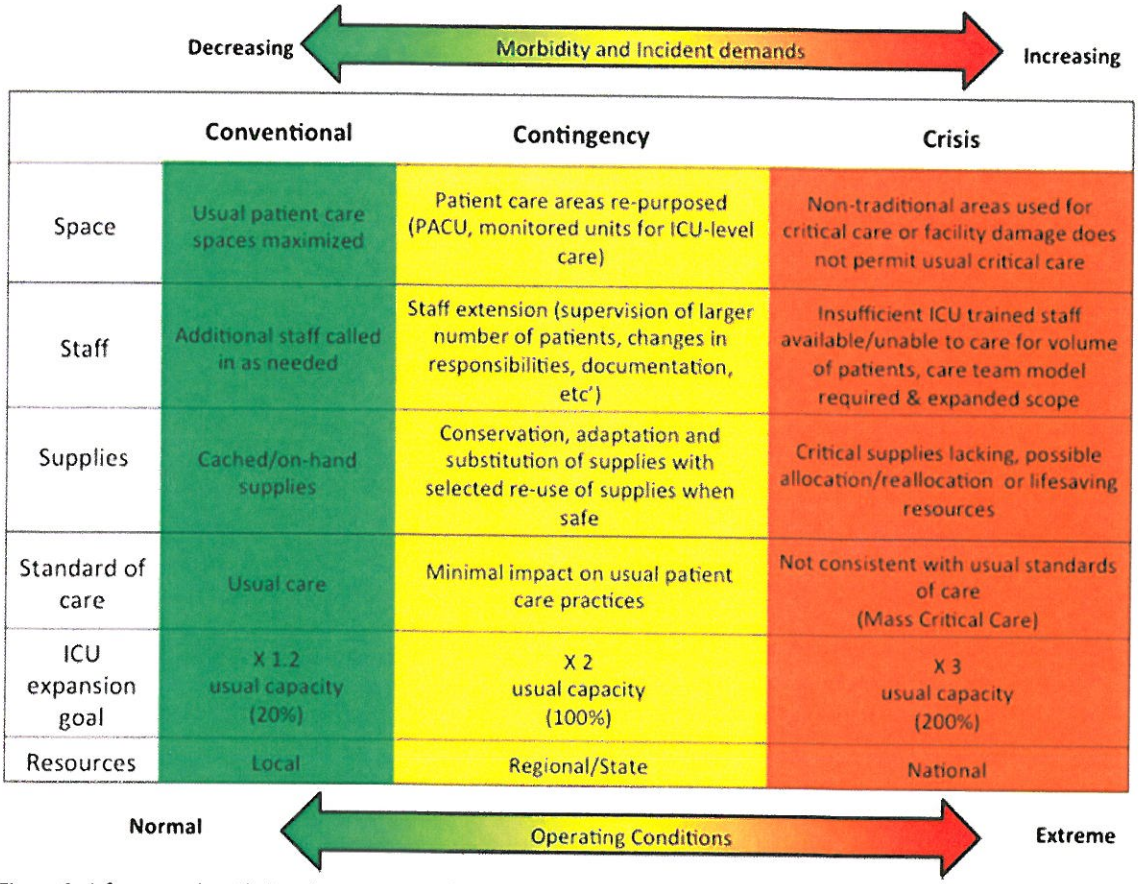


Figure 2. A framework outlining the conventional, contingency, and crisis surge responses. PACU: postanesthesia care unit. [from Christian, et al.; Chest (2014)].(20)

3. Establish clear Lines of Communication (LOC) to ensure:
    a. The ability to maintain power, particularly at austere or atypical sites of care.
    b. The ability to rapidly download a transferrable version of clinical information to follow patients through the system.
    c. That the systems exist to efficiently share this information with staff.
    d. That the communication be consistent, from designated sources, and the information be trusted by staff.(21-23)
4. Establish Patient Tracking and Re-unification systems:
    a. Command centers should also help plan and coordinate a system for patient tracking, identification, and the ability to communicate with family members and next of kin regarding status and location of loved ones who may be restricted from visitation.(23)
5. Establish security, access points, and "clean" areas with access restricted:
    a. Given high levels of stress, limited resources, potentially crowded living conditions, and considerable anxiety surrounding pandemic disease, coordination with security both for a facility and the ICU should be included in the planning process.
    b. Establish "satellite" units in alternative locations to care for critically ill patients unaffected by the pandemic to group contagious patients, cohort staff, and protect non-infected patients.(24)
    c. Consider allocating "high risk" staff (underlying medical conditions, age >60) to these sections.
    d. Consider access to specialty care that may be needed in these sections with screening as patients enter.
6. Coordination of re-prioritization of clinical duties:
    a. Limitation of non-urgent care, well visits, routine visits or imaging
    b. If prolonged, give consideration to designating satellite sites to continue routine, but necessary care
    c. Coordinate re-allocation of assets off loaded by limitations to areas of need (Critical Care, Inpatient care, Initial triage, and Urgent/Emergency Care).(25)
    d. Limit administrative, educational and academic duties to those necessary to directly support patient care
7. Develop Recall Roster for all assets (nursing, physician, housekeeping, dietary, security, admin, etc) and triggers for re-calling those who may be needed from remote work.
8. Consider logistic/ancillary support needs when determining "Essential Personnel" for tasks including:
    a. Disposal of PPE and cleaning both "dirty" rooms and shared spaces. These tasks should be prioritized and will be in very high demand.(26)
    b. Allocation of adequate space for safe, respectful care of the deceased.(27)
    c. Designating locations and facilities to shelter and feed families of ill patients, staff members, and even families of staff members to augment and limit the up to 40-50% absenteeism anticipated with illness, school/childcare closure, and fear.(24, 25)

Preparing Critical Care Resources & Teams.

1. ***Staffing.*** Many MTFs have reduced staffing capabilities to support their ICUs. However, in a global pandemic requiring care for a surge of critically ill patients, additional staffing models should be considered. Although tele critical care resources should be optimized, there may still be significant deficits in critical care trained healthcare workers.
    a. Staff Shortages:
        i. Preparation also needs to be made to compensate for reduced staffing. Illness, fatigue, fear, and care giver duties, particularly with school/daycare closure, limit staff availability with some estimates as high as 60% absenteeism.(24, 28)
        ii. Strategies listed above may mitigate (facility based child care, cohort care teams, etc) but planning should consider at least a 25-40% reduction in staff availability. These

guidelines are currently under review.

iii. The Society of Critical Care Medicine (SCCM) recommends the following staffing model to support expanded critical care bed capacity in the event of a global pandemic (https://www.sccm.org/Blog/March-2020/United-States-Resource-Availability-for-COVID-19), which includes use of multiple non-ICU trained healthcare workers (noted in red):(29)

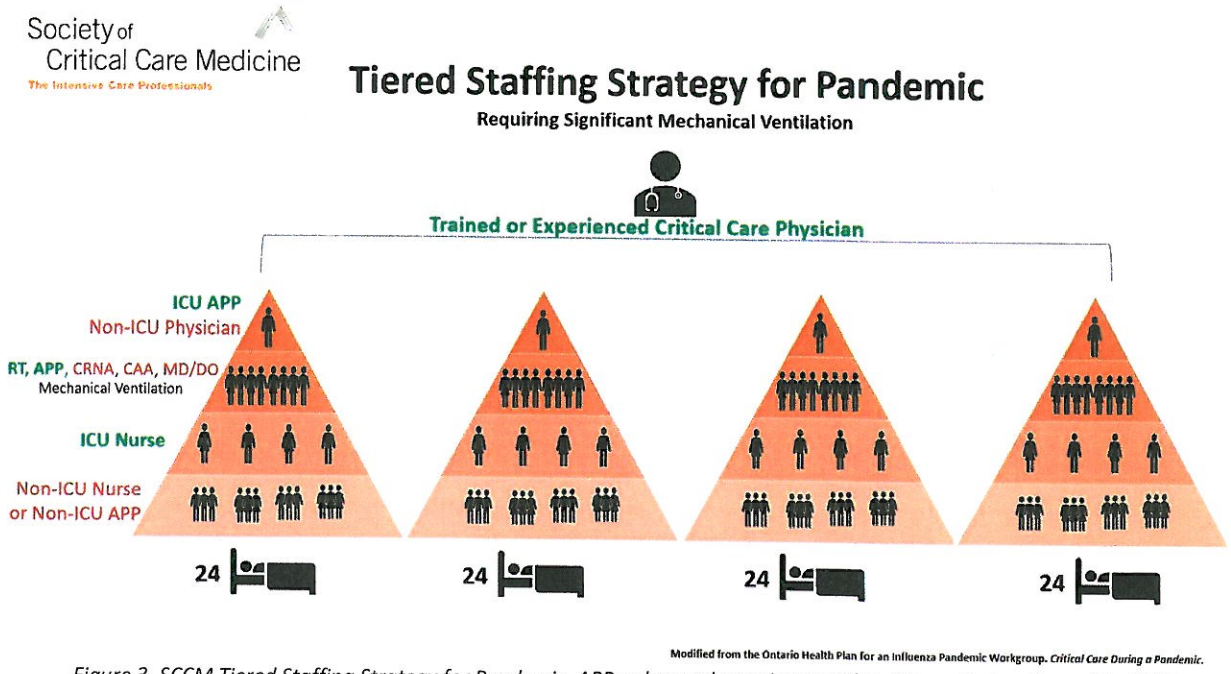


Figure 3. SCCM Tiered Staffing Strategy for Pandemic. APP: advanced practice provider; RT: respiratory therapist; CRNA: certified registered nurse anesthetist; MD/DO: physician [from SCCM link above].(29)

b. In accordance with Joint Commission regulations facilities and local leadership may cross-level providers as needed to provide any type of patient care, treatment and services necessary as a life saving measure- or to prevent serious harm, provided the care, treatment, and services provided are within the scope of the individual's license without modification of existing privileges. Privileging authorities may award disaster privileges on activation of their emergency management plans consistent with provisions established in DHA PM 6025.13, Volume 4.

2. ***Training of Staff.***
   a. ICU "Just in time training" for augmentees from other areas available at https://www.sccm.org/covid19 or https://www.sccm.org/disaster
      - If local expertise is not available, utilization of existing DHA teleconsultation platforms (PATH, ADVISOR) may augment capabilities.
      - Places with ICU care should develop brief local ICU orientation models focusing on safety practices, unit hierarchy, protocols, and consultative relationships but should be brief, no more than 4 hrs.
   b. PPE; Donning and doffing officers should be assigned to train and monitor this.
      - These personnel could/should be pulled from non-clinical roles (administrators, support staff, etc) and could fulfill a vital safety role after being trained. Training video: https://www.youtube.com/watch?v=bG6zISnenPg (30)
3. ***Equipment and Consumables.*** Daily assessment of ventilators, ventilator circuits, PPE, fluids, and sedating medication should be tracked with equipment burn rates estimated and updated as more information is available.
   a. Creation of intubation packs consisting of all necessary PPE (N95, hats, eye protection, gowns, shoe covers, disposable stethoscopes) to avoid providers assembling gear outside

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

b. Consider alternative options to reduce and re-use critical items such as PPE and ventilator circuits. No current guidance but local policies and solutions should be shared as they become available.

c. When expanding into OR or PACU, the spaced utilization of anesthesia ventilators should be considered. Some should be held in reserve based on facility needs for acute, non-COVID needs.

4. ***Space:***

   a. ***ICU Contingency Units.*** Most MTFs have cancelled elective surgeries, which means that some operating room capacity, pre- or post-anesthesia recovery, and other monitored, ventilator capably areas may be available to use as alternative ICU rooms.

   b. **Ward Cohorting:** Consideration should be given to establishing COVID wards. This includes regular as well as ICU care areas. Clean barriers on open units similar to chemical "hot lines" could be used. This includes cohorting staff to "COVID-positive" or "COVID-negative" teams based on which cohort they are caring for to reduce transmission. In particular, it is recommended that patients with non-COVID-19 coronavirus be separated from COVID-19 patients because of the risk of homologous recombination.

Establishment of a DoD Case Registry for Clinical Performance Improvement.

1. Systematic collection and iterative analysis of key data on risk factors and outcomes, coupled where possible with collection and repository storage of residual material from pertinent clinical diagnostic specimens, is essential to optimization of care delivery.
2. This should be executed urgently in the context of an approved, directed performance improvement initiative, in the setting of a learning health system.

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

1. **Screening:** Screen and isolate all patients with suspected COVID-19 at the first point of contact with the health care system (ER/clinic/drive-through screening).
2. **Triage:** Triage patients using standardized triage tools and initiate the appropriate disposition decision depending on the clinical setting.
3. **Initial treatment of hospitalized inpatients** consists of optimized supportive care in the ward or intensive care unit. Patients with increased risk of severe disease and mortality include:
   - Age >60
   - Diabetes mellitus
   - Hypertension
   - Immunosuppression
   - Cardiopulmonary disease
4. Patients may present with mild symptoms but have high risk of deterioration and should be admitted to a designated unit for close monitoring.
5. **Mild Illness.** For mild illness, hospitalization may not be required unless concern about rapid deterioration. Isolation to contain/mitigate virus transmission should be prioritized. Safe home care can be performed according to CDC guidance (https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infectionpresenting-with-mild-symptoms-and-management-of-contacts).
6. **ICU Admission Criteria.** ICU admission and exclusion criteria may be a fluid decision based on the facility. Given that allocation of dedicated ICU beds and surge capabilities amongst individual hospitals are variable, each hospital should provide a specific plan regarding ICU admission/exclusion criteria. This could be based on the percentage of resources utilized (e.g., beds, ventilators). An example of a plan is

provided below from the San Antonio VA:

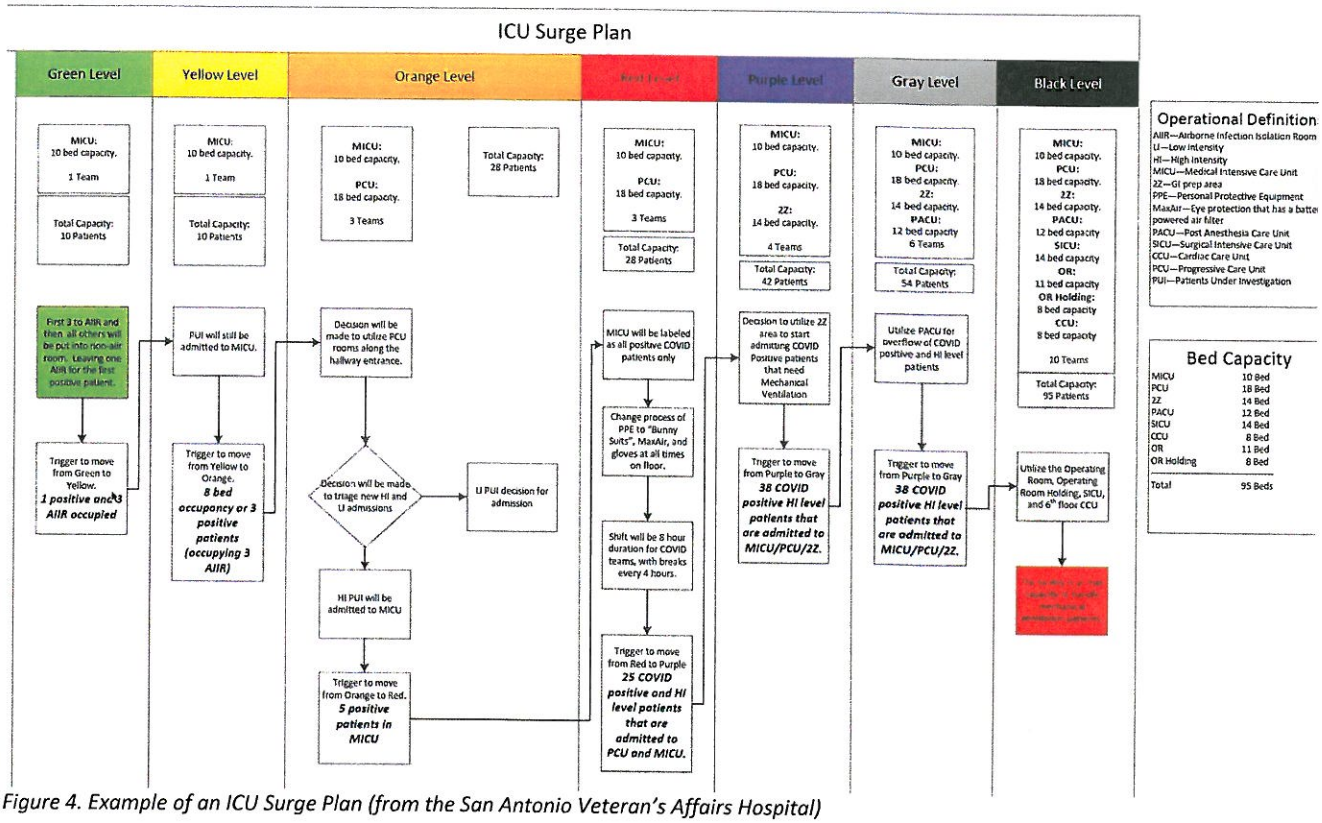


Figure 4. Example of an ICU Surge Plan (from the San Antonio Veteran's Affairs Hospital)

IMMEDIATE IMPLEMENTATION OF APPROPRIATE Infection Prevention Control (IPC) MEASURES

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

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

COLLECTION OF SPECIMENS FOR LABORATORY DIAGNOSIS

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

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

MANAGEMENT OF MILD COVID-19: SYMPTOMATIC TREATMENT AND MONITORING

1. The mainstay of treatment for mild cases of COVID-19 is supportive care.
2. Those with mild disease may be managed as an outpatient, but the determination of outpatient vs inpatient care should be individualized based on consideration of symptom severity and risks for adverse outcomes (e.g., underlying illness and age), and the patient's social context:
    - Their access to resources such as food and other necessities for daily living
    - Their access to appropriate caregivers or ability to engage in self-care
    - Their ability to engage in symptom and public-health monitoring
    - The transmission risk within the home (e.g., the availability of a separate bedroom to minimize sharing of immediate living spaces with others, their access to appropriate personal protective equipment such as gloves and a facemask, their ability to adhere to home isolation, respiratory and hand hygiene, and environmental cleaning, and the presence of household members at increased risk for COVID-19 complications).(11, 33, 34)
3. Although 81% of patients in a Chinese case series had mild symptoms, those who progressed to more severe disease were hospitalized a median of 7-11 days after the onset of illness.(4, 6, 35) Therefore, close monitoring for symptomatic progression through the second week of illness is important for non-hospitalized patients. Close monitoring should be emphasized in patients aged ≥ 60 years and/or with underlying medical comorbidities that may increase their risk for disease progression, to include: cardiovascular disease, cerebrovascular disease, chronic respiratory diseases,

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

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

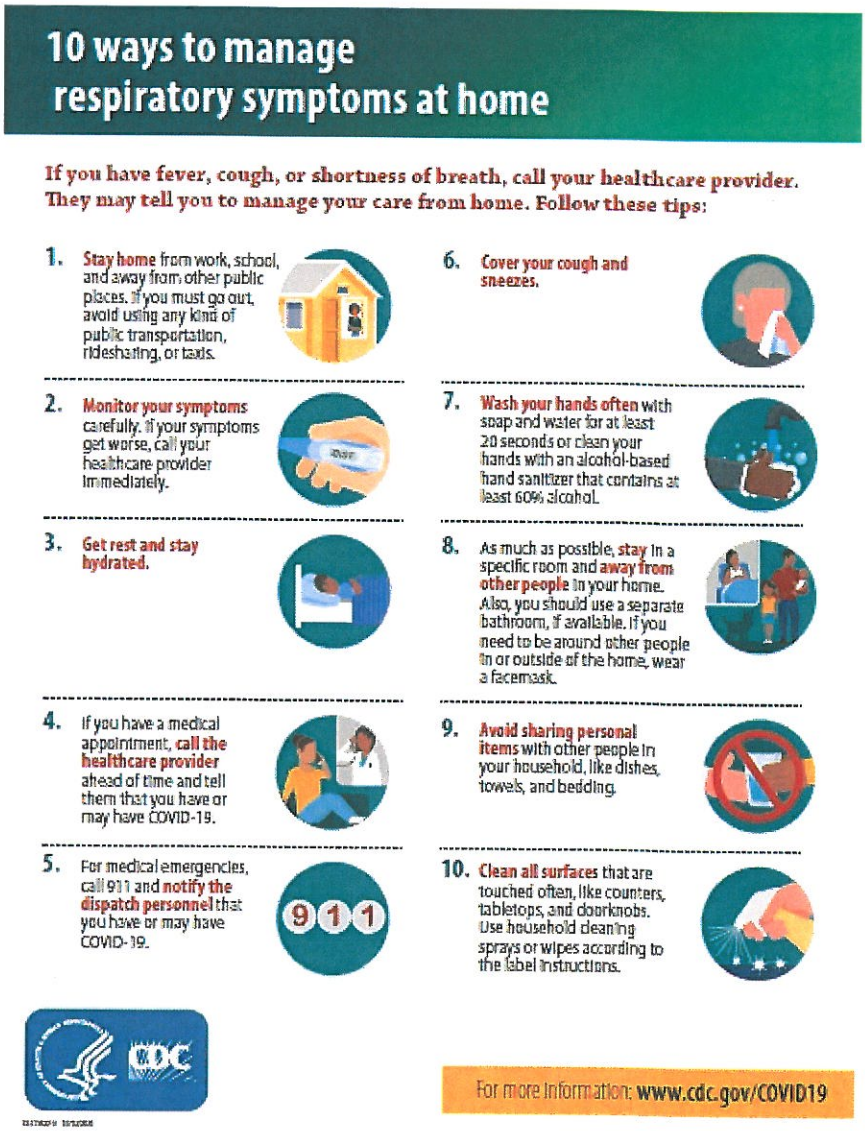


Figure 5. CDC Home Care Management Recommendations for COVID-19 Patients (website above). (34)

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

MANAGEMENT OF SEVERE COVID-19: OXYGEN THERAPY AND MONITORING

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

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

Recommended Daily Labs:

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

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

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

If Clinically Indicated

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

* https://emcrit.org/pulmcrit/nlr/

13. Do not allow ICU visitors for IPC purpose during a pandemic except under exigent circumstances.
14. Facilities should assess daily operational status via huddle of equipment including ventilators, medications (e.g. induction agents and paralytics), and staffing (including respiratory therapists, physicians and nursing). If there is a risk that the number of patients will overwhelm ventilator capacity then elective surgical cases will be cancelled to divert ventilators to the ICU. In the event of more patients than ventilators, then patients requiring intubation can be intubated and bag valve mask ventilated until a lower acuity patient can be extubated. Splitting ventilators with use of viral filters in patients with similar pulmonary compliance has also been proposed. (https://emcrit.org/pulmcrit/split-ventilators)

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

1. Clinical judgment and patient severity will dictate provider decision on early antibiotic therapy.
2. Procalcitonin levels have been low in COVID-19 with minimal bacterial co-infections reported.
3. Post-mortem results anecdotally reported from China suggest concern for Aspergillus pulmonary infections.
4. Consider empiric antimicrobials for intubated patients with COVID-19. Recommend antibiotic guidance as per ATS/IDSA Community Acquired Pneumonia (CAP) guidelines or as per critical care or infectious disease consultation.(42) However, as a starting point upon intubation, the following table can be used until consultation is available:

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

	Starting Antibiotic Regimen
No comorbidities or immunosuppression or risk factors for MRSA or *Pseudomonas aeruginosa**	• Ceftriaxone† 2 g once daily, *and* Azithromycin† 500 mg once daily
With comorbidities‡	• Cefepime 1-2 g every 8-12 hours, *and* Azithromycin† 500 mg once daily *OR* • Piperacillin-Tazobactam 4.5 g every 6-8 hours, *and* Azithromycin† 500 mg once daily

Definition of abbreviations: MRSA = methicillin-resistant *Staphylococcus aureus*
*Risk factors include prior respiratory isolation of MRSA or *P. aeruginosa* or recent hospitalization AND receipt of parenteral antibiotics (in the last 90 d). If concern for MRSA, add **Vancomycin** 15-20 mg/kg q 8-12 hours (usually 2g/dose)
†If Ceftriaxone not available, replace with **Ampicillin/Sulbactam** 3 g q6h; If Azithromycin not available, replace with **Doxycycline** 100 mg q12h
‡Comorbidities include chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; immunodeficiency/asplenia.

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

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

Development of Respiratory Failure

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

Endotracheal Intubation

1. Intubation should be performed early for a number of reasons, including the rapid disease progression, but also the additional time required to prepare for intubation in full PPE.
2. Intubation has the highest risk of aerosolization and exposure to COVID-19 of all procedures, and the person performing intubation is most at risk.(31) For this reason, the most experienced person should perform endotracheal intubation to reduce exposure to the healthcare team and all team members should be in appropriate PPE with fit-tested N95 and medical protected head hood or powered air purifying respirator (PAPR) during intubation. If PAPR is unavailable, N95, hair cover, protective coverall, gown, double gloves, face shields, goggles, and shoe covers should be used. Limit the number of staff members during airway manipulation to reduce the risk of unnecessary exposure. (https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/)
3. A pre-intubation checklist is strongly encouraged, which should include supplies to be brought inside the room by specific team members and others that should remain outside the room in case they are needed. **Appendix A** provides an example intubation checklist (adapted from University of Washington). *Note: a disposable stethoscope should be used to avoid transferring the virus and staff should touch as little as possible in the room to avoid fomites.*
4. For patients with a normal airway assessment, awake intubation should be avoided and modified rapid sequence intubation with sufficient muscle relaxation is strongly encouraged. For patients with difficult airways, good preparation of airway devices and detailed intubation plans should be made in advance.(43)
5. Some centers have advocated for further reducing exposure during pre-oxygenation and ventilation through preparing an additional COVID Intubation Pack (**Appendix B**), in addition to intubation meds, a video laryngoscope (if used, or direct laryngoscopy), and a non-vented BiPAP mask. The following video demonstrates the set-up: (https://youtu.be/C78VTEAHhWU).
6. **Appendix C** provides a framework for intubation with medications and doses, although this is not a substitute for clinical judgement.
7. Additional cognitive aids have been developed and might be useful. **Appendix D** provides examples.

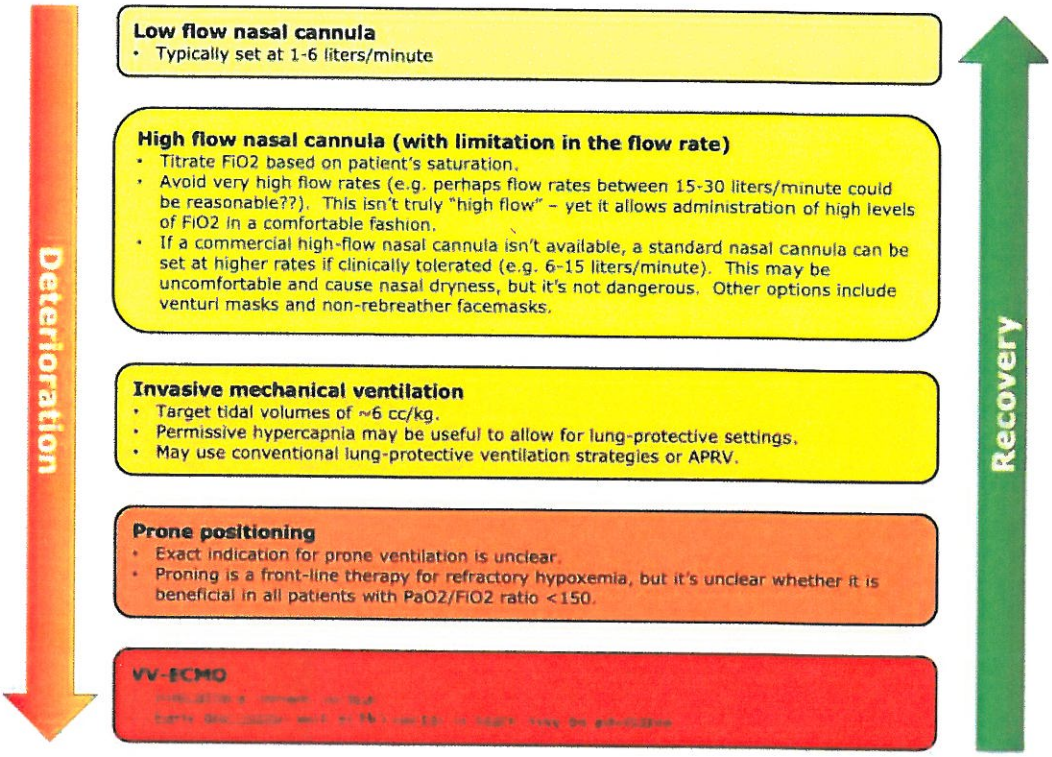
Management of ARDS

1. ***Non-invasive ventilation (NIV).*** It is recommended to avoid NIV because there is no exhalation filter. If there is an exception to this such as patients that chronically use NIV or DNI patients, these patients will require airborne isolation regardless of ICU/acute care status. *Note:* V60 ventilators are

also highly aerosolizing and should be discouraged.

2. ***High-flow nasal cannula (HFNC).*** Although an area of controversy, early expert opinion favors HFNC over other non-invasive modalities (https://emcrit.org/ibcc/COVID-19/#high_flow_nasal_cannula) because it appears to be well tolerated, more efficacious than BIPAP and less provider intensive. There is presently no definitive evidence that HFNC augments transmission of virus.
3. ***Mechanical Ventilation.*** COVID-19 does not appear to cause substantially reduced lung compliance as is typical with ARDS, but rather atelectasis and interstitial pneumonia. Physicians in Italy have described severe hypoxia with decent pulmonary compliance. (http://www.ventilab.org/2020/02/29/ventilazione-meccanica-e-polmonite-da-coronavirus/)
   a. Target *ARDSnet* ***high PEEP****, lung-protective tidal volume* (**4-8 mL/kg ideal body weight**), and lower inspiratory pressures (**plateau pressure <30 cm H_2O**).(41, 44)
      i. Start with 6 mL/kg ideal body weight tidal volume and titrate as needed
      ii. In patients with moderate to severe ARDS, suggest higher PEEP instead of lower PEEP. PEEP tables are available to guide titration: http://www.ardsnet.org/tools.shtml
      iii. In younger children, maximal PEEP setting is 15 cm H_2O as higher PEEP can result in decreased cardiac output.
   b. *Permissive hypercapnia* ensuring adequate hemodynamics and a pH >7.15 may be tolerated
4. ***Proning.*** Evidence has shown that patients who are unable to adequately ventilate in the supine position may benefit from being placed in the prone position to improve oxygen saturation (PaO2), pulmonary mechanics, and arterial blood gases (ABGs). (45-49) Anecdotal reports from Italy have found that patients with COVID-19 usually respond well to early pronation.
5. Prone positioning requires proper sedation/pain medications and paralytic agents if necessary.
   a. Length of pronation cycle should be a minimum of 16 hours in the prone position with a return to supine positioning at least once a day.
   b. Prone positioning should be performed as clinically indicated within the first 24 hours of the diagnosis of severe hypoxemia.
   c. Recommend use of a manual proning protocol with coordination if mechanical beds are not available. **Appendix E** provides an example protocol, which was adapted from University Medical Center in Las Vegas, NV. Additional protocols (including videos) are available.(50)
   d. Pregnancy is *not* a contraindication for proning or neuromuscular blockade.(51)
6. ***Neuromuscular Blockade.*** In patients with moderate-severe ARDS (PaO2/FiO2<150), neuromuscular blockade by continuous infusion should **not** be routinely used, but may be considered in the setting of worsening hypoxia or hypercapnia and in situations where the patient's respiratory drive cannot be managed with sedation alone resulting in ventilator dyssynchrony and lung decruitment.
7. ***Airway suctioning.*** Use in-line catheters for airway suctioning and clamp endotracheal tube when disconnection is required (for example, transfer to a transport ventilator). Avoid disconnecting the patient from the ventilator, which results in loss of PEEP and atelectasis.
8. ***Bronchoscopy.*** Routine diagnostic bronchoscopy is **not** recommended. It is not necessary for the diagnosis of viral pneumonia and should be avoided to minimize aerosolization. Tracheal aspirate samples for diagnosis of 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.
9. ***Inhaled nitric oxide and prostacyclin.*** There is no evidence for routine use of inhaled nitric oxide, prostacyclin or other selective pulmonary vasodilators in acute respiratory failure. However, during emerging infectious disease outbreaks when resources are exhausted, inhaled nitric oxide and prostacyclin may be considered as a temporizing measure when patients develop refractory hypoxemia despite prone ventilation, or in the presence of contraindications to proning or ECMO.
10. ***Extracorporeal Membrane Oxygenation (ECMO).*** In settings with access to expertise in ECMO, consider referral of patients who have refractory hypoxemia despite lung protective ventilation who are otherwise appropriate candidates. For more information: https://www.elso.org/COVID-19.

General schema for respiratory support in patients with COVID-19



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

The Internet Book of Critical Care, by @PulmCrit

https://emcrit.org/ibcc/COVID-19/#high_flow_nasal_cannula
https://i1.wp.com/emcrit.org/wp-content/uploads/2020/03/respsup.jpg?resize=713%2C600&ssl=1

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

Cardiovascular Disease (CVD)

Among 44,672 confirmed COVID-19 cases, those with CVD, diabetes (DM) and hypertension (HTN) suffered from an increased case-fatality rate -10.5% for CVD, 7.3% for DM, 6.0% for HTN vs 2.3% overall. Furthermore there several published reports suggesting SARS-CoV2 infection leading to exacerbation of CVD conditions, or CVD complications.(4, 35, 52)

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. Troponin value, velocity of change in troponin level, and echocardiographic imaging should guide the management of the elevated troponin, although current opinion advises that troponin and BNP should only be measured if clinical evaluation suggests acute coronary syndrome or heart failure.(53)
2. ***Electrocardiogram (ECG).*** Recommend ECG in suspected or acute coronary syndrome. May consider of obtaining from cardiac tele-monitoring screen.
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.
4. ***Acute Myocardial Injury.***
    a. *Definition*: An algorithm for the interpretation of myocardial injury is provided for reference and is based on the 4th Universal Definition of Myocardial Infarction

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

b. *Incidence and Prognosis*: Recent reports found that 7-17% of hospitalized patients with COVID-19, have a combination of elevated cardiac biomarkers, in addition to electrocardiographic and echocardiographic abnormalities.(3, 4, 6) This myocardial injury appears to be a late manifestation (up to 14 days from illness onset).(4)

5. ***Myocarditis.***
   a. *Incidence*: In a case series of 150 patients with COVID patients, nearly 10% of deaths were attributed to myocarditis with circulatory failure, and in 33% of cases it was believed to have contributed as a mechanism for multisystem organ failure.(52) Currently, pericarditis has not yet been reported.
   b. *Diagnosis*: There is currently no role for endocardial biopsy. POCUS at initial evaluation to help protocol TTE. Serial TTE/POCUS only if it will impact management.
   c. *Management*: Supportive care depending on hemodynamic status. Case reports on different treatment strategies (glucocorticoid and IVIG) but none are validated by clinical trials.
6. ***Acute Coronary Syndrome.***
   a. *Incidence*: Based on available published data, there is a potential symptom overlap between acute coronary syndrome and COVID-19 infection.(2)
   b. *Evaluation*: Goal is to differentiate acute plaque rupture, demand related ischemia or myocarditis. Recommendation is for cardiology consultation when unable to determine etiology.
   c. *Management*: Once the diagnosis of acute coronary syndrome is made, medical management should be coordinated with cardiology. ST-Elevation Myocardial Infarction (STEMI) Fibrinolytics protocols should be reviewed at each institution with cardiology to discuss care plans in the event of strained resources.
7. ***Cardiac Arrhythmias.***
   a. *Incidence*: Common CV manifestation in COVID-19 patients. Current cases series report an occurrence of unspecified arrhythmias in 17% of hospitalized patients with COVID-19 (44% of ICU patients vs 7% non ICU patients).(4) The new onset of malignant tachyarrhythmias in combination with acute myocardial injury should raise suspicion for potential underlying myocarditis.(2)
   b. *Management*: Follow ACLS protocols. Cardiology consultation.
8. ***Heart Failure and Cardiomyopathy.***
   a. *Incidence*: In a recent report it was observed that 23% of patients with COVID-19 had presentations consistent with heart failure. More frequently observed in patients who did not survive the hospitalization (51.9% vs 11.7%).(4) Fulminant cardiomyopathy can occur and is thought to be a late feature described in patients recovering from respiratory failure. Cardiogenic shock and cardiac arrest contributes to 7-33% of deaths.(52)
   b. *Mechanism*: SARS-CoV-2 is thought to infect host cells through ACE2 to cause COVID-19, while also causing damage to the myocardium, although specific mechanisms are uncertain. (54)
   c. *Management*: In the absence of high grade AV block or unstable bradycardia, cardiogenic shock, or acute kidney injury (AKI), guideline directed medical therapies should be continued in patients with heart failure. Assessment of continuation of these therapies should be determined on a frequent basis depending on the patient's clinical status. The American College of Cardiology, Heart failure Society of America, and American Heart association published a joint statement at the time of this writing that recommends continuation of ACE-I/ARB therapy in patients with COVID-19.(55)

Acute Kidney Injury

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

Nutrition

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

Other

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

Table 3. Prevention of Complications

Anticipated outcome	Interventions
Reduce days of invasive mechanical ventilation	• 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 twice daily) in adolescents and adults without contraindications. For those with contraindications, use mechanical prophylaxis (intermittent pneumatic compression devices)
Reduce incidence of catheter-related bloodstream infection	• 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 AND lactate is ≥ 2 mmol/L, in absence of hypovolemia.(40, 56)
2. Recognize septic shock in children with any hypotension (systolic blood pressure [SBP] < 5th centile or > 2 SD below normal for age) or two or more of the following: altered mental state; bradycardia or tachycardia (HR < 90 bpm or > 160 bpm in infants and HR < 70 bpm or > 150 bpm in children); prolonged capillary refill (> 2 sec) or feeble pulses; tachypnea; mottled or cold skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia.
3. Standard care includes early recognition and the following treatments within 1 hour of recognition: antimicrobial therapy, and initiation of fluid bolus and vasopressors for hypotension (Surviving Sepsis Guidelines). The use of central venous and arterial catheters should be based on resource availability and individual patient needs. Detailed guidelines from the Surviving Sepsis Campaign and WHO are available for the management of septic shock in adults and children.

Septic Shock Resuscitation.

1. For septic shock in adults: give 250–500 mL crystalloid fluid as rapid bolus in first 15–30 minutes and reassess for signs of fluid overload after each bolus.(56)
2. For septic shock in children, give 10–20 mL/kg crystalloid fluid as a bolus as quickly as possible using a manual push and reassess for signs of fluid after each bolus.(57)
3. ***Avoid Excessive Fluid Resuscitation***. The cause of death from COVID-19 is most often ARDS and subsequent complications, which may be exacerbated by fluid administration. (2) Patients usually present with normal lactate and blood pressure, but some patients do suffer from superimposed bacterial septic shock. Conservative fluid therapy consistent with FACTT trial should be considered for patients with evidence of hypoperfusion and a history suggestive of total body hypovolemia (e.g. prolonged nausea/vomiting and diarrhea).(58) Consider use of point of care ultrasound (POCUS) to guide fluid resuscitation and prevent volume overload. If there is no response to fluid loading or signs of volume overload appear (e.g. jugular venous distension, crackles on lung auscultation, pulmonary edema on imaging, or hepatomegaly in children), then reduce or discontinue fluid administration. This step is particularly important in patients with hypoxemic respiratory failure.
4. Resuscitation endpoints include perfusion targets (e.g., MAP 60-65 mmHg in adults; urine output > 0.5 mL/kg/hr in adults or 1 mL/kg/hr in children; improved level of consciousness; and lactate).
5. In **pregnant women**, compression of the inferior vena cava can cause a decrease in venous return and cardiac preload and may result in hypotension. For this reason, pregnant women with sepsis and or septic shock may need to be placed in the left lateral decubitus position at 30 degrees to off-load the inferior vena cava.
6. Clinical trials conducted in resource-limited studies comparing aggressive versus conservative fluid regimens suggest higher mortality in patients treated with aggressive fluid regimens.
7. Do **not** use hypotonic crystalloids, starches, or gelatins for resuscitation.
8. Vasopressors should be administered when shock persists during or after fluid resuscitation to maintain MAP goal 60-65 mmHg.
9. If central venous catheters are not available, vasopressors can be given through a peripheral IV, but use a large vein and closely monitor for signs of extravasation and local tissue necrosis. If extravasation occurs, stop infusion. Vasopressors can also be administered through intraosseous needles.
10. If signs of poor perfusion and cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine.
11. Norepinephrine is considered first-line treatment in adult patients; epinephrine or vasopressin can be added to achieve the MAP target.
12. Angiotensin II (Giapreza) is a vasopressor that may provide benefit in vasodilatory refractory shock as a third-line agent. However, in a resource-constrained environment, this is an unproven costly therapy.
13. In children, epinephrine is considered first-line treatment, while norepinephrine can be added if shock persists despite optimal dose of epinephrine.

Rapid Response or Code Blue.

1. A local Protected Code Blue Protocol should be developed for resuscitating COVID-19 patients that is peer-reviewed and based on the best available data and evidence. It should be updated based on performance improvement data and experience.
2. Staff should be trained appropriately using high-fidelity simulation.
3. Where it is necessary that the Rapid Response or Code Blue team attends, the following is recommended:
    a. PPE must be available that is equivalent to that used in ICU, therefore airborne precautions including an N95 mask.
    b. Entry to a patient's room should be limited to vital staff, which may mean a reduction in the Code Blue Team respondents.
    c. The patient should be assessed by the most senior medical staff available to determine appropriate management and disposition.

d. If aerosol generating procedures (AGP) are required, these should ideally be performed in a negative pressure room, however this needs to be balanced with the safety of transporting the patient.

e. CPR is an AGP and we recommend all staff should wear airborne PPE including an N95 mask before commencing chest compressions. If available, an automated compressor device should be used to minimize required staff and exposure.

f. If the patient is on a ventilator, keep the patient on a ventilator with an adjusted rate of 10 during CPR unless airway obstruction is suspected. If not intubated, consider placing a laryngeal mask airway (LMA) with a self-inflating bag, appropriate viral filter, and PEEP valve as intubation during an arrest will increase aerosolization of viral particles and increase the risk of spread.

g. Avoid a prolonged code in patients that experience cardiac arrest who demonstrate signs of progressive cardiogenic shock or hypoxic respiratory failure.

h. Focus on potentially reversible conditions (H's and T's): DOPE pneumonic for sudden hypoxia, identification and treatment of shockable rhythm, identification/treatment of tension pneumothorax. Consider use of portable ultrasound and obtain a blood gas.

i. Equipment/medications that are needed in the room should be handled with attention to infection control best practices. If a specialized kit is not available, consider placing them through a crack in the door onto a bedside table in the room, but avoid physically handing it to code team personnel.

4. The following table identifies best practices based on a "Minimum, Better, Best" model, as the COVID-19 outbreak could ultimately result in limited resources based on observational data from other countries. The goal is to achieve all elements of each category, as "Good" equates with the minimum standard-of-care while "Best" equates with the most ideal condition.

Minimum-Better-Best Paradigm for Limited Code Blue

	Minimum	Better	Best
Advance Directives	Discuss & document with every patient's medical power of attorney (MPOA) if patient unable to speak for self	Discuss & document with every patient; Involvement of Palliative Care for high risk	Develop a script for clinician that incorporates unique circumstances & ethical considerations if worsening pandemic. Ideally, there are DNRs for those who might code due to refractory cardiogenic shock or respiratory failure
Alert mechanism	Educate current Code Team members about who should respond to "Overhead Code Blue" to COVID patients	Early activation	Directed announcement ONLY to COVID Code Team
PPE / Precautions	Droplet for room; Minimize door opening	Airborne/Negative ISO; Infection Control Gatekeeper; Door remains closed	Use of PPE Checklist; PAPR
Communication (via PAPRs or individuals outside room)	Whiteboard for written instructions; Closed-loop	Speakerphone in room; Vocera; Gatekeeper	Personal communication devices; VA Video Connect (tablets)
CPR	Rotate 2 individuals who don't leave room	Rotate 2 individuals who don't leave room and accomplish multiple tasks based on pre-established priorities	Automated compressor device (e.g. LUCAS) (outside room) for high risk patients
IV access	Two standard functioning PIVs for all COVID patients	Tibial IO (if needed)	Early placement of central access before potential arrest
ACLS Equipment	Dedicated Code Cart for COVID ICU and wards; Accounting for Code Carts to ensure appropriate backups	For high-risk patients: consider early placement of defib pads in room or on patient, or prepositioning the Code Cart outside patient room	Specialized cart/kit containing appropriate meds, modular packs of equipment, and designated defibrillator; Dedicated COVID ward: US, EKG machine, portable CXR
Airway	Non-rebreather mask immediately over patient mask *OR* BVM with viral filter and ETCO2	Place LMA for non-intubated patients. For intubated patients, either leave on vent (if good chest rise, +ETCO2) or	Early intubation BEFORE arrest occurs

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

Patient Transport.

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

ADJUNCTIVE THERAPIES FOR COVID-19: TREATMENT PROTOCOLS

Note: *All therapies are investigational and none are proven as the literature is evolving quickly*. ***There are no specific therapeutics approved by the FDA to treat people with COVID-19.*** None can be routinely recommended for use outside of a randomized clinical trial. Additionally, there is no evidence for use of the following medications for outpatients or mildly ill patients. Use of these resources for that purpose should be discouraged through prescribing restricted to critical care, infectious disease, or rheumatology physicians.

Ethics of Clinical Research during a Pandemic: There are no US Food and Drug Administration (FDA)-approved drugs specifically for the treatment of patients with COVID-19. There is genuine uncertainty in the expert medical community over whether proposed off-label and investigational treatments are beneficial. Randomized, placebo-controlled trials (RCT) are the gold standard for determining if an experimental treatment can benefit patients. Some may question whether it is ethical to deprive patients of an agent that could potentially prevent or treat COVID-19, given the high mortality rate among critically ill patients and lack of known and available treatment options. A Committee of National Academies of Science, Engineering, and Medicine reviewed and conducted an analysis of the clinical trials conducted during the 2014–2015 Ebola virus disease outbreak in West Africa and found 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." (59)

Steroids.

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

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

2. However, new consensus guidelines recommend considering **methylprednisolone** for intubated COVID-19 patients with ARDS.(40)
3. Steroids may be indicated for vasopressor-refractory shock, asthma, COPD exacerbation, or for antenatal therapy at risk for preterm birth from 24-34 weeks of gestation.

Remdesivir.

1. Remdesivir is an investigational intravenous drug with broad antiviral activity that inhibits viral replication through premature termination of RNA transcription and has in-vitro activity against SARS-CoV-2 and in-vitro and in-vivo activity against related betacoronaviruses. It has been tested in humans against Ebolavirus disease, where it was not found to be superior to other therapies in the PALM RCT.(61) It has shown promise in vitro and in animal models for coronavirus infection.(62-64)
2. National Institute of Allergy and Infectious Diseases (NIAID) is leading a multicenter adaptive design randomized placebo-controlled trial of candidate therapies for COVID-19, initially focused on comparing Remdesivir to placebo "A Multicenter, Adaptive, Randomized Blinded Controlled Trial of the Safety and Efficacy of Investigational Therapeutics for the Treatment of COVID-19 in Hospitalized Adults." MAMC, NMCSD, BAMC, NMCP and WRNMMC MTFs are participating sites through IDCRP. Potentially eligible candidates are adult DoD Health Care Beneficiaries meeting inclusion criteria (SARS-CoV-2 positive with evidence of pneumonia with oxygen saturation of ≤94% on room air or requiring supplemental oxygen or mechanical ventilation). Exclusion criteria include alanine aminotransaminase (ALT) or aspartate aminotransaminase (AST) levels >5 times the upper limit of normal, stage 4 severe chronic kidney disease or a requirement for dialysis [i.e., estimated glomerular filtration rate (eGFR) <30]. (https://clinicaltrials.gov/ct2/show/NCT04280705)
3. Gilead has two Phase 3 randomized open-label trials of remdesivir (5-days versus 10-days versus standard of care) open to enrollment for adults with COVID-19, radiographic evidence of pneumonia and oxygen saturation of ≤94% on room air (severe disease: https://clinicaltrials.gov/ct2/show/NCT04292899) or >94% on room air (moderate disease: https://clinicaltrials.gov/ct2/show/NCT04292730). Exclusion criteria include ALT or AST levels >5 times the upper limit of normal, participation in another clinical trial of an experimental treatment for COVID-19, requirement for mechanical ventilation, or creatinine clearance <50 mL/min..
4. Remdesivir is potentially available under compassionate use from Gilead for patients with clinical pneumonia: compassionateaccess@gilead.com. From Gilead's website; "Compassionate use requests must be submitted by a patient's treating physician. Gilead is currently assessing requests on an individual basis and require, at a minimum, that the patient be hospitalized with confirmed COVID-19 infection with significant clinical manifestations."
5. USAMMDA Force Health Protection Division has established an expanded access treatment IND with a limited number of treatment courses of Remdesivir for Active Duty Service Members CONUS/OCONUS (and Federal civilian and contract employees deployed OCONUS while in support of operational forces) meeting inclusion criteria. "Intermediate-Size Patient Population Expanded Access Protocol for Treatment of Coronavirus Disease 2019 (COVID-19) with Remdesivir." Clinicians should contact USAMMDA FHP Division to determine eligibility to receive product, 24-hour international telephone: +1-301-401-2768.

Chloroquine (CQ) and Hydroxychloroquine (HCQ).

1. These drugs have been widely used as anti-malarial treatment and prophylaxis and to treat autoimmune conditions.
2. BLUF: No high-quality evidence exists to support use at present. *Potential toxicities include QTc prolongation and risk for arrhythmias.*
3. In vitro studies have reported antiviral activity against SARS-CoV and more recently against SARS-CoV-2. Mouse studies for SARS-CoV demonstrated improved lung pathology without reduction in viral titers; similar animal studies for SARS-CoV-2 have not yet been completed. Recent studies conducted in China