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indicate in vitro activity of these agents against SARS-CoV-2, and a small survey in French patients showed reductions in viral load. An additional preliminary report on chloroquine clinical activity was released by investigators in China, but detailed information is pending.(64-67) Both CQ and HCQ concentrate in the lung. Optimal dosing needed to reach adequate concentrations in lung tissue for treatment of COVID-19 are unknown; modeling has suggested high doses might be required.(67) Despite showing in vitro antiviral activity, prior clinical trials demonstrated no benefit of CQ against other viral infections such as dengue virus, chikungunya, influenza, and HIV, though none investigated the use of chloroquine for coronavirus infection.(68-71) In a non-human primate study, hydroxychloroquine appeared to paradoxically enhance chikungunya infection.(72)

4. A report of 20 treated COVID-19 patients who received HCQ alone and in combination with azithromycin suggested that treatment was associated with viral load reduction over 6 days, compared to a nonrandomized control group, and were more pronounced in patients who received the combination; clinical impact was not assessed and methodologic issues limit the strength of the observation.(73) A brief report of a Chinese study of 100 COVID-19 patients suggested clinical improvement (“improved lung images, time to viral negative conversion, and shortening of disease course”) with CQ or HCQ treatment versus an unspecified control; methodologic details were absent from the report, limiting the strength of conclusions.(74) If these comparisons are substantiated after availability of adequate additional data, this would be the first time chloroquine or hydroxychloroquine was found to be effective for the clinical management of a viral infection.
5. Several clinical trials have been initiated or are planned to study CQ and HCQ for treating and preventing COVID-19. Significant off-label use is occurring overseas and in some US hospitals.
6. A variety of dosing regimens have been reported in use, including: Hydroxychloroquine 400 mg PO BID x 1 days, then 200 mg PO BID x4 days.

Lopinavir/Ritonavir.

1. Coronavirus cellular infectivity and replication are dependent on virally-encoded and cellular protease activity. Clinically used protease inhibitors effective for HIV and HCV infection have been examined for potential utility in treatment of SARS, MERS, and COVID19.
2. Unconfirmed media reports from China suggested this combination to be effective for COVID-19 treatment. However, on 18 March 2020, RCT results were reported that found no benefit in patients who received lopinavir/ritonavir compared to standard care for treatment of severe disease.(75-77)
3. Do not use in combination with amiodarone (fatal arrhythmia), quetiapine (severe coma), or simvastatin (rhabdomyolysis).

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

Anti-IL6 monoclonal antibodies.

1. A variety of therapies are being administered to severely ill patients in China and elsewhere. One that is receiving substantial attention currently is an anti-IL6 receptor humanized monoclonal antibody, tocilizumab (Actemra®), which was added to the treatment guidelines published by China’s National Health Commission (4 Mar 20) to treat serious coronavirus patients with lung damage.
2. Tocilizumab and sarilumab are licensed in US for treatment of giant cell arteritis, rheumatoid arthritis, and cytokine release syndrome following CAR-T therapy. They carry a black box warning for risk of severe, potentially fatal, infections.
3. No high-quality evidence currently exists to support use. Some reports from China have suggested elevated IL6 levels are associated with severe disease in COVID19 infection, though other reports have not found the same association. Tocilizumab has been used in Italy according to anecdotal reports and an unpublished uncontrolled case series from China treated 21 hypoxemic patients with

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

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

Several additional agents are under investigation and information is expected to emerge rapidly. Discernment of benefits and harms from novel therapies will require diligent attention to quality of evidence reported. The American Society of Health-System Pharmacists last updated their Assessment of Evidence for COVID-19-Related Treatments on 21 March 2020, which can be found here:

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

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

Caring for Pregnant Women with COVID-19

1. Limited information on the effects of COVID-19 for pregnant women exist in the current literature and limited to 2 case series including 18 pregnant women. This small series showed severe respiratory morbidity in 1/18 cases. Clinical findings were similar in cases of non-pregnant adults. Pregnant women experience immunologic and physiologic changes that make them more susceptible to viral respiratory infections. Pregnant women might be at greater risk for severe illness, morbidity, or mortality compared with the general population, as is observed with other related coronavirus infections. Pregnant women should receive the same care as those who are not pregnant in regards to screening, radiology studies, laboratory evaluations and critical care.
2. American College of Obstetricians and Gynecologists (ACOG) and Society for Maternal-Fetal Medicine (SMFM) algorithm for outpatient assessment and management for pregnant women with suspected or confirmed novel coronavirus (COVID-19). <https://www.acog.org/-/media/project/acog/acogorg/files/pdfs/clinical-guidance/practice-advisory/covid-19-algorithm.pdf?la=en&hash=2D9E7F62C97F8231561616FFDCA3B1A6>
3. Case series suggest no evidence of vertical transmission, similar to other viral respiratory illnesses, such as influenza.(79)
4. Preterm delivery has been reported. Some cases were iatrogenic and not due to spontaneous preterm labor. No neonatal deaths have been reported.(79)
5. Patients confirmed with COVID-19 in pregnancy or deemed persons under investigation should be considered for enrollment in the Pregnancy Coronavirus Outcomes Registry (PRIORITY) (<https://priority.ucsf.edu/>).
6. **Admission:** Patients with suspected or confirmed COVID-19 should be admitted to a unit capable of caring for the respiratory needs of the patient as well as provide appropriate fetal monitoring as clinically indicated. Patient should be in isolation per hospital and CDC guidance.
7. **Guidance for treatment:** Aggressive infection control, testing for COVID-19, testing for co-infection, oxygen therapy as needed, avoidance of fluid overload, empiric antibiotics (due to risk of superimposed bacterial risk), fetal and uterine contraction monitoring, early mechanical ventilation for progressive respiratory failure, individualized delivery planning, Maternal Fetal Medicine consultation, Pulmonology, Critical Care and Infectious disease involvement as indicated. Team based management is recommended. Consider early transfer of care to higher level facility if unable to provide services at MTF.(80) If a pregnant patient is admitted to an ICU for worsening pulmonary status, a Maternal Fetal Medicine consultation should be made.
8. **Imaging:** With few exceptions, radiation exposure through radiography, computed tomography (CT) scan, or nuclear medicine imaging techniques is at a dose much lower than the exposure associated with fetal harm. If these techniques are necessary in addition to ultrasonography or MRI or are more readily available for the diagnosis in question, they should not be withheld from a pregnant patient. The use of gadolinium contrast with MRI should be limited; it may be used as a contrast agent in a pregnant woman only if it significantly improves diagnostic performance and is expected to improve

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- fetal or maternal outcome.(81)
9. **Delivery:** Delivery should be reserved for maternal and fetal indications. Recommend health care team wear appropriate PPE during delivery and delivery should be in a negative pressure room. For women infected in the third trimester who recover, attempts to postpone delivery until a negative test result or quarantine status is lifted. This will minimize risk of transmission to the neonate.
 10. **Cesarean section:** Cesarean section should be reserved for maternal and fetal indications. Recommend operating room with negative pressure isolation.
 11. **Antenatal surveillance:** Gestational age appropriate fetal monitoring should be part of the initial assessment of any women with respiratory symptoms and continuous fetal monitoring should be provided for any critically ill pregnant woman.
 12. **Ultrasound:** Given how little is known about the natural history of COVID-19, mid-trimester ultrasound assessment may be considered following first or second trimester infection exposure. Third trimester growth assessment is reasonable to consider for later second trimester and third trimester infections.
 13. **Follow up after diagnosis of COVID-19:** Patients should be treated according to symptom severity and admitted to the hospital if vital signs are abnormal or symptomatic support is indicated. When patient is discharged from the hospital a plan for follow up should be established. In non-pregnant patients with COVID-19 pneumonia there is evidence that respiratory status can worsen up to a week after symptoms initially presented. For that reason close follow up with patients via phone triage should be performed. If patients symptoms worsen arrangements should be made for patient to be seen by a health care provider to assess clinical status.
 14. **Postpartum care:** Postpartum patients with COVID-19 should be isolated from other patients in a postpartum isolation room. Breastfeeding is encouraged. CDC recommends that temporary separation of mother and newborn to avoid exposure of the newborn to COVID-19. (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcareguidance.html>). Women who intend to breastfeed should be provided a dedicated breast pump to express breast milk. There is no evidence of virus transmission in breastmilk.(79) Discussions prior to delivery surrounding the possibility of early separation of mother and infant to avoid post-partum transmission. Considerations can be made to delay delivery to prevent unnecessary exposure to neonate but ultimately delivery timing should be made based on maternal and fetal indications.
 15. Hospitals should develop a local plan for appropriate locations where COVID-19 positive patients can come to receive care to assure appropriate prenatal care is delivered to the patient and to minimize risk of exposure to the virus of other patients and health care workers. Pregnancy care should be considered non-elective.

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

1. Vertical transmission does not appear to occur, but perinatal infection leading to severe manifestations has been documented. It is unknown whether newborns with COVID-19 are at increased risk for severe complications, but transmission after birth via contact with infectious respiratory secretions is a concern.(82)
2. In addition to face mask and hand hygiene, consider temporarily separating a symptomatic PUI or COVID-19 mothers from her baby (e.g. separate rooms) depending on clinician judgement and individual circumstances. This carries risks as well (e.g. delayed maternal-child bonding, poor breastfeeding relationship, etc.).
3. COVID-19 positive postpartum mothers as well as postpartum PUIs will be counseled about the risks and benefits of colocation vs. separation.
4. Postpartum patients who elect to co-locate (also referred to as 'rooming in') with their infants will be encouraged to wear a facemask and gloves and to practice hand hygiene before each feeding. They will also be encouraged to wash any skin that may come in contact with the infant (e.g. breasts, chest, arms, etc.). They will be encouraged to limit other close contact with the infant(s) and a separate non-infected caregiver should be present to help care for the infant. This separate non-infected caregiver should perform a majority of the infant's care. While not breastfeeding, infants

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

Pumping / Expressed Breast Milk (83)

1. Mothers who wish to breastfeed should be provided with a dedicated breast pump.
(<https://consultqd.clevelandclinic.org/managing-pregnancy-during-the-covid-19-pandemic/>)
2. Postpartum patients who are pumping should follow CDC guidelines on equipment use and feeding.
3. Collecting Milk:
 - a. Wipe the surface where syringes/bottles will be placed after collection with a germicidal disposable wipe, and cover surface with clean paper towel or cloth.
 - b. Mother will wash hands and breasts before use and cleaning equipment before and after use. Mother will wear a mask while pumping.
 - c. Mother collects breast milk by hand or by pump into clean syringes or bottles then ensures syringe/bottle cap is secured. The outside of the container will be wiped with a germicidal disposable wipe. A label is then placed to identify date, time, and patient.
 - d. Transport and storage of breast milk from isolation room to common refrigerated storage should follow strict infection control procedures per hospital policy.

Infants

1. Infants born to mothers with confirmed COVID-19 should be considered PUIs.
2. All infants born to mothers with suspected or confirmed COVID-19 should be bathed immediately following delivery.
3. These infants should be tested for COVID-19 before hospital discharge. Prior to discharge, inpatient providers will directly discuss care of the infant with the follow-up provider.

Neonatal Intensive Care Unit (84)

1. COVID-19 positive postpartum mothers and their household contacts should not be allowed to visit in the NICU.
2. Any infant who has symptoms that meet criteria for NICU admission will be assessed by the NICU team and admitted to a COVID-19 cohort pod or other segregated section of the unit.
3. COVID-19 positive postpartum mothers and their household contacts will not be allowed to visit in the NICU.
4. For care teams assigned to infants requiring CPAP, SiPAP or undergoing aerosolizing procedures such as intubation, full PPE including N95 (or PAPR), eye shields, gown, hair cover, and gloves should be worn when caring handling the infant.
5. Patients requiring nasal cannula or those who are intubated on mechanical ventilation (closed circuit) require contact/droplet precautions when handling to include surgical mask, gown, hair cover, and gloves.
 - a. Per WHO guidance for clinical management of COVID-19, “newer high-flow nasal cannula (HFNC) and non-invasive ventilation (NIV) systems with food interface fitting do not create widespread dispersion of exhaled air and therefore should be associated with low risk of airborne transmission.” These patients could be cared for with contact/droplet precautions only (to include facemask) but could consider N95 (or PAPR) if readily available.

Visitation

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

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

- a. If the mother chooses to co-locate with the infant, the support person will be encouraged to help with the infant's care.
- b. If the mother chooses to be separated from her infant, the support person may help with the infant's care when they are brought to the room.
- c. Newborns who are PUIs are not eligible for elective circumcision.

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

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

Caring for Children with COVID-19

1. Children (0-18 years) with COVID-19 are more likely to remain asymptomatic or have mildly symptomatic disease. Severe symptoms requiring admission for supplemental oxygen have been described in up to 10% of symptomatic children, particularly those under the age of 5, with the highest risk in those under 12 months of age. The mortality rate appears to be extremely low: one study out of China reported only one death in 2,143 pediatrics patients.(85)
2. The intersection with chronic pediatric respiratory conditions such as asthma, cystic fibrosis, and chronic lung disease, and with the attendant increased risk of severe disease, is unknown.
3. Respiratory virus co-infections and secondary bacterial infections are possible.
4. During periods of community transmission and in the absence of targeted therapy for mild and moderate disease, the decision to test children for SARS-CoV-2 is driven by resource availability, infection prevention and control principles, and epidemiologic contact tracing or hot-spot case finding.
5. Pediatric symptoms, if present, are similar to common viral respiratory infections with a majority of symptoms affecting the upper airway. This differs from adults, who tend to have lower respiratory symptoms most prominent. (13, 85)
 - Fever 80-95% – majority <24hr duration
 - (Dry) cough 45-80%
 - Myalgias or fatigue 10-45%
 - Pharyngitis 10-40%
 - Rhinorrhea and/or congestion 10-30%
 - Diarrhea 10-20%
 - Dyspnea or hypoxemia 5-10%
6. Most labs are normal to include inflammatory markers (ESR, CRP, procalcitonin), chemistries, kidney and hepatic function. White blood cell count is typically normal but may be low.
7. If abnormal imaging, CXR will have non-specific increased lung markings or patchy infiltrates. Chest CT shows ground glass opacities.
8. Treatment of severe disease remains supportive, to include critical care interventions as required. Enrollment in clinical trials, or compassionate use of experimental therapies, should be considered for children with severe disease just as they would be for severely affected adults. There is no evidence to suggest that prophylaxis is necessary or effective for the majority of children.
9. Children appear to be efficiently shed the virus, even if asymptomatic. Viral load is detectable in respiratory secretions for up to 2 weeks and in stool for up to 4 weeks.(86, 87)
10. Given the prolonged duration of shedding of respiratory viruses in children, during periods of community transmission of SARS-CoV-2, it may be prudent to assume symptomatic children are infected, unless proven otherwise from an infection control standpoint - an issue particularly relevant to caregivers from vulnerable risk populations.

Caring for Older Persons with COVID-19

1. COVID-19 can result in severe disease and death among older adults. Early data from China suggest that a majority of deaths have occurred among adults aged ≥ 60 years especially those with underlying health conditions. In the United States, mortality rates in patients above age 85 have ranged 10-27%, and 3-11% among patients 65-84 years.(36)

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2. Ensure that care for the older adult and severely ill is in keeping with their goals of care, advance directives and patient and family wishes.
3. Conversations regarding goals of care should continue to be part of routine care.
4. Patients should be informed about their condition, and, if desired, their prognosis, in a way that is easy to understand.
5. If the patient is unable to communicate meaningfully, ensure that a surrogate decision maker or health care agent has been identified in accordance with state law based on facility location.
6. Symptom management: Aggressive control of symptoms such as pain, dyspnea or other bothersome symptoms relieves unnecessary suffering and is therefore crucial for all patients regarding of age, function, comorbidities and prognosis.
 - a. Pain
 - Acetaminophen should be used first, typically 500mg every 6 hours as needed.
 - If acetaminophen is insufficient, start an opiate (drug, dose, route, and frequency should be individualized and based on symptom severity, kidney/liver function and prior opiate exposure). Consider local supply in drug selection to mitigate risk of drug shortage.
 - Start a stimulant laxative, if prescribing an opiate to prevent constipation.
 - b. Dyspnea
 - If providing supportive care and supplemental oxygen is ineffective for management of severe dyspnea, a low-dose opiate may be used to help alleviate symptoms.
 - c. All providers should be able to provide basic symptom management, routine discussions about code status and goals of care in patients that are seriously ill.
 - d. If complex symptom management, difficult discussions about code status, and care goals arise, consider consultation from a palliative medicine subspecialist if available at your institution.
7. Compassionate extubation in the setting of comfort oriented care or the actively dying patient should be considered a medical procedure similar to ventilator initiation and follow a specific plan as removal of the ventilator can cause discomfort.
8. When resources become scarce:
 - a. Decisions regarding allocation of resources should be made at local, regional, state or federal levels.
 - b. Providers should avoid discussing rationing care at the bedside and should continue to provide compassionate care for the individual patient.
 - c. Age and comorbidities should not be a factor for provision of care for older adults.
 - d. Individual decisions and institutional policy regarding allocation of resources should be discussed in an interdisciplinary fashion and include input from stakeholders such as palliative medicine and healthcare ethics experts.
 - e. Institutional policy should be frequently reevaluated given the rapidly evolving nature of this crisis.
 - f. Institutional Clinical Ethics Committees should work closely with palliative medicine services to review process and decision making in resource scarce environments.(88)

SURGICAL CONSIDERATIONS FOR PERSONS WITH COVID-19

Perioperative Care of COVID-19+ Patients and PUIs

Overview.

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

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

In the OR.

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

Intubation.

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

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

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

Surge Capacity, Staffing, and 'Elective Surgery'

1. Military surgeons are well versed in addressing surge capacity both when deployed, and in MTFs.

Surgeons should adopt a similar approach when dealing with the potential for large numbers of non-

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

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

TELEMEDICINE SUPPORT DURING THE COVID-19 PANDEMIC

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

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are overcome by demand (see below).

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

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

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

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

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

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

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

Does the patient have:

<u>BOX 1</u>		<u>BOX 2</u>
Fever (or are they hot to the touch)		Has the patient traveled to a CDC Health Advisory Level 2 or Level 3 country in the last 14 days? (https://wwwnc.cdc.gov/travel/notices)
Cough		
Shortness of Breathing or Difficulty Breathing		Are they currently under investigation or isolation for COVID-19 by public health or other medical professionals?
Other flu-like symptoms (sore throat, runny nose, body aches or chills)	AND	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 quarantine themselves, if able, from close contact with others until EMS arrival.
- Notify responding EMS or First Responder Crews (to include Law Enforcement, Fire and EMS) that the patient meets pre-arrival screening criteria for COVID-19. Isolation and PPE measures should be taken prior to contact.
- Follow local agency policies to limit multi-unit responses or to limit the number of First Responders that are exposed to the patient if possible.
- Transport Agencies will contact the receiving facility as soon as possible, preferably prior to transport (See EMS TRANSPORT OF PERSONS UNDER INVESTIGATION OR PATIENTS WITH CONFIRMED COVID-19).

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

Strained EMS Response due to Increased 911 Calls/Requests.

1. EMS systems may be stressed due to an influx of 911 calls due to known or suspected COVID-19 transmission or infection. In areas with limited EMS resources overwhelmed by 911 call volumes, the following should be considered:
 - a. EMS and/or Fire Dispatch should triage 911 calls and prioritize responses accordingly (e.g. if a patient calls reporting signs and symptoms consistent with COVID-19, but denies respiratory distress and other complaints suggestive of a life-threatening condition (i.e. chest pain, etc.), ambulance services should be directed to an alternative, higher-acuity call.
 - b. If EMS arrives on scene and determines that a patient does not have a life-threatening complaint (relating to the potential exposure or signs and symptoms of COVID-19), and other 911 calls are pending a response, EMS crews should contact On-line Medical Control to discuss refusal of transport. Refusal of transport is not appropriate when call volumes are low.

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

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

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

1. A facemask should be worn by the patient for source control.

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

EMS Personnel Precautions for Procedures.

1. Prior to the initiation of any patient care, all crew members must don appropriate PPE as outlined above.
2. If a nasal cannula is in place, or will be used, the surgical mask should be placed over the top of the nasal cannula. An oxygen mask can be used on the patient if clinically indicated.
3. If patient presentation allows, EMS personnel providing care to a patient suspected of having COVID-19 should contact Medical Direction before initiating an aerosol-generating procedure. These aerosolized procedures include:
 - a. Nebulizer Treatments
 - b. Bag Valve Mask (BVM) Ventilations
 - c. Endotracheal Intubation
 - d. Oropharyngeal Suctioning
 - e. Continuous Positive Airway Pressure Ventilations (CPAP)
 - f. **Cardiopulmonary Resuscitation (CPR)**
4. If an aerosol-generating procedure is required/recommended, the doors to the patient compartment of the ambulance should remain open to allow ventilation of the area during these procedures. If the ambulance is equipped with an HVAC system it should remain on during patient transport.
5. If used, BVMs should have a HEPA filter attached. If the EMS agency has access to ventilators, units should contact the specific ventilator manufacturer for additional guidelines and to obtain part numbers for compatible HEPA filters.

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

1. After transporting the patient, leave the rear doors of the transport vehicle open to allow for sufficient air changes to remove potentially infectious particles. The time to complete transfer of the patient to the receiving facility and complete all documentation should suffice.
2. When cleaning the vehicle, EMS clinicians should wear a disposable gown and gloves. A face shield or facemask and goggles should be worn if splashes or sprays during cleaning are anticipated.
3. Clean and disinfect reusable patient-care equipment before use on another patient, according to manufacturer's instructions.
4. Routine cleaning and disinfection procedures (e.g. use of cleaners and water to pre-clean surfaces prior to applying an EPA-registered, hospital-grade disinfectant for emerging viral pathogens) are appropriate for COVID-19.
5. Ensure disinfection procedures are followed consistently, to include the provision of adequate ventilation when chemicals are in use. Doors should remain open when cleaning the vehicle.

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

Guideline Only/Not a Substitute for Clinical Judgment

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

EN ROUTE CRITICAL CARE CONSIDERATIONS FOR PERSONS WITH COVID-19

1. Per TRANSCOM Instruction 41-02, patients with known or suspected exposure to, or an active infection with, a CDC defined High Consequence Infectious Disease or novel or CDC “Category A” disease shall be treated in place unless an exception to policy (ETP) is granted. Relevant authorities that must concur with or approve the ETP are detailed in the TRANSCOM instruction. “Treat in place” is the plan unless otherwise directed.
2. Current CDC guidance for transport is largely based on SARS and MERS and is not yet reflective of the evolving information on COVID-19.(89) While CDC guidance does not advocate for use of biocontainment units for patients, the CDC’s recommendation for airborne precautions and selection of aircraft with optimal airflow characteristics to reduce risk to aircrew/front end is challenging in airframes used for AE/CCATT transport. After review of published airflow characteristics for the C-130, C-17, KC-135 and KC-10, CDC and National Strategic Research Institute aerosol scientists recommended against transporting symptomatic patients in an open aircraft. Therefore, AMC recommended to TRANSCOM that any mission generated to transport COVID-19 patients on DoD aircraft use biocontainment, except as a last resort.
3. If an ETP is granted for patient movement, contract civilian air ambulance such as Phoenix Air Group is the first choice. They have access to single patient units and also operate the State Department’s Portable Bio-Containment Modules (PBCM, formerly known as the CBCS). DoD owns and operates Transport Isolation Units (TIS) for biocontainment. Both the TIS and the PBCM are multi-place units capable of transporting up to 4 litter patients. The PBCM has better engineering controls to manage airborne transmissible pathogens and would be preferred for patient transport. In either case, patients should be moved in biocontainment transport units with specially trained AE and CCAT teams rather than using usual AE mechanisms.
4. Patients with known or suspected exposure to, or an active infection with a pathogen that is not a novel or CDC “Category A” disease may be transported within the PM system, utilizing standard transmission-based precautions in accordance with AFI 48-307, Vol.1, En-Route Care and Aeromedical Evacuation Operations. Movement should be requested when it is essential to provide appropriate care, while seeking to minimize opportunities for transmission of pathogens within and between theaters and countries.

WHOLE OF GOVERNMENT RESPONSE IN COORDINATION OF RESOURCES

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

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

HHS link to Resources

<https://www.phe.gov/emergency/Tools/Pages/default.aspx>

HHS Regional Emergency Coordinators Contact List

<https://www.phe.gov/Preparedness/responders/rec/Pages/default.aspx>

State FEMA Office contacts:

<https://www.fema.gov/emergency-management-agencies>

ETHICAL CONSIDERATIONS WHEN CARING FOR PERSONS WITH COVID-19

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

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

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

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

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

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

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

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

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

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

For Providers:

To bring inside room:

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

☐ Airway Supplies:

- ☐ ETT (7 & 7.5 for adults, appropriate size for children) with syringe for cuff
- ☐ Glidescope or C-MAC (facilitate intubation from a distance)
- ☐ Appropriate stylet
- ☐ Bougie
- ☐ OG tube with syringe, lube and tape
- ☐ OP/NP airway
- ☐ Colorimetric end-tidal CO2 detector
- ☐ Suction setup

☐ Disposable stethoscope

☐ Sani-wipes (should be located inside room)

Keep outside room (on standby):

☐ Back up Airway Supplies:

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

☐ Airway cart (never bring in room)

☐ EZ-IO

For Nursing:

☐ RSI meds kit

☐ Restraints

☐ Foley

☐ ABG syringe

☐ Post-intubation meds:

- ☐ propofol
- ☐ fentanyl
- ☐ phenylephrine
- ☐ norepinephrine drip

For Respiratory Therapy:

☐ Ventilator with appropriate filters

☐ ET securing device

☐ Waveform capnography adapter

☐ Viral filter for Ambubag

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

APPENDIX B: COVID-19 PRE-INTUBATION PACK*

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

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

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

APPENDIX C : COVID-19 INTUBATION PROTOCOL

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
- 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 necessary, 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

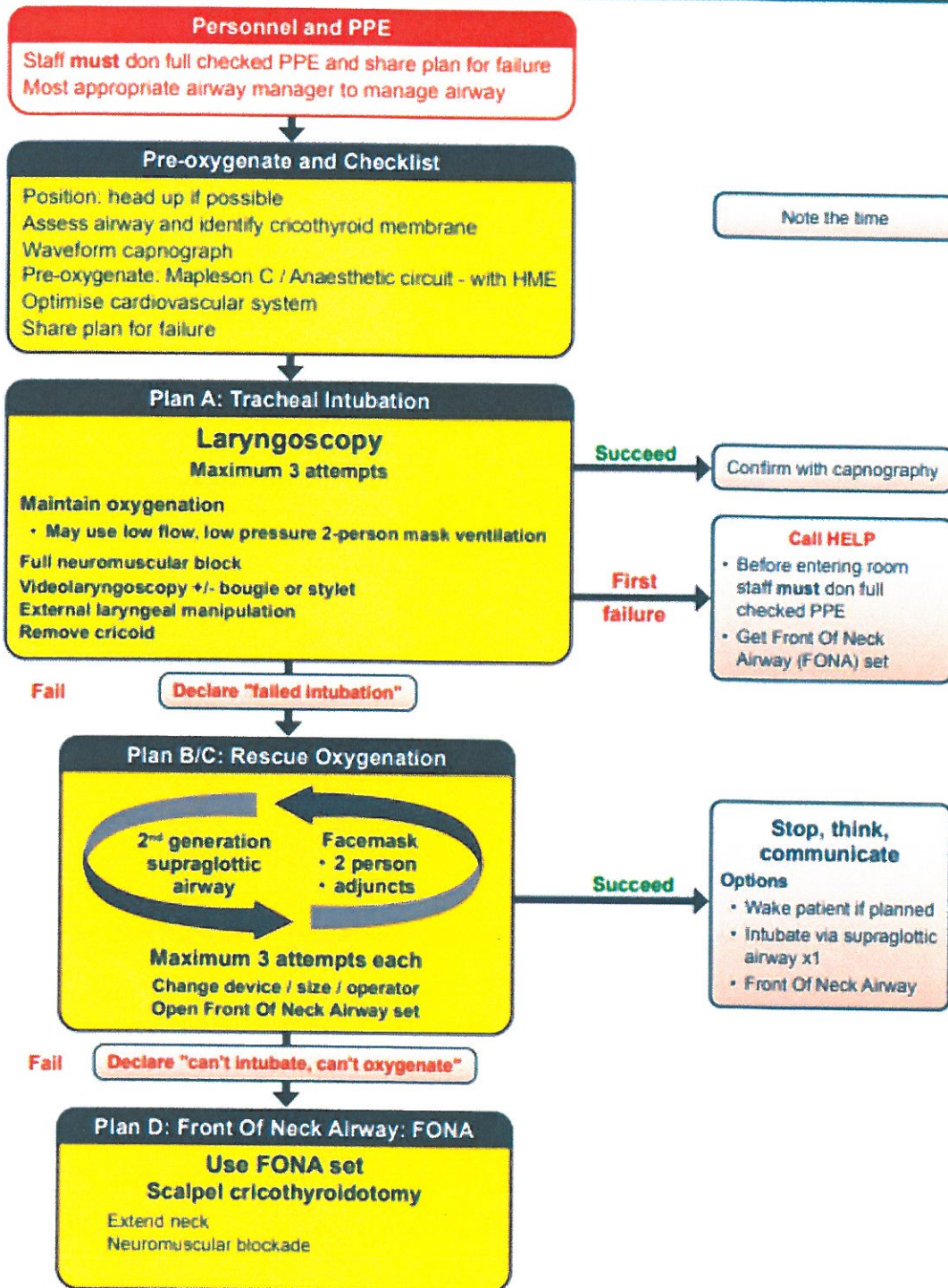
Post-Intubation

- 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 D : COVID-19 COGNITIVE AIDS FOR INTUBATION

Emergency tracheal intubation checklist COVID-19				
Personal Protective Equipment	Prepare Equipment	Prepare for Difficulty	In the Room	Post-procedure and Safety
OUTSIDE ROOM				
<p>PPE – be thorough, don't rush!</p> <ul style="list-style-type: none"> <input type="checkbox"/> Wash hands <input type="checkbox"/> Put on PPE <input type="checkbox"/> Long sleeved gown <input type="checkbox"/> FFP3 mask <input type="checkbox"/> Gloves <input type="checkbox"/> Eyewear <input type="checkbox"/> Wipeable shoes <p><input type="checkbox"/> Check fully by buddy with checklist</p> <p><input type="checkbox"/> Names on vests</p> <p>Allocate roles:</p> <ul style="list-style-type: none"> <input type="checkbox"/> If team leader and intubator, allocate force and intubator's assistant <input type="checkbox"/> Drugs monitor, time <input type="checkbox"/> Runner (outside) <input type="checkbox"/> JEFONA <p><input type="checkbox"/> How do we contact further help if required?</p>	<p><input type="checkbox"/> Check kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> BIV or Mapleson C with HME attached <input type="checkbox"/> Guided <input type="checkbox"/> Working suction <input type="checkbox"/> Videolaryngoscope <input type="checkbox"/> Bougie stylet <input type="checkbox"/> Two tracheal tubes, ties and s/s/ring <input type="checkbox"/> 2° generation SGA <input type="checkbox"/> cDNA set <p><input type="checkbox"/> Do you have all the drugs required?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ketamine <input type="checkbox"/> Rocuronium <input type="checkbox"/> Maintenance sedation <p><input type="checkbox"/> Weight?</p> <p><input type="checkbox"/> Allergies?</p>	<p><input type="checkbox"/> If the airway is difficult, could we wake the patient up?</p> <p><input type="checkbox"/> What is the plan for a difficult intubation?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Prior A RSI <input type="checkbox"/> Prior B/C 2-handed 2-person BIV <input type="checkbox"/> 2° generation SGA <p><input type="checkbox"/> Confirm agreed plan</p> <p><input type="checkbox"/> Does anyone have any concerns?</p>		
INSIDE ROOM				
<p><input type="checkbox"/> Airway assessment</p> <ul style="list-style-type: none"> <input type="checkbox"/> Larynx CTM <input type="checkbox"/> LMA/COCHA <p><input type="checkbox"/> Apply monitors</p> <ul style="list-style-type: none"> <input type="checkbox"/> OI waveform capnography <input type="checkbox"/> USPO, probe <input type="checkbox"/> LECG <input type="checkbox"/> Blood pressure <p><input type="checkbox"/> Checked IV access (x2)</p> <p><input type="checkbox"/> Optimise position</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consider ramping or remove Trendelenburg <p><input type="checkbox"/> Optimal preoxygenation</p> <ul style="list-style-type: none"> <input type="checkbox"/> US runs <input type="checkbox"/> DETC > 85% <input type="checkbox"/> At least 3 minutes <p><input type="checkbox"/> Optimise patient condition be optimised any further before intubation?</p> <ul style="list-style-type: none"> <input type="checkbox"/> JF intubator/ notope <input type="checkbox"/> JACore NCT <input type="checkbox"/> Delayed sequence induction? 				
AFTER AND LEAVING				
<p><input type="checkbox"/> Airway management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Establish ventilation after cuff inflation <input type="checkbox"/> Check waveform capnography <input type="checkbox"/> Ultrasonic tracheal tube tie each disconnection <input type="checkbox"/> Avoid unnecessary disconnections <p><input type="checkbox"/> Other</p> <ul style="list-style-type: none"> <input type="checkbox"/> Insert N2T <input type="checkbox"/> Consider deep tracheal viral sample <p><input type="checkbox"/> Careful equipment disposal</p> <p><input type="checkbox"/> Decantamination of reusable</p> <p><input type="checkbox"/> Remove PPE</p> <ul style="list-style-type: none"> <input type="checkbox"/> Observed by buddy <input type="checkbox"/> Use checklist <input type="checkbox"/> Metaculous disposal <input type="checkbox"/> Wash hands 				

Tracheal intubation of critically ill adults Adapted for COVID-19



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

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

CALL FOR HELP



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

Plan D: Front Of Neck Airway: FONA

Extend neck

Ensure neuromuscular blockade

Exclude oxygen failure and blocked circuit

Personnel and PPE

New staff **must** don full checked PPE

Most appropriate airway manager to perform FONA

Scalpel cricothyroidotomy

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

Laryngeal handshake to identify cricothyroid membrane

Palpable cricothyroid membrane

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

Impalpable cricothyroid membrane

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

Post-FONA care and follow up

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

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

APPENDIX E : ADULT PRONE POSITIONING PROTOCOL EXAMPLE*

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

Procedure for patient preparation prior to proning:

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

Procedure of manual pronation:

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

Procedure for proper patient positioning (see diagram below):

1. Head and Neck positioning:

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

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

2. Arm positioning:

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

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

3. Patient positioning:

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

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

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

4. Leg positioning:

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

5. Tilt the patient into reverse Trendelenburg:

Goal is 30 degrees, as patient tolerates.

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

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

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

Patient monitoring and care:

1. Time patient is prone/supine:

- a. It is recommended in the literature that patient is placed in the prone position for a minimum of 16 hours. The timing for prone cycling requires a physician order and is always situational. Patients should be returned to supine position for up to four hours, once per day preferably early AM to allow the interdisciplinary team time to assess while in supine position. While in supine position, reassessment of oxygenation, skin assessment and other relevant exam elements should occur. If the patient does not tolerate being supine (i.e. requiring increased ventilator settings, decreasing PaO₂/FiO₂ ration, hemodynamically unstable or decreasing SpO₂/PaO₂) return patient to the prone position.
- b. Patients in prone position should receive the same standard of care as a patient that is supine (i.e. oral care,

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- 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

