



**Updated March 26, 2020**

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## **Lessons Learned: COVID-19**

### ***Protocols and Best Practices for addressing COVID-19 in the hospital setting***

**Compiled by EvergreenHealth Hospitalists**

***The information presented here is intended for use by physicians and hospital staff and should not be considered medical advice. Please contact your healthcare provider with any healthcare questions.***

The EvergreenHealth Hospitalist group offers critical early lessons learned from our experience managing many of the first COVID-19+ patients hospitalized in the U.S. In this document, you will find consolidated information on what to anticipate and how to prepare for the arrival of COVID-19+ patients, recommendations on maximizing safety in the hospital environment, and key clinical management considerations which incorporate clinical expertise generously shared by colleagues across the globe. We also include a robust list of online resources at the conclusion of this document. We appreciate your review and welcome your [response](#) regarding what you found helpful as well as any feedback.

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#### **ANTICIPATE & PREPARE**

- **Burn rate on PPE supply.** Your facility will use greater quantities of personal protective equipment (PPE), oxygen equipment, and isolation rooms than initially thought. Based on your current protocols, determine for each day of hospital care for a patient in isolation uses \_\_\_ gloves, \_\_\_ surgical masks, \_\_\_ N-95 masks, \_\_\_ gowns.
- **N95 fit.** Fit-test all staff as far ahead as possible. A proper fitting can take 30 minutes.
- **Conserving supplies.** Be prepared to reuse N95 and CAPR/PAPR equipment. Create cleaning protocols for reuse of masks and hoods. Understand what solutions adequately kill coronavirus. Alcohol solution may not be adequate.
- **Increased length of stay.** Hospital length of stay will increase due to slow recovery from respiratory issues and disposition issues when COVID+ patients are ready for discharge.
- **Staffing concerns.** Staff will become ill, quarantined, and may have difficulty getting to work. Child care for staff families is a consideration. Solicit additional manpower. Have a process ready for emergency credentialing. Develop policy on sick leave. Some departments may shoulder more workload than others: critical care nursing, respiratory therapy, housekeeping, intensivists, hospitalists.

- **Workforce shortages.** Expect critical care staffing to be impacted the most, especially nursing and respiratory therapy.
- **Cleaning.** Identify appropriate cleaning solutions. Establish cleaning protocols of the environment. Build in additional time to clean rooms and radiology facilities.
- **Telemedicine and video capabilities.** Consider virtual clinical services to reduce PPE use. Determine documentation and billing procedures.
- **Counseling patients and families.** Expect to spend more time counseling patients and families. Consider lower per-provider patient volumes if feasible.
- **Rapidly changing guidelines.** State guidelines may evolve more quickly than CDC / federal guidelines in response to the environment on the ground.
- **Disposition of COVID+ patients may be challenging.** Are there unconventional beds in the community with nursing capability where patients can convalesce, to free up hospital beds?

#### TESTING:

- **Testing precipitates resource use.** Recognize that availability of COVID testing may drive resource consumption, including PPE, hospital rooms, discharge capability.
- **Aerosol-generating procedure (AGP).** Testing with a nasopharyngeal swab is an AGP. Use appropriate isolation status and PPE for this procedure. Consider a procedure room and a dedicated team for performing AGPs.
- **False negative** rate is unclear, may be variable between labs, and *technique-dependent* with nasopharyngeal swabs.
- **Frequent updates.** Designate one individual to regularly update staff on testing procedures, including who is the highest priority to be tested, which swab(s) are required, what paperwork is needed, turnaround time, and when to expect that additional testing will become available.

#### INFECTION CONTROL:

- **Negative Airflow:** Building engineers can determine which rooms and units can be converted to negative airflow.
- **Cohorting.** If feasible, care for COVID-positive patients on separate closed units.
- **Create clear donning and doffing circuits:** Designate clear donning / doffing circuits so cross-contamination NEVER occurs between clean and dirty PPE. Clearly designate donning areas with clean masks, gowns, and gloves. Clearly designate where dirty supplies should be doffed and collected without contaminating clean supplies. Train all staff to safely don and doff PPE.
- **Use appropriate Personal Protection Equipment (PPE):** Have clear signage. Use "special droplet & contact precautions" in isolation rooms unless an aerosol-generating procedure is underway or occurred within 45 minutes, in which case "airborne precautions" are used. Current CDC guidelines: [link here](#)
- **AGPs.** Educate staff in understanding which procedures generate aerosols and increase transmission risk. Consider creating a dedicated AGP team.

- **Conserve supplies.** Be prepared to reuse N95 and CAPR/PAPR equipment. Create cleaning protocols for reuse of masks and hoods. Understand what solutions adequately kill coronavirus -- alcohol solution may not be adequate.
- **"Cluster" patient care.** If safe, cluster patient care to decrease PPE turnover.
- **COVID-pending patients.** Be aware of PPE turnover on patients awaiting COVID testing results while in special isolation precautions.
- **Fomites.** Recognize that transmission among health workers may occur in work rooms, break rooms, eating areas, etc. Determine appropriate cleaning procedures for hard surfaces. Chlorine solution (0.5% for surfaces) may replace scarce wipes.
- **Visitor Policy:** Establish a rational and humane visitors policy. Consider compassionate visitation for end of life in isolation rooms.
- **Health care worker quarantine:** Understand quarantine procedures for health workers after exposure and if symptomatic vs. asymptomatic. CDC guidelines: [link here](#)
- **Hospital transmission.** Establish a process for identifying hospital exposures and monitoring affected staff, patients, and visitors for transmission.

## HUMAN RESOURCES

- **Task-shifting.** As intensivist manpower becomes scarce, consider enlisting hospitalist help to manage critical patients while intensivists focus on procedures and ventilator management. Credential outpatient internists or subspecialists to help with stable hospital patients. RNs may be called to do respiratory therapy tasks as RT availability may become limited.
- **Develop staff absence policy.** Establish when to test, when safe to return to work, paid sick leave. Current CDC guidelines for healthcare providers returning to work: <https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/hcp-return-work.html>
- **Monitor morale.** Recognize that low morale may occur in situations where staff feel unsafe or have little or no control. These feelings of helplessness may increase the risk of error.
- **Plan for wellness and sustainability.** Recognize signs of acute stress disorder.
- **Sleeping quarters.** Consider sleeping arrangements for staff wanting to protect families and isolate.
- **Deploy quarantined staff.** Consider using staff isolating at home for telephone follow-ups, communications, journal research, etc.
- **High risk staff.** Identify staff at higher risk of severe illness from COVID19. Develop policies to mitigate exposure.
- **Manage stigmatization.** Recognize that staff and patients' families are being stigmatized in the community.

## CLINICAL MANAGEMENT 1: Inpatient Care of COVID patients

- **Presenting story.** As your community experiences community spread of COVID, have a high index of suspicion. Often patients are admitted to the hospital after 7-9 days of symptoms. Some are not improving/worse after taking empiric antibiotics for pneumonia. Some are younger, healthier adults with no history of pneumonia. Typical

picture at presentation includes increasing shortness of breath with cough, with or without fever. Fever present in about 40% on arrival. About 90% display fever during their inpatient course. A subset of patients have nausea and/or diarrhea before respiratory symptoms develop. Some may lose sense of smell. Many presenting to the hospital have infiltrates on CXR. Even with negative CXR, CT chest can show ground glass opacities, which may be associated with worse prognosis.

- **Common lab findings.** Most have normal WBC but relative lymphopenia, low procalcitonin, some have mild LFT elevations. CRP and LDH often elevated but nonspecific.
- **False negative** rate for COVID testing is unclear. May be variable between labs and technique-dependent with nasopharyngeal swabs. Consider repeat testing and ongoing isolation if high level of concern.
- **Course:** Patients may present prior to peak illness severity. Patients may appear stable for days, then develop sudden respiratory decompensation. Others are intubated within hours of arrival. Fevers are cyclical, persistent, and can be very high, up to 39-40 C. Stable patients discharged from the ED or hospital may return for readmission within a few days with hypoxia and/or worsening CXR findings. Consider telephone follow-up calls for discharged patients.
- **Prolonged course.** Unlike other respiratory illnesses, course tends to be more prolonged, with some patients 2-3 weeks into their illness still requiring significant supplemental oxygen.
- **Drug trials.** Work with your ID colleagues to determine access to therapeutics. NIH is conducting a remdesivir clinical trial. Hydroxychloroquine may be in short supply with media coverage of this medication. Tocilizumab, Aviga, and Kaletra also being studied; Kaletra did not improve outcomes in a recently published Chinese trial. Monitor literature for new data to guide decision-making.
- **Coinfection.** Bacterial co-infection rates are low. Though tendency is to start empiric antibiotics, consider stopping if low procalcitonin, negative sputum culture, or clinical stability. Low percentage of viral co-infection including influenza and other respiratory viruses.
- **Chest imaging.** In China, CT scans are done routinely on COVID patients using dedicated COVID scanners. Those with rapid radiographic changes and bilateral infiltrates may have poorer prognosis. The American College of Radiology recommends against diagnosis of COVID using CT alone.
- **Possible co-morbid cardiac disease.** COVID associated with new cardiomyopathies and cardiovascular collapse with VF arrest, usually in ICU cohort.
- **ARBs.** Consider use of ARBs. Suggested biological mechanism is disruption of viral binding in lungs. Data from prior SARS outbreak:  
<https://onlinelibrary.wiley.com/doi/10.1002/ddr.21656>
- **Routine medications.** Consider stopping ACE inhibitors and NSAIDs, which may be associated with worse outcomes. Consider switching nebulizers to MDIs to avoid generating aerosols. Simplify medication schedules, if safe and appropriate.

- **Guidance on discharging patients from the hospital.**  
<https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-hospitalized-patients.html>

## CLINICAL MANAGEMENT 2: Key ICU lessons

- **Rapid decompensation.** Most of our initial ICU subset of patients required critical care within the first 24hrs of ED presentation, usually after admission to a hospital floor bed. On initial contact with the patient and family, we confirm code status and address goals of care including decisions regarding ICU admission. Most patients transferring to the ICU present with an abnormal CXR, with bilateral infiltrates.
- **Severe ARDS** is seen in nearly half of our initial ICU cohort care within 72hrs of presentation. Usual care includes PEEP ladder, proning, epoprostenol, paralytics, and ECMO.
- **Multisystem organ failure:** Respiratory failure is often the primary concern. Additional clinical findings include shock requiring vasopressors, cardiomyopathy in a significant number, malignant arrhythmias including VF/VT arrest, liver dysfunction, and renal failure with dramatically elevated CK levels. Hepatorenal injury excludes patients from Remdesivir use.
- **AGP risks:** Higher in the ICU with endotracheal intubation, bronchoscopy, CPAP, high flow O2, concern for unintentional extubation resulting in an open ventilator circuit. Be aware prior to performing procedures. Limit nebulizers. No documented infections in intensivists at the time of this writing despite large COVID-19 caseloads. Healthcare exposures may be limited with cohorting, closed ICU, and virtual consults by non-intensivists when appropriate.
- **Potential for recovery:** Successful extubation and other clinical improvement at the 2 week mark. Experience from China suggests weeks of mechanical ventilation for those with hope for recovery.
- **Characteristics and Outcomes of the First 21 ICU patients at EvergreenHealth**  
<https://jamanetwork.com/journals/jama/fullarticle/2763485>
- **Society of Critical Care COVID-19 Surviving Sepsis Guidelines**  
<https://www.sccm.org/getattachment/Disaster/SSC-COVID19-Critical-Care-Guidelines.pdf>
- **Establish Framework for Allocation of Scarce Resources:** Intended to be applied at the regional level and ideally is built on existing triage and disaster management protocols in your state.  
Chest/John Hopkins Framework for Statewide Allocation of Scarce Ventilators  
[https://journal.chestnet.org/article/S0012-3692\(18\)32565-0/fulltext](https://journal.chestnet.org/article/S0012-3692(18)32565-0/fulltext)  
Northwest Healthcare Response Network/WADOH Crisis Standards of Care  
<https://nwhrn.org/scarce-resource-management-and-crisis-standards-of-care-overview-and-materials/>

## CLINICAL MANAGEMENT 3: Systems

- **Social isolation of patients.** Visitation is highly restricted per CDC and DOH guidelines to mainly end-of-life visitations. Consider ways to reduce social isolation for COVID+

patients, such as video chat, phone chargers, spiritual care. Patients will be sick and may be afraid and alone. They may receive only minimum interaction with staff and won't be able to see their family until leaving the hospital.

- **Communications among providers.** Consider how moment-to-moment changes to clinical practice can be communicated efficiently to providers. Expect changes in clinical practice to evolve quickly, sometimes over a matter of hours to days. Limit unnecessary risk to your colleagues with a higher threshold for consults or telehealth visits.
- **Establish regular communication within your service group.** By conference call or with other appropriate means of social distancing. Review new guidelines and new issues identified during day, and generate strategies.
- **Collaborate with Experienced Providers:** We connected with Chinese physicians before other US hospitals were seeing COVID patients, they were able to advise on PPE, clinical course, experimental treatments. Additional resources include CDC conference calls, regional critical care grand rounds, professional society online resources and webinars.
- **Rapid accumulation of Data:** Major medical journals are churning through clinically relevant data daily for online publication. Policy decisions are changing daily. This is occurring on a worldwide scale.

## ADDITIONAL ONLINE RESOURCES

### OVERVIEWS

1. CDC Coronavirus page: symptoms, community resources, US case tracker, info for providers, latest updates

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>

2. EM Crit: Excellent overview, includes diagnosis and treatment, discusses meds

<https://emcrit.org/ibcc/covid19/>

3. EB Medicine: Excellent overview, epidemiology, ER and Hospitalist management, “situation summary”, PDF to print

<https://www.ebmedicine.net/topi.../infectious-disease/COVID-19>

4. Seattle Intensivist One-Page Summary on Covid-19,

<https://www.kevinmd.com/.../an-intensivists-one-pager-on-covi...>

### MASTER PROTOCOL SITES

1. University of Washington

<https://covid-19.uwmedicine.org/>

2. University of California, San Franc

<https://infectioncontrol.ucsfmedicalcenter.org/coronavirus>

### TRACKERS

1. WHO Daily Situation Reports

<https://www.who.int/.../novel-coronavirus-2.../situation-reports>

2. North America Trackerisco

<https://coronavirus.1point3acres.com/>

### 3. Johns Hopkins Tracker

<https://coronavirus.jhu.edu/map.html>

### **FOREIGN LANGUAGE RESOURCES** - NYC.gov, see "Posters"

<https://www1.nyc.gov/.../health/health-topics/coronavirus.page>

### **EMERGENCY MEDICINE**

1. See Master Protocol Sites above

2. ACEP COVID-19 Resources

<https://www.acep.org/resource/dynamic/79753/78842>

### **INTERNAL MEDICINE / CRITICAL CARE**

1. Use of Single Ventilator for Multiple Patients

<http://rc.rcjournal.com/content/57/3/399>

2. ECMO in COVID-19

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

3. Society of Critical Care COVID-19 Surviving Sepsis Guidelines

<https://www.sccm.org/getattachment/Disaster/SSC-COVID19-Critical-Care-Guidelines.pdf>

4. Chest - Framework for Scarce Resource Allocation

[https://journal.chestnet.org/article/S0012-3692\(18\)32565-0/fulltext](https://journal.chestnet.org/article/S0012-3692(18)32565-0/fulltext)

5. Characteristics and Outcomes of the First 21 ICU patients at EvergreenHealth

<https://jamanetwork.com/journals/jama/fullarticle/2763485>

6. Cottage Health Infectious Disease Grand Rounds - March 12<sup>th</sup>

<https://www.youtube.com/watch...>

### **OBSTETRICS AND GYNECOLOGY**

1. ACOG COVID-19 Practice Advisory - Includes CDC links for many issues and inpatient and outpatient evaluation

<https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2020/03/novel-coronavirus-2019>

2. CDC COCA Webinar on Pregnant and Pediatrics (summarized in post labeled OB/PEDIATRICS), audio resource

[https://emergency.cdc.gov/c.../calls/2020/callinfo\\_031220.asp...](https://emergency.cdc.gov/c.../calls/2020/callinfo_031220.asp...)

### **PEDIATRICS**

1. AAP Early COVID-19 Data/Pedi Epidemiology

<https://pediatrics.aappublications.org/.../peds.2020-0702.ful...>

2. Clinical and CT Differences Between Peds and Adults w COVID-19

<https://onlinelibrary.wiley.com/doi/10.1002/ppul.24718>

### **RADIOLOGY**

1. Society of Italian Radiology: Case Files demonstrating CXR and CT findings

<https://www.sirm.org/category/senza-categoria/covid-19>

## 2. Lung Ultrasound Findings

<https://link.springer.com/article/10.1007/s00134-020-05996-6>

### **SURGERY**

1. See Master Protocol Sites above

2. ACS Statement on Elective Procedures

<https://www.facs.org/abou.../covid-19/information-for-surgeons>

### **CARDIOLOGY** - ACC COVID-19 Hub

<https://www.acc.org/latest-in-cardiology/features/accs-coronavirus-disease-2019-covid-19-hub>

### **GASTROENTEROLOGY**

1. Joint Statement from AGA, ACG, AASLD, ASGE

<https://www.gastro.org/.../joint-gi-society-message-covid-19-...>

2. ASGE Statement on Endoscopy Precautions

<https://els-jbs-prod-cdn.literatumonline.com/.../CoronavirusO...>

### **OPHTHALMOLOGY** - AAO Statement

<https://www.aao.org/hea.../alert-important-coronavirus-context>

### **PSYCHIATRY** - Resources for Psychiatrists - Discusses telehealth, PPE, and more

<https://www.psychiatry.org/.../covid-19-mental-health-impacts...>

### **SPECIAL POPULATIONS – INMATES**

1. Federal Bureau of Prisons Action Plan

<https://www.bop.gov/mobile/>

2. Statement from King County

<https://www.kingcounty.gov/depts/jails.aspx>

### **TELEMEDICINE**

1. AAP Coding and Billing Factsheet [https://www.aap.org/.../Doc.../coding\\_factsheet\\_telemedicine.pdf](https://www.aap.org/.../Doc.../coding_factsheet_telemedicine.pdf)

2. AAP Telemedicine Resources <https://www.aap.org/.../ma.../telehealth-care/Pages/default.aspx>

3. Health and Human Services - Telehealth Emergency Enforcement Discretions

<https://www.hhs.gov/hipaa/for-professionals/special-topics/emergency-preparedness/notification-enforcement-discretion-telehealth/index.html>

### **TREATMENT ARTICLES**

1. ACEI / ARBS

<http://www.nephjc.com/news/covidace2>

<https://www.ncbi.nlm.nih.gov/m/pubmed/32129518>

<https://www.escardio.org/.../position-statement-of-the-esc-co...>

2. Chloroquine

[https://www.jstage.jst.go.jp/.../adv.../0/advpub\\_2020.01047/\\_pdf](https://www.jstage.jst.go.jp/.../adv.../0/advpub_2020.01047/_pdf)

### 3. Remdesivir and Chloroquine

<https://www.nature.com/articles/s41422-020-0282-0>

### 4. Favilavir

<https://www.pharmaceutical-technology.com/.../china-approves-...>

### 5. Use of NSAIDs/steroids vs. acetaminophen / paracetamol

<https://www.bmj.com/content/bmj/368/bmj.m1086.full.pdf>

BMJ 2020;368:m1086 doi: 10.1136/bmj.m1086

### 6. Kaletra trial in China, n-199

<https://www.nejm.org/doi/full/10.1056/NEJMoa2001282>

## **THE INTERNATIONAL EXPERIENCE**

### 1. Keeping the Coronavirus from Infecting Health-Care Workers, Atul Gawande - experience in China, Singapore and Hong Kong

<https://www.newyorker.com/news/news-desk/keeping-the-coronavirus-from-infecting-health-care-workers>

### 2. Contact Transmission of COVID-19 in South Korea: Novel Investigation Techniques for Tracing Contacts

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7045882/>

### 3. JAMA Viewpoint regarding China Case Series of the first 72,000 patients (original article in Mandarin)

<https://jamanetwork.com/journals/jama/article-abstract/2762130>

### 4. Webinar describing Italy's experience

[https://www.esicm.org/webinars/covid-19-national-coordination-experience-in-italy/?utm\\_source=Coronavirus&utm\\_campaign=d0c6df2ad5-](https://www.esicm.org/webinars/covid-19-national-coordination-experience-in-italy/?utm_source=Coronavirus&utm_campaign=d0c6df2ad5-)

[EMAIL\\_CAMPAIGN\\_2019\\_01\\_21\\_09\\_38\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_92b99a76af-d0c6df2ad5-236379179](https://www.esicm.org/webinars/covid-19-national-coordination-experience-in-italy/?utm_source=Coronavirus&utm_campaign=d0c6df2ad5-EMAIL_CAMPAIGN_2019_01_21_09_38_COPY_01&utm_medium=email&utm_term=0_92b99a76af-d0c6df2ad5-236379179)

### 5. Imperial College of London COVID-19 Team - Effect of (NPIs) to reduce COVID- 19 mortality and healthcare demand

<https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf>

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**PDF downloaded from <https://www.evergreenhealth.com/covid-19-lessons>**