

Guidelines in Managing Cardiac Arrest in the Emergency Department During the Covid-19 Pandemic

The novel coronavirus Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the etiologic agent of coronavirus disease 2019 (COVID-19), has rapidly spread throughout the world, infecting just over 3 million people as of April 27, 2020 and claimed over 211,000 lives.¹ Of admitted patients, 27.8% have evidence of myocardial injury² with mortality among hospitalized patients as high as 69.4%.² In addition to classic mechanisms of cardiovascular collapse seen in infected patients, such as systemic inflammatory response, destabilized coronary plaques, and hypoxia, Sars-CoV-2 also directly infiltrates the myocardium resulting in myocarditis and reduced systolic function. Possible treatments currently under investigation, including hydroxychloroquine and azithromycin, prolong the QT interval and may increase the risk for fatal arrhythmias.^{2,3}

While cardiac arrest secondary to known SARS-CoV-2 infection, especially in the intensive care unit environment, may be related to any of the previously described mechanisms, the emergency department is faced with an unselected cohort of patients presenting in extremis or frank cardiac arrest. The true incidence of COVID-19 disease is unknown. Symptoms may vary from frank respiratory distress to anosmia and malaise⁴ and as many as 90% of patients with SARS-CoV-2 infection may be asymptomatic.⁵ Testing via PCR, particularly early in the disease, has a reported

sensitivity of just 32-63%.⁶ Coupled with high viral infectivity (R0 of 2.3-2.7)⁷ care team providers should presume that each patient is infected.⁸

As a consequence, the resuscitation of emergency department patients during the COVID-19 pandemic requires a conscious effort to minimize infection risk. The purpose of this narrative is to present a best-practice model based in 4 basic caveats:

1. Reduce the risk of exposure to the entire health care team
2. Decrease the number of aerosol generating procedures (AGPs)
3. Utilize a small resuscitation team to limit potential exposure
4. Consider early termination of resuscitative efforts

Reduce the risk of exposure to the entire health care team

Although some controversy exists, cardiopulmonary resuscitation is generally classified as an aerosol generating procedure (AGP).⁸⁻¹⁴ Special emphasis should be placed upon ensuring proper donning of personal protective equipment (PPE) for healthcare workers involved in the patient's care. If resources are available, a member of the healthcare team can help coordinate PPE donning and doffing, identifying and correcting donning and doffing errors in real time. During all AGPs including CPR and intubation, healthcare workers should be in appropriate PPE: PAPR or (n95 with a face shield) + gown + gloves.^{8,15} Once AGPs are complete, members of the healthcare team still must wear modified droplet and airborne precaution PPE for a duration dependent on the air exchanges per hour for the room. It is imperative that the air of the treatment room be completely turned over prior to discontinuation of N95s or PAPRs as the virus can

remain viable in the air.^{8,15} After this period of time, other members of the team can enter the room after they don modified droplet precautions PPE: gloves + gown + surgical mask with eye protection.

A patient who arrives in the ED with either a cuffed endotracheal tube that is inflated with a good seal and attached to a viral filter or a well seated supraglottic airway, such as a King/second generation LMA (Air-Q) with a sealed gastric port and attached to a viral filter, is not considered to present a significantly increased risk of aerosolizing the virus. However, placement of these devices is an AGP. Care should be taken to avoid inadvertent tubing disconnection, such as when transferring a patient, as this does present an increased aerosolization risk.

If there is pre-hospital notification of a patient arriving in cardiac arrest, identified team members (below) should don PPE appropriate for AGPs and be ready in a negative pressure room/resuscitation bay (when possible) to receive the patient.

For arrests in the emergency department or if a patient arrives with no pre-hospital notification, the resuscitation team must don PPE and attend to the patient only after they are protected. Although this potential delay in patient care is counter to the historical approach to managing patients in extremis, it is supported by medical ethics.¹⁶⁻¹⁸

In an effort to minimize staff requirements and exposure risks during the cardiopulmonary resuscitation of adult patients, a mechanical CPR device should be used, if available. 19

To prevent contamination of items, the Code Cart should not be brought into the patient's room, and medications should not be retrieved from an in-room medication dispensing system. Not using the in-room medication dispensing system also helps to maintain PPE as many machines require a fingerprint. Equipment should be passed from a team member outside the room or in an anteroom to a team member wearing appropriate PPE within the room using a bin or a plastic bag.

For adult medical resuscitations, consider creation of a "COVID Medication Resuscitation Kit" that contains two vials of each (changes can be made depending on practice patterns): epinephrine, atropine, naloxone, amiodarone or lidocaine, calcium chloride/gluconate, and sodium bicarbonate that is taken into the room for initial management. For intubated patients, paralytics, analgesics, and sedation medications should be readily available, and consideration made to put them on a pump before transferring them into the room to facilitate ease of initiation. Consider extended tubing to enable the pump to be stored and adjusted outside the room.

Decrease the number of aerosol generating procedures

The early restoration of circulation may prevent the need for further resuscitative measures; therefore, a defibrillator should be attached as soon as it is available, and

shockable rhythms should be immediately addressed prior to starting chest compressions or advanced airway procedures.

When EMS arrives, compressions should be halted as the patient is moved to the hospital gurney. If the patient arrives via EMS and the patient is being bagged via a bag-valve-mask (BVM), bagging should be halted as the patient is moved from the ambulance bay to the room as this is an AGP. Once in a controlled environment, if there is a prehospital airway, placement should be confirmed and secured by those in modified droplet and airborne precautions PPE, a viral filter placed or confirmed, and a mechanical CPR device should be attached if available and not already present. An attempt to exchange the prehospital supraglottic airway to an endotracheal tube (ETT) when the prehospital device is functional is not recommended given the risk of aerosolization. The process of converting a supraglottic device to an ETT should only be attempted after return of spontaneous circulation (ROSC) is obtained.

If a patient arrests in the ED or a patient arrives with no pre-hospital notification, the airway should be placed in a manner that maximizes success with the first attempt. The use of an SGA is an appropriate option for patients in arrest.²⁰

Utilize a small resuscitation team to limit potential exposure

The composition of the resuscitation team should be designed to limit the number of people exposed to the patient and AGP. A sample team composition for adult cardiac arrest may include 1-2 physicians or advanced practice providers (determined in real

time based on patient situation), 1 respiratory therapist, 1 nurse to administer medications and defibrillate, 1 nurse to record (consider use of telehealth device to facilitate this role outside the room), and 1 individual to attach and monitor the mechanical CPR device (can be done by a nurse or EMS provider already in the room). Note that the team composition will be dictated in part by the available emergency department personnel.

A similar team should be assembled for the resuscitation of pediatric patients, with the exception of using a mechanical CPR device. Instead, 1-2 additional individuals may be needed to perform compressions (as decided by team leader).

Ancillary responders should remain outside the room and enter only if requested by the team leader. They should wear the appropriate level of PPE before entering the room. These ancillary personnel may include: additional providers, pharmacist, lab service technician/phlebotomist, radiology technician, resource RN, and Chaplain or Social Worker. If a pharmacist is not available to help obtain/dose/verify the medications, a nurse may be necessary outside the room, especially in a pediatric code.

Consider early termination of resuscitative efforts

Current advanced life support cardiac arrest termination of resuscitation guidelines typically require extended resuscitative efforts be performed.^{21,22} However, during a pandemic, alterations in standard resuscitative efforts may need to occur based upon patient surge volumes. Several studies support the decision to abrogate resuscitative

efforts during crisis standards of care. Ninety percent of patients who survive out-of-hospital cardiac arrest achieve return of spontaneous circulation (ROSC) within 15 minutes.²³ For patients in presenting in asystole, the likelihood of survival to discharge beyond 10 minutes resuscitative effort is essentially zero.^{24,25}

Conclusion

The resuscitation of patients during the COVID-19 pandemic requires a conscious effort to limit exposure using a small team, reducing aerosol generating procedures, and considering termination of resuscitative efforts based on survival statistics.

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