

FHCC GUIDE FOR CARDIAC ARREST CODES IN PUI AND COVID-19 PATIENTS**(April 15, 2020)**

The following guide was developed in agreement with a recent publication entitled “**Interim Guidance for Basic and Advanced Life Support in Adults, Children, and Neonates with Suspected or Confirmed COVID-19**” from the Emergency Cardiovascular Care Committee and Get With the Guidelines®-Resuscitation Adult and Pediatric Task Forces of the American Heart Association in Collaboration with the American Academy of Pediatrics, American Association for Respiratory Care, American College of Emergency Physicians, The Society of Critical Care Anesthesiologists, and American Society of Anesthesiologists; and supported by the American Association of Critical Care Nurses and National EMS Physicians.¹

The present guide adapts the section on adult in-hospital cardiac arrest to our current Federal Health Care Center (FHCC) protocols and resources available. This guide does not apply to patients who are known to be COVID-19 negative and who should receive standard basic and advanced life support. However, it may be reasonable to reduce personnel involved in all resuscitations during the pandemic for social distancing purposes.

1. Background

The SARS-CoV-2 pandemic has created the challenge to ensure that patients with or without COVID-19 who suffer cardiac arrest get the best possible chance of survival without compromising the safety of rescuers. Hypoxemic respiratory failure, myocardial injury, ventricular arrhythmias, and shock are common presentations in COVID-19 patients that predispose them to cardiac arrest.

Rescuers need to mitigate their risk of exposure to the virus from aerosol-generating procedures (AGPs) during CPR, which includes chest compressions, positive pressure ventilation, and establishment of an advanced airway. In addition, resuscitation efforts often involve numerous providers working close to each other in a high-stress situation that may result in lapses in infection control practices. All these factors are considered in this guide.

2. Reduction of Risk to Rescuers**a) Anticipation and Prevention of Cardiac Arrest**

Cardiac arrest in PUI and COVID-19 patients admitted to FHCC could occur in an acute medical unit or in the ICU. Every effort will be made to recognize PUI and COVID-19 patients admitted to an acute medical unit at risk of developing cardiac arrest and consider their transfer to the ICU where a cardiac arrest CODE can be run in a more controlled manner. Among the conditions predisposing to cardiac arrest, COVID-19 pneumonia is highest on the list followed by cardiovascular events (i.e., hemodynamic instability and cardiac arrhythmias).

Patients with COVID-19 pneumonia will be identified by typical features present in a chest x-ray and/or in a CT of the thorax and will have (a) oxygenation needs requiring variable levels of supplemental oxygen and (b) variable increases in work of breathing (WOB) that may require non-invasive or invasive ventilatory support.

Oxygenation and WOB will be closely monitored obtaining vital signs at a minimum interval of four hours for those with COVID-19 pneumonia, activating the updated FHCC RRS based on warning signs with specific criteria related to oxygenation and WOB increase (Figure 1).

Admission to ICU will be consider when more than 6 L/min of oxygen are needed to maintain a pulse oximetry $\geq 92\%$ or when the WOB is ≥ 4 based on a WOB scale developed by the Critical Care Service at FHCC (Figure 1). Once in ICU, high flow nasal cannula (or other

noninvasive means to support oxygenation and ventilation) will be initiated having a low threshold for intubation if the WOB increases or hemodynamic instability develops.

If the patient is not in a negative pressure room and the risk for cardiac arrest is high, consideration will be given to move the patient to a negative pressure room if available to minimize the risk of exposure to rescuers during a resuscitation attempt.

b) Appropriateness of Starting and Continuing Resuscitation Efforts

In the context of COVID-19, the risk to rescuers is increased. The mortality of critically ill COVID-19 patients is high and increases with age and comorbidities. Therefore, it is reasonable to consider age, comorbidities, and severity of illness in determining the appropriateness of resuscitation balancing the likelihood of success against the risk to rescuers and to patients when scarce resources are being diverted. Accordingly, the goals of care will be addressed early with the patient (or surrogate decision-maker) in anticipation of potential need for increased levels of care.

Under conditions in which the care of severely ill patients, who are unlikely to survive the critical illness, requires intense resources that strain the capability to effectively deliver care to patients with less severe illness and better prognosis, the scarce resource allocation (SRA) committed will be consulted, and the outcome of this process informed to the patient or surrogate decision-maker.

c) Effective Communication

The PUI or COVID-19 status of the patient in cardiac arrest will be communicate to any new provider before arrival to the scene and when transferring to another environment of care.

3. CODE Team

The resuscitation efforts will be conducted by four rescuers and a runner. The four rescuers will include (a) an Airway Manager, (b) a Respiratory Therapist, and (c) two ICU Nurses who will enter the scene and conduct the resuscitation effort. The runner will be an ICU Nurse and will assist the CODE team bringing devices and supplies to the scene as needed.

Before entering the scene, the CODE team members will don with our current PPE to guard against contact and AGPs. At the time of this writing, our PPE for AGPs requires the use of fit-tested N95 respirator, face shield, head cover, yellow gown, and gloves. A set of 4 PPEs will be readily available in the ICU code bag to be used by the CODE team in the event of a cardiac arrest inside or outside the ICU.

All CODE team members will have familiarized with and/or completed training on our "ICU Guide for Airway Management in COVID-19 Patients" and will have their specific roles pre-assigned at the beginning of the shift.

The CODE team leader will be the rescuer with the largest experience in conducting resuscitation CODES and will be defined at the beginning of the shift or when members of the team change during the shift.

4. Resuscitation CODE

The CODE will be activated by calling 9-1-1 as per current FHCC protocol. A choreographed approach will be preferred addressing simultaneously or in short sequence: (a) Oxygenation, Airway Management, and Ventilation; (b) Chest Compressions; (c) Rhythm Assessment and Interventions; and (d) Vascular Access and Drug Delivery. The decision of which intervention to prioritize will be driven by the mechanism of the cardiac arrest. For example, if the cardiac arrest occurs abruptly secondary to ventricular fibrillation, the immediate efforts will be focused on placing defibrillation pads and delivering unsynchronized electric shocks. On the other hand, if the

cardiac arrest occurs associated with severe hypoxemia and increased WOB, the immediate efforts will be focused on oxygenation and ventilation. Accordingly, each resuscitation effort will have a specific dynamic responsive to the cardiac arrest etiology with the interventions described below implemented and prioritized at the discretion of the CODE team leader.

4.1 Resuscitation Interventions

a) *Oxygenation, Airway management, and Ventilation*

For patients who are not intubated, interventions listed in the “ICU Guide for Airway Management in COVID-19 Patients” will be considered except for neuromuscular blockade and sedation during the initial resuscitation attempt.

Establishing an infraglottic airway with a cuffed endotracheal (ET) tube using a GlideScope, if possible and appropriate, will be a priority early during the resuscitation effort. To achieve this goal, the Airway Manager working in conjunction with the Respiratory Therapist might need to first deliver oxygen and secure airway patency followed by bag-valve-mask (BVM) ventilation. If the Airway Manager is not able to rapidly place an ET tube, a supraglottic King airway or a Laryngeal mask will be attempted.

A high efficiency particulate air (HEPA) filter will be placed in the path of exhaled gas between the mask or airway device and the bag-valve. Between the HEPA and bag-valve, a capnography adaptor will be placed and used to verify proper supraglottic or infraglottic airway placement and to monitor the efficacy of the resuscitation intervention.

If the patient is still in cardiac arrest, ventilations using a BVM will be synchronized to compressions delivering 30 compressions followed by 2 ventilations. Ventilations through an infraglottic or supraglottic airway will be delivered at 10 breath per minute providing uninterrupted chest compressions.

For patients who are intubated and receiving invasive mechanical ventilation, mechanical ventilation will be continued during chest compressions changing the setting of the ventilator to deliver pressure controlled breaths with 100% oxygen with a pressure titrated to deliver a tidal volume of ~ 6 ml/kg, and a set rate of 10 breath per minute disabling the trigger mode of the ventilator to prevent auto-triggering if at all possible.

b) *Chest Compressions*

The preferred mode of delivering chest compressions will be mechanical using the LUCAS device, operating in the ACTIVE (30:2) mode when delivering BVM ventilations and in the ACTIVE (continuous) mode when ventilating through an established supraglottic or infraglottic airway. It would be acceptable to deliver manual chest compressions if the LUCAS device cannot be placed properly or compressions cannot be initiated within less than 3 minutes from the onset of cardiac arrest. Manual chest compressions will be delivered by one of the CODE team members if the cardiac arrest occurs in the ICU and by a member of the treating team if the cardiac arrest occurs outside the ICU pending arrival of the CODE team.

c) *Rhythm Assessment and Interventions*

Will be performed according to current AHA-ACLS guidelines.

d) *Vascular Access and Drug Delivery*

Will be performed according to current AHA-ACLS guidelines.

4.2 Resuscitation Roles

a) The Airway Manager will be either the in-house ICU attending or the OORAM provider on-call and will be responsible for all aspects related to oxygenation and to securing a

patent and stable airway along with the initiation of invasive mechanical ventilation if required.

- b) The Respiratory Therapist will assist the Airway Manager and be responsible for the operation of devices selected for oxygenation and ventilation.
- c) The two ICU nurses will be responsible for deploying and operating the LUCAS device, the crash cart, and the defibrillator followed by securing IV access and delivering drugs according to current AHA-ACLS guidelines.
- d) The ICU nurse runner will bring to the room or scene of cardiac arrest the LUCAS device and crash cart while the CODE team gears up with the proper PPE, and subsequently with delivering additional devices and supplies as requested by the CODE team.

5. Special Circumstances

Patients in Prone Position

In patients without an advanced airway, turning the patient to the supine position for the resuscitation effort will be attempted.

In patients with an advanced airway, turning the patient to the supine position for the resuscitation effort will be attempted if feasible without risk of equipment disconnections and aerosolization. If not feasible, defibrillator pads will be placed in the anterior-posterior position and provide chest compressions with the hands in the standard position over the T7 to T10 vertebral bodies realizing that the effectiveness in the prone position is not well established.

6. References

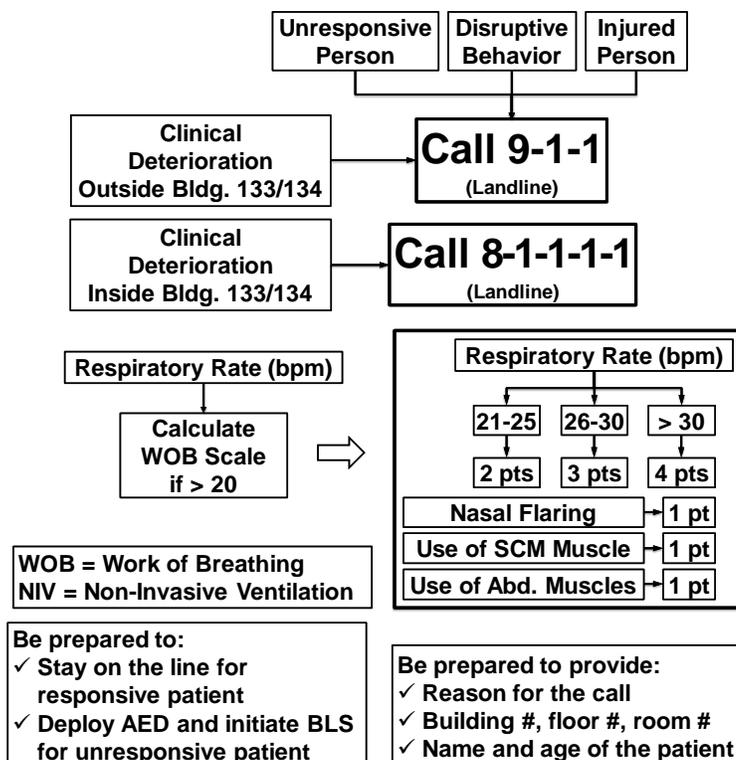
1. Edelson DP, Sasson C, Chan PS, Atkins DL, Aziz K, Becker LB, Berg RA, Bradley SM, Brooks SC, Cheng A, Escobedo M, Flores GE, Girotra S, Hsu A, Kamath-Rayne BD, Lee HC, Lehotzky RE, Mancini ME, Merchant RM, Nadkarni VM, Panchal AR, Peberdy MAR, Raymond TT, Walsh B, Wang DS, Zelop CM, Topjian A. Interim Guidance for Basic and Advanced Life Support in Adults, Children, and Neonates With Suspected or Confirmed COVID-19: From the Emergency Cardiovascular Care Committee and Get With the Guidelines((R))-Resuscitation Adult and Pediatric Task Forces of the American Heart Association in Collaboration with the American Academy of Pediatrics, American Association for Respiratory Care, American College of Emergency Physicians, The Society of Critical Care Anesthesiologists, and American Society of Anesthesiologists: Supporting Organizations: American Association of Critical Care Nurses and National EMS Physicians. *Circulation* 2020;10.

Prepared with guidance from professional organizations and input by pertinent FHCC services, led by:

Raúl J. Gazmuri MD, PhD, FCCM
Section Chief, Critical Care and ICU Director
Captain James A. Lovell Federal Health Care Center
Director, Resuscitation Institute
Professor of Medicine and Professor of Physiology & Biophysics
Rosalind Franklin University of Medicine and Science
Emails: raul.gazmuri@va.gov; raul.gazmuri@rosalindfranklin.edu

FHCC RAPID RESPONSE SYSTEM – Caller Algorithm –

WARNING SIGNS OF ADULT CLINICAL DETERIORATION	
Respiratory Rate (bpm)	< 8 or > 30
Reflex WOB Scale (pts)	> 3
Need for New NIV (BiPAP)	Yes
Oxygen Saturation (%)	< 90 or $FiO_2 > 0.60$
Heart Rate (bpm)	< 40 or > 140
Systolic BP (mmHg)	< 80 or > 200
Chest Pain	Yes
Severe Refractory Pain	Yes
Syncope	Yes
Fall with Suspected Head Injury	Yes
Mental Status Change	Yes
Repetitive Seizures	Yes
Condition of Concern	Yes



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Figure 1: Updated RRS with warning signs for adult clinical deterioration with specific thresholds and tools for early recognition of worsening respiratory function based on oxygenation and work of breathing criteria.