Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Editorial

Cardiopulmonary Resuscitation During the Coronavirus Crisis: Important Updates for the Cardiothoracic and Vascular Anesthesia Community

THE GUIDELINES about cardiopulmonary life support were updated in 2015 and more recently in 2019.[1-3] These recent revisions have addressed aspects such as airway strategies, vasopressor therapy, and the role of extracorporeal membrane oxygenation.[2-4] The coronavirus pandemic has since challenged critical care worldwide, prompting significant adjustments in the delivery of acute cardiopulmonary support at the point of care.[5,6] These considerations have affected the clinical approaches to both diagnosis and management of the acute cardiopulmonary presentations of coronavirus disease-2019 (COVID-19).[7,8]

In the event of cardiac arrest, the conduct of basic and advanced life support in adults, children, and neonates requires thoughtful adaptations to address the challenges associated with COVID-19.[5] The perspectives from care providers on the front lines have raised the following issues about life support for cardiac arrest during the COVID-19 pandemic: infection control, risk stratification to guide decision-making, protocols to guide resuscitation in patients who wish to set limits on their care, and additional deliberations at the national level to inform point-of-care delivery in this context.[5] These perspectives and unique considerations in COVID-19 have resulted in a recent update to the guidelines for basic and advanced life support.[5,6]

These guideline updates have addressed the following major considerations in the conduct of life support in these challenging settings: provider exposure; oxygenation and ventilation strategies; the appropriateness of resuscitation; and, lastly, considerations specific to certain care situations.[6] The purpose of this freestanding editorial is to outline these timely recommendations for life support in cardiac arrest. These perspectives can serve as a clinical update for the perioperative cardiothoracic and vascular community as we navigate the coronavirus pandemic at our respective institutions.

Possible Mechanisms for Cardiac Arrest in COVID-19

The spectrum of infection with COVID-19 includes risks of hospital admission and critical illness that have been estimated to be in the 10% to 20% and 5% to 10% ranges, respectively.[8,9] The possible etiologies for cardiac arrest in COVID-19 include hypoxia from acute respiratory distress syndrome, cardiogenic shock from myopericarditis, and vasoplegic shock from associated sepsis.[8,9] Furthermore, severe infection in COVID-19 can precipitate acute coronary syndromes and significant arrhythmias in patients with predisposing risk factors.[8,9] The risk of arrhythmias also may be increased by proposed therapies for COVID-19 such as hydroxychloroquine and azithromycin through their prolongation of the QT interval.[9,10]

Given that there are multiple mechanisms for cardiac arrest in COVID-19, it is likely that there may be more than 1 mechanism in certain patients. Echocardiography at the bedside may be helpful to diagnose and manage the etiology of circulatory shock and should be conducted in accordance with the latest recommendations for COVID-19.[11-13] The clinical utility of bedside ultrasound should be remembered for serial evaluation of the presence and progression of pulmonary infection in COVID-19.[13]

Control of Provider Exposure During Life Support for Cardiac Arrest

It is important that providers limit their risk for contracting COVID-19 to maintain their physical and psychological safety and to minimize attrition of the workforce.[14,15] The rescuers should use full recommended barrier precautions before entering the resuscitation area, including correct application of personal protective equipment.[14-16] The rescuer team should follow the institutional protocol for infection control, given that the specific recommendations will depend on the current intensity of the pandemic and resource availability.[17] The expert consensus also has advised that personnel be limited to those who are essential for provision of clinical care and that the team use clear and structured communication, including the details of COVID-19 status and plans to address infection control.[5,6] Furthermore, where available and applicable, the rescuer team also should consider the deployment of mechanical devices for chest compressions in order to limit required providers for resuscitation in adolescents and adults.[6]

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Control of Viral Aerosolization During Airway Management

The risk of viral aerosolization during airway management and consequent infection is considered high in the presence of COVID-19 infection.[17] The risks of viral aerosolization are greatly minimized in the setting of endotracheal intubation with a cuffed endotracheal tube and a closed circuit with in-line suction and a high-efficiency particulate air (HEPA) filter in the path of the exhaled gas flow.[17,18] The value of viral clearance with a HEPA filter has justified the recommendations that positive- pressure ventilation in life support be carried out with this device, whether by bag-and-mask, supraglottic airway device, or an endotracheal tube.[6] The preferred airway management in this setting is prompt endotracheal intubation by an experienced operator and video laryngoscopy if available while chest compressions are paused.[6] The viral isolation in a closed circuit also is further enhanced with minimized disconnects. The detailed protocols for airway management in this setting have prompted the development and deployment of specialized airway teams at some institutions.[17,18]

The Appropriateness of Resuscitation for Cardiac Arrest in COVID-19

The intensity of the team effort in cardiopulmonary resuscitation can draw clinical attention from other patients in the same hospital area.[19] Furthermore, the mortality for critical care illness in COVID-19 is high, especially in the presence of major risk factors such as advanced age, diabetes, concomitant cardiovascular disease, and immunosuppression.[7-9] Resources can be scarce at times during the pandemic, especially at the peak of the crisis in certain regions.[19,20] It is therefore important to consider the probability of success of cardiopulmonary resuscitation in a given patient versus the risks of infection, diverted clinical attention, and resource use during the pandemic, especially in stressed healthcare environments during the crisis phase of the COVID-19 pandemic.[5-9,19,20]

Given these considerations, the expert consensus has recommended that goals of care be addressed with patients and their families, especially if escalations in care are deemed likely due to clinical trajectory and associated risk factors.[5,6] The palliative care service can be a valuable resource to guide and inform these discussions.[21,22] The institution should consider protocols to guide cardiopulmonary resuscitation for the workforce on the front lines of care in the pandemic.[5,6] These protocols should take into account input from all stakeholders and known risk factors for mortality. They also can be indexed to local conditions in real time through the surge phases of the pandemic.[22-25] These institutional recommendations should include indications and contraindications for extracorporeal membrane oxygenation in patients with severe COVID-19 in a fashion appropriate for expertise and resources at a given medical institution.[7-9,26-28]

Situation-Specific Considerations for Life Support in COVID-19

In patients who are critically ill with COVID-19, the expert consensus has recommended that the goals of care be addressed with the decision-makers, especially if there is a significant change in clinical status.[5,6] These patients should be monitored and managed closely so that endotracheal intubation is conducted in an elective fashion because airway management in an emergency setting carries higher risk for both patient and providers.[16-18] If possible, these patients should be managed in a negative-pressure room behind closed doors to further minimize the risks of viral transmission.[16-18]

In the setting of a patient with COVID-19 who has an endotracheal tube at the time of cardiac arrest, the closed circuit should be maintained with a HEPA filter.[6] The ventilator settings should then be titrated according to clinical response and the trend in arterial blood gases with attention to the inspired oxygen concentration, the tidal volume, the respiratory rate, and the levels of positive end-expiratory pressure.[6] The patient should be sedated as needed to prevent unplanned tracheal extubation. If the patient is prone at the time of cardiac arrest without a secure airway, the preferred management is to proceed to the supine position for prompt endotracheal intubation and continued cardiopulmonary resusucitation.[5,6] If a prone patient with an endotracheal tube experiences cardiac arrest, the supine position is preferred for cardiopulmonary resuscitation but only if the turn can be conducted safely.[5,6]

The associated cardiopulmonary changes of pregnancy may increase the risks of clinical deterioration in severe COVID-19.[5-10,29] Preparations for perimortem delivery should begin very early in resuscitation, given the additional considerations, including infection control.[5,6] In the setting of neonatal resuscitation, the providers should exercise all barrier protections in the event of suspected or known COVID-19 for the child or mother. Because airway suctioning after delivery is high risk for viral aerosolization, it is not indicated for uncomplicated deliveries.[5,6] The intravenous rather than endotracheal administration of epinephrine has been advocated for infection control. The transport and care of neonates who are critically ill with COVID-19 should be conducted in closed incubators to minimize viral transmission.[6]

Conclusions

The current pandemic from COVID-19 has prompted multiple new priorities in cardiovascular life support. These priorities concern provider exposure, viral aerosolization, appropriateness of resuscitation, and specific scenarios to balance both quality of care and infection control.

Conflict of Interest

None.

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