

Special Article

Indian Resuscitation Council (IRC) suggested guidelines for Comprehensive Cardiopulmonary Life Support (CCLS) for suspected or confirmed coronavirus disease (COVID-19) patient

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ABSTRACT

Management of the recent outbreak of the novel coronavirus disease (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) remains challenging. The challenges are not only limited to its preventive strategies, but also extend to curative treatment, and are amplified during the management of critically ill patients with COVID-19. Older persons with comorbidities like diabetes mellitus, cardiac diseases, hepatic impairment, renal disorders and respiratory pathologies or immune impairing conditions are more vulnerable and have a higher mortality from COVID-19. Earlier, the Indian Resuscitation Council (IRC) had proposed the Comprehensive Cardiopulmonary Life Support (CCLS) for management of cardiac arrest victims in the hospital setting. However, in patients with COVID-19, the guidelines need to be modified, due to various concerns like differing etiology of cardiac arrest, virulence of the virus, risk of its transmission to rescuers, and the need to avoid or minimize aerosolization from the patient due to various interventions. There is limited evidence in these patients, as the SARS-CoV-2 is a novel infection and not much literature is available with high-level evidence related to CPR in patients of COVID-19. These suggested guidelines are a continuum of CCLS guidelines by IRC with an emphasis on the various challenges and concerns being faced during the resuscitative management of COVID-19 patients with cardiopulmonary arrest.

Key words: Airway management, breathing, cardiopulmonary resuscitation, chest compression, COVID-19, SARS-CoV-2

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DISCLAIMER

The guidelines by the Indian Resuscitation Council (IRC) under the aegis of Indian Society of Anesthesiologists (ISA) may require modifications in future, in line with the emerging scientific data related to resuscitation of patients with suspected or confirmed COVID-19 infection. The steps in the algorithm herein are only guidelines, and the healthcare workers are

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empowered to make individualized and context dependent decisions regarding delivery of timely CPR in COVID-19 patients.

PREAMBLE

The outbreak of the novel coronavirus disease (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) erupted in the city of Wuhan of Hubei province in China in December 2019.^[1,2] The ongoing outbreak has progressed over a very short period of time and has involved a large populace worldwide. Currently, no disease-specific curative treatment is available and supportive measures remain the mainstay of management of COVID-19 patients.^[2] The patient's immune system is a major determinant of the disease progression and its resolution. Recent evidence suggests that older persons with comorbidities like diabetes mellitus, cardiac, hepatic, renal and respiratory disorders or immune impairing conditions are more vulnerable and have a higher mortality.^[2,3] The number of COVID-19 cases are increasingly being reported across India as well.^[4] While the majority of patients are either asymptomatic or have mild to moderate disease severity, some patients require ventilatory support, and cardiovascular collapse has also been observed.^[4,5] These patients would require timely cardiopulmonary resuscitation (CPR) for a favorable outcome.

Earlier, the Indian Resuscitation Council (IRC) had proposed the Comprehensive Cardiopulmonary Life Support (CCLS) for management of cardiac arrest victims in the hospital setting.^[6] The recent COVID-19 pandemic has swept the whole world and has put healthcare workers (HCW) at tremendous risks of contracting the infection in the line of their duty, especially in the treatment and resuscitation of these patients. The hospitalized COVID-19 positive patient could deteriorate and may require cardiopulmonary resuscitation. The successful outcome of cardiac arrest is based not only on quick institution of basic resuscitation procedures, but also on the correction of underlying causes like hypoxemia, fluid and electrolyte imbalance, and administration of drugs as per recommendations made in earlier publications on the subject.^[6-8] However, in view of various concerns like differing etiology of cardiac arrest, virulence of the virus and high risk of its transmission to rescuers and the need to avoid or minimise aerosolization from the patient due to various procedural interventions, the CCLS guidelines needed to be modified.^[5] The

detailed methodology of resuscitation has already been described in earlier publications; the algorithm and the description here is a continuum of those guidelines in the context of COVID-19.^[6-8] There is limited evidence related to cardiopulmonary resuscitation (CPR) in these patients, as the SARS-CoV-2 is a novel infection and not much literature is available with high-level evidence related to CPR in patients of COVID-19.

METHODS

IRC, under the aegis of Indian Society of Anesthesiologists (ISA) planned to review the literature related to CPR in COVID-19 patients and to propose the guidelines for CPR in cardiac arrest victim with COVID-19 positive status or high suspicion of COVID-19. Resuscitation among COVID-19 related search terms were identified. A literature search for studies published in English from 1st January 2016 to 28th April 2020 using PubMed, EMBASE, MEDLINE, Ovid, Google Scholar Databases and other search engines using the following search items and keywords was carried out: automated external defibrillator; breathing; cardiopulmonary resuscitation; chest compression; COVID-19; defibrillation; early defibrillation; high quality CPR; pulse check for cardiac arrest; SARS-CoV-2 in various combinations. Additional manuscripts were searched from bibliographic cross-referencing of retrieved articles. In addition, guidelines of various resuscitation councils on CPR in COVID-19 patients were reviewed.^[8,9] The working group discussed various aspects through e-communication and online meetings. The evolving evidence was reviewed by the experts and the final document was written.

DISCUSSION

Algorithm for CCLS for suspected or confirmed COVID-19 patient

Preparation, Identification, and Personal Protective Equipment (PPE)

Cardiac arrest in the COVID-19 patient is most likely to occur in the critical care or the high dependency unit of the hospital where all the facilities for resuscitation are usually available. It may also occur in the isolation ward, where all the facilities may not be immediately available. Once the suspected or confirmed patient is admitted to the healthcare facility, it is important to identify the patients (based on history, examination and required investigations) who are at risk of acute deterioration. Patients with low oxygen saturation,

hypotension, altered sensorium, etc. appear to be at increased risk of cardiopulmonary events.^[4,5,10,11] This would help the physician to be better prepared to deal with cardiac arrest in an effective manner. Early recognition and correction of hypoxemia, hypotension, electrolyte, and acid-base abnormalities in these vulnerable patients will reduce the incidence of cardiac arrest. It has been reported that the younger patients without any pre-existing comorbid condition have better chances of survival and therefore should be prioritized for active resuscitation.^[3,12] All the HCWs must wear personal protective equipments (PPE) (including N95 mask, goggles or face shield, water resistant gown, double gloves, apron, long shoe cover and hood), while they are in the patient care area and proceed in a step wise manner as depicted in the algorithm [Figure 1]. During resuscitation, certain precautions should be taken to prevent exposure to the virus. These include minimising the need, duration of aerosol generating procedures, and preventing spill over into the environment. It is preferable to use aerosol containment device like airway management boxes, cover all plastic sheets for prevention of aerosol release into the environment.

Checking patient's response and activation of COVID code blue

Checking of patient's response needs to be done with appropriate PPE. Elicit response from the patient by tapping on shoulder and speaking loudly. Try maintaining maximum distance from patient's face. If the patient responds by purposeful movement and/or opens eyes, he would need to be continuously monitored (including pulse oximetry) and investigated further. If the patient is not responding by purposeful movement or opening eyes, it can be assumed that the patient is in a state of cardiac arrest. Now, activate the designated COVID code blue team and ask for the crash cart with defibrillator and airway management equipment. To prevent the exposure to rescuers, the team may have maximum of three persons. Till the extra help arrives, the first rescuer should continue with the process of resuscitation. The rescuer should continue with high quality chest compressions and defibrillation, till the other rescuer joins.

Pulse/rhythm and breath check

Check carotid pulse or check cardiac monitor for the rhythm and look for breathing, if the patient is not on ventilator. Do not listen and feel for breathing. This should be performed within 5–10 s. If oxygen is being administered via nasal cannula to the patient, then

consider putting a triple layer surgical mask on the patient's face. This shall help in containing the aerosol spill into the environment. If pulse or perfusing rhythm is present along with normal breathing, then assess further for patient being non-responsive and manage accordingly. It is advisable to check for oxygen saturation using pulse oximeter during this assessment as respiratory complications are common in COVID-19 patients. Appropriate ventilatory support, preferably with definitive airway is necessary in patients who present with abnormal breathing, but, with a definite pulse. Use viral filters over the face mask (if bag and mask ventilation using two hand technique) or over endotracheal tube. Early use of closed circuit and ventilator is desirable to avoid aerosolisation. In case of absence of breath and pulse or perfusing rhythm, then, chest compression along with ventilatory support is to be started. Early definitive airway and the use of a closed circuit with filter and ventilator is desirable. Till the definitive airway has been secured, face needs to be covered by transparent plastic sheet before initiating chest compressions. Use of mechanical chest compression devices should be preferred, if available. The ventilatory parameters should be adjusted either by increasing the airway pressure alarm limit in volume control ventilation or by using pressure control ventilation support along with increasing the oxygen to 100% when a patient on ventilatory support, develops a cardiac arrest.^[9] In such cases, the chest compression rate of 120 compressions/min to a depth of 5–6 cm should continue.^[6] High quality chest compressions must be given during the CPR.^[6] Patients in prone position should be made supine before initiating CPR.

Defibrillation

Early defibrillation is desirable. If defibrillator is immediately available, and the rhythm is shockable, defibrillation should be done as per the standard CCLS protocol.^[6] The early return of spontaneous circulation (ROSC) may prevent the need for further resuscitation measures. If the defibrillator is not immediately available, chest compression (with the patient's face covered with either a plastic sheet or a triple layered face mask), should be done till the defibrillator arrives. Pre-emptive application of adhesive pads for defibrillation is desirable in high-risk patients in a critical care set up. One of the management protocols of COVID-19 patients includes use of hydroxychloroquine and azithromycin.^[13] This combination may cause torsades de pointes and requires defibrillation and use of intravenous magnesium (administered 1–2 g slow IV).^[13,14]

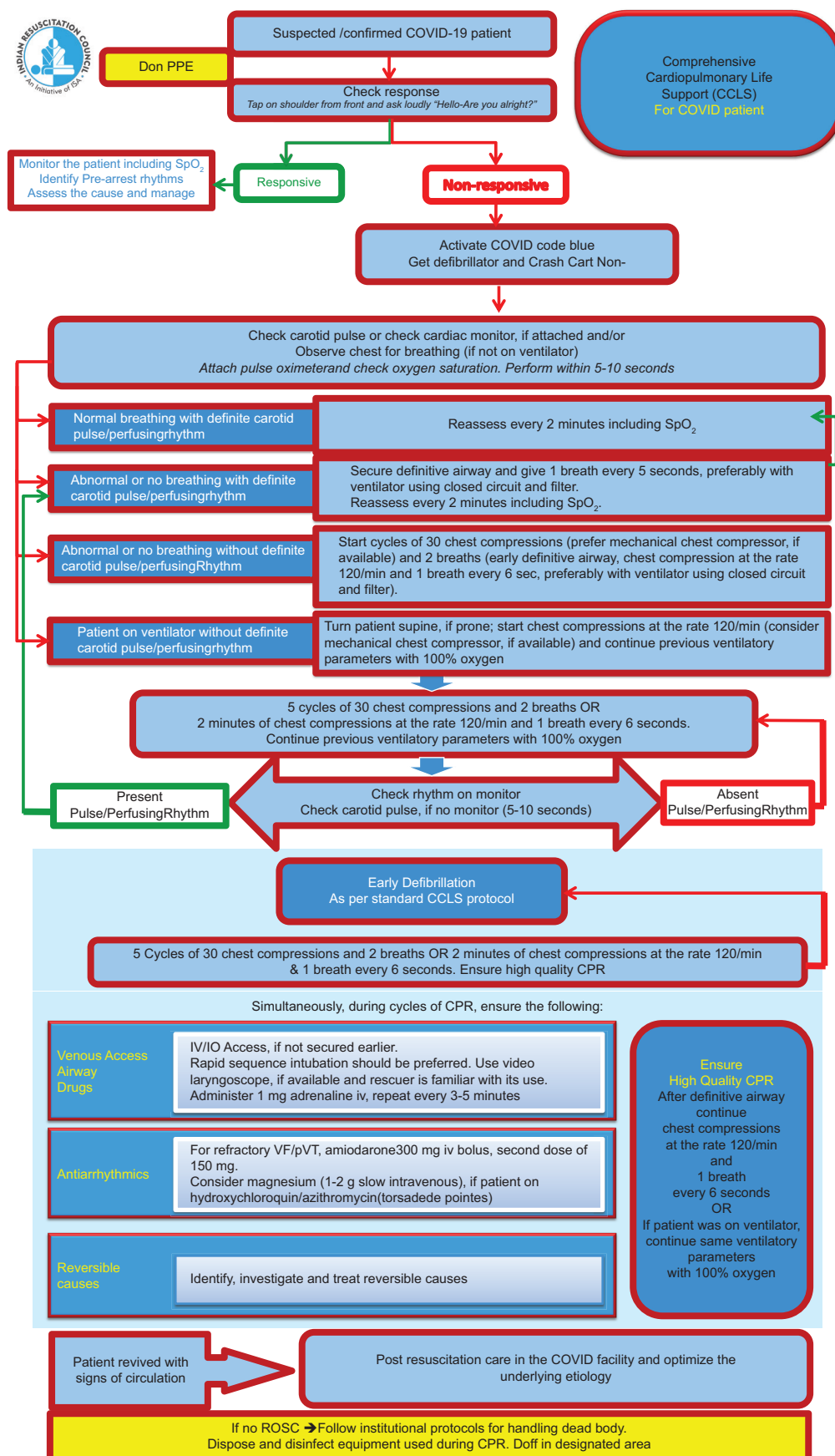


Figure 1: COVID-19 Comprehensive Cardiopulmonary Life Support (CCLS) algorithm

Tracheal intubation

Tracheal intubation with all aerosol generating procedure (AGP) precautions should be done when the airway management equipment is available. Use of an aerosol spillover or containment device can be helpful. Patient should be oxygenated with a well-fitting face mask for 3–5 min to prevent the need for positive pressure ventilation, in case time permits. A neuromuscular blocking agent may be given to facilitate tracheal intubation, if respiratory efforts are present. The choice of drugs depends on institutional policy. Rapid sequence intubation should be preferred to obviate the need for positive pressure ventilation.^[15,16] At times, crash tracheal intubation may be required in an unresponsive victim with cardiac arrest. The best skilled airway manager should intubate trachea to maximize the possibility of first pass success. Bag and mask ventilation using face mask needs to be avoided to prevent aerosol formation and risk of contamination to the surrounding and HCW. Use two hands technique for holding face mask, an assistant can squeeze the bag using low flows (less than five L/min) and low tidal volume, if positive pressure ventilation is needed. It is preferable to use video laryngoscope (if equipment and expertise is available) rather than direct laryngoscopy for tracheal intubation as the intubator can position himself at some distance away from the patient's face at the time of intubation which is an aerosol generating activity. Inflate the tracheal tube cuff before instituting positive pressure ventilation. The tracheal tube should be clamped before insertion, to minimise aerosol escape from the lungs. The clamp is released only after cuff inflation, attachment of the breathing circuit and prior to positive pressure ventilation. The rescuers need to follow the standard algorithm for difficult intubation.^[17,18] The correct placement of tracheal tube needs to be ascertained by continuous waveform capnograph. Mechanical ventilation should be started with heat and moisture exchanger filters (HMEF) at the inspiratory and expiratory limb, besides one between the tracheal tube and the patient.

Advanced resuscitation management

If cardiac activity returns after defibrillation and mechanical ventilation, the patient should be managed as per the post resuscitation protocol. If there is no return of cardiac activity, CPR should be continued for 2 min. It should be ensured that the IV line is running for administration of the drugs as per the standard CCLS protocol.^[5] Defibrillation may be done after every 2 min, if the rhythm is shockable. Attention should be paid to the identification and management of reversible

causes of arrest.^[5] Resuscitation may be discontinued if there is failure to achieve end tidal carbon dioxide (EtCO₂) more than 10 mmHg and absence of any organized rhythm after 20 min of resuscitation. Use of effective communication among team members is important. Since communication may be affected by use of PPE, a strategy needs to be planned. The team dynamics and role of rescuers may be ascertained as appropriate and conduct of drills will be useful for COVID code blue members. Debriefing session among the rescuers after the resuscitation attempt is being emphasized by IRC. This should include any lapse or scope to improve the quality of CPR and the protection of the HCWs.

Disposal of clinical waste

After the resuscitation, dispose all equipment used during CPR as per the institutional infection control committee protocol. Used equipments like laryngoscopes, masks, etc. should be placed in a tray rather than bed sheet to minimise surface contamination. The work surfaces and reusable airway management equipment should be disinfected as per the institutional protocols. After the CPR activity, the HCW should doff PPE very carefully with the help of another HCW in sequential steps, to avoid self-contamination. The clinical waste should be discarded in the appropriate and designated bins.

SUMMARY

CPR is a high-risk activity in a suspected or confirmed COVID-19 patient. The rescuer must wear appropriate PPE before undertaking any patient care activity, including chest compression. The risk to the anesthesiologist is maximum at the time of aerosol generating procedures like airway management, besides oral suction. If available, mechanical chest compression device should be used in place of manual chest compression as it will keep the rescuer away from the patient and thereby decreasing the probability of transmission of infection. Use of aerosol containment device can help in reducing the aerosol spill into the environment. All precautions must be rigorously followed to ensure safety of the HCWs in a highly infectious environment of a COVID-19 patient.

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Conflicts of interest

There are no conflicts of interest.

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