

# A survey of cardiopulmonary resuscitation in COVID-19 patients

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## Abstract

**Background and Aims:** The novel coronavirus 2 (SARS-CoV-2) pandemic has placed severe resource constraints on hospitals. High mortality rates of the COVID-19 have overwhelmed the resuscitation services. The constant fear of virus infection during cardiopulmonary resuscitation (CPR) has placed severe restrictions on the resuscitation services. Reports of poor outcomes after CPR further dampened the spirits of CPR providers. Hence we surveyed CPR practices for COVID-19 patients across hospitals in India by health care providers.

**Material and Methods:** An online survey using Google Forms was initiated to collect data on performance of CPR in diagnosed cases of COVID-19 after in-hospital cardiac arrest. The survey's web-link was publicized using social media, and participation sought of all personnel involved in CPR delivery in COVID-19 patients. The responses received were analyzed. The main outcome measured were determination of the percentage of COVID-19 patients discharged home who were administered CPR.

**Results:** There were 248 responses from different parts of India. At the time of cardiac arrest, 194 victims had diffuse lung infiltrates, 22 had mild lung disease, while 32 had no documented lung lesion. Twenty-five victims had evidence of pulmonary embolism, 39 had cardiac involvement, and 3 had brain involvement. Return of spontaneous circulation (ROSC) was achieved in 59.27% of cases but ROSC sustained in only 22.59%. 7.25% of patients, who received CPR, could be discharged home.

**Conclusion:** The survey has shown reasonable survival rates after CPR administration in COVID-19 patients suffering from IHCA. We should not ignore the need to maximize live outcomes after CPR, even in COVID-19 patients.

**Keywords:** Cardiopulmonary resuscitation, coronavirus-19 disease, personal protective equipment, return of spontaneous circulation

## Introduction

The novel coronavirus 2 (SARS-CoV-2) pandemic has placed health care services under tremendous strain. India has recorded more than 144140 deaths from COVID till date (16 Dec 2020) with a case fatality rate of nearly 2%.<sup>[1]</sup> Hospitals face severe resource constraints in human resources, infrastructure, revenue, acute patient load, personal protective

equipment availability, and inadequate drug supplies. Changing government directives and work restrictions make things worse. High mortality rates have overwhelmed the resuscitation services. The constant fear of virus infection and adherence to the novel crisis safety standards compound the problems faced by health care workers (HCW).

Cardiopulmonary resuscitation (CPR) is a potential aerosol-generating procedure. Aerosol/droplets generation,

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oral suction, and fomite exposure during vigorous chest compression and airway management in patients with severe coronavirus disease 2019 (COVID-19) make CPR administration a high-risk procedure.<sup>[2-4]</sup> During the conduct of CPR, thus, the safety of the HCW must receive inordinate priority. Poor outcomes have been reported after cardiac arrest in COVID-19 patients.<sup>[5]</sup> Some clinicians are reluctant to initiate CPR in patients likely to succumb to the disease. During the initial phase of the pandemic, there were reports of even withdrawal of intensive care support, leave aside CPR, in patients assumed to be non-salvageable. A recent publication reported no survival to discharge in COVID-19 patients after in-hospital cardiac arrest (IHCA), despite CPR.<sup>[6]</sup> The Indian Resuscitation Council (IRC) received multiple anecdotal reports of survival after CPR for IHCA. We conducted a survey to determine the outcomes after CPR in COVID-19 patients after IHCA and assess the use of personal protective measures.

## Material and Methods

An online survey using Google Forms was initiated to collect data on performance of CPR in diagnosed cases of COVID-19 after IHCA after approval of the Institutional Ethics Committee of Max Smart Super Specialty Hospital, Saket, Delhi ((Ethical Committee No RS/MSSSH/GMHRCMS/MHEC/ANES/20-21 dated 18 Dec 2020). The survey's web-link was publicized using different WhatsApp groups of the Indian Resuscitation Council. The survey link was active from 18 Dec 2020 to 31 Dec 2020. Participation of all HCW involved in CPR delivery in COVID-19 patients was sought. The respondents' details were kept confidential and were only accessible to the Principal Investigator (MCK). The survey questionnaire was simple to encourage a more extensive response (Appendix 1). All fields were compulsory, except one which was left open for respondents to highlight issues, if any, they faced. The responses received were tabulated and analyzed.

## Results

There were 248 responses from different parts of India. Nearly all responses were from tertiary care centers, with a few from single-specialty centers. Sixty-five victims were women and 183 men. A positive RT-PCR/Antigen test established the diagnosis of COVID-19 in 236 cases. The diagnosis was based on high-resolution computerized tomography scan (HRCT) findings or clinical/laboratory presentation in the other 12 cases.

At the time of IHCA, 194 victims had diffuse lung infiltrates, 22 had mild lung disease, while 32 had no documented

lung lesion. Twenty-five victims had evidence of pulmonary embolism, 39 had cardiac involvement, and 3 had brain involvement. One victim had an IHCA after going into diabetic ketoacidosis and having a myocardial infarction. One victim had IHCA after attempted hanging and another due to massive blood loss after a road traffic accident. Table 1 shows the relevant demographic data.

In 59.27% of cases, the return of spontaneous circulation (ROSC) was achieved. However, ROSC was sustained in only 22.59% of cases. Nearly a third of the patients revived after IHCA (7.25% of all patients) could be discharged to home. Half the survivors had diffuse lung disease, while the others had mild lung disease. Table 2 shows the outcome data. Four patients developed acute kidney injury, four needed extracorporeal membrane oxygenation (ECMO) support, while nine developed sepsis after resuscitation. None of the patients placed on ECMO survived.

Two hundred thirty-two responders were wearing level-3 personal protective equipment (PPE) during resuscitation. Sixteen responders wore only an N-95 face mask as they felt that wearing a PPE would have delayed the CPR. A few responders performed CPR after placing a transparent plastic sheet over the victim for self-protection. The majority of responders used transparent face-shields.

Sixty-two victims were administered just Compression-only life support (COLS). Only 10 of them had ROSC, and of them only four survived to discharge. Almost all providers, who administered only COLS, were in level-3 PPE.

**Table 1: Demographic Data**

	Demographics	n
Category of Health care worker Resuscitating	Anesthesiologist	146
	Emergency Physician	29
	Intensivist	39
	Resident	34
Age of patient	<30 years	6
	30-50 years	89
	50-60 years	84
	60-80- years	59
	>80 years	10
Co-Morbid conditions	Diabetes Mellitus	157
	Hypertension	168
	Chronic Kidney Disease	64
	Chronic Respiratory Disease	35
	Coronary Artery Disease	1
	Hypothyroidism	9
	Neurological Disease	3
	Chronic Liver Disease	1
	Cancer survivor	1

**Table 2: Outcomes after CPR for In-Hospital Cardiac Arrest**

		<i>n</i>
Immediate Outcome	No Return of Spontaneous Circulation (ROSC)	101 (40.7%)
	Successful ROSC	91 (36.7%)
	ROSC but didn't sustain	56 (22.59%)
Final Outcome	Patient could not be weaned off mechanical ventilation and succumbed to a secondary cause	76 (30.65%)
	Patient succumbed to disease later	154 (62.1%)
	Discharged to home	18 (7.25%)

## Discussion

An initial study from China reported a 13% ROSC after CPR in COVID-19 patients, but only 2.9% survived 30 days.<sup>[7]</sup> Thapa *et al.* reported a success rate of 53.7% for ROSC after IHCA, but all the victims succumbed later.<sup>[6]</sup> The poor outcomes reported by these studies dampened spirits and raised concerns about CPR's futility, especially considering the compromised HCW safety environment. As survival benefit to the patient is minimal, some authors felt that risks to HCWs are not justified.<sup>[8]</sup>

A section of the medical fraternity recommended eluding CPR in the current depleted state of hospital staffing.<sup>[4]</sup> This triggered the debate on the Do-Not-Resuscitate (DNR) option for all cardiac arrests in patients with COVID-19. To avoid non-beneficial intensive care and make beds available for salvageable patients in these times of capacity stress, DNR has been advocated in COVID-19 patients.<sup>[9]</sup> In our survey, successful ROSC after IHCA was reported in 59.27% of cases. 7.25% of cases administered CPR cases survived and were discharged to home. This survey thus negated the belief of tragic outcomes associated with CPR in COVID-19 patients. The DNR option, in patients with COVID-19, has not been recommended by others too.<sup>[2,10,11]</sup>

In 76% of the responses received, CPR was administered to patients with diffuse lung infiltration. Totally 10 of the 18 survivors had severe lung disease, while the balance 8 had either mild lung disease or no documented lung disease. Three survivors had documented evidence of cardiac disease. CPR after a cardiac event with a shockable rhythm has a better potential for success.<sup>[8]</sup> In most COVID-19 patients, refractory progressive hypoxemia and shock, despite maximal respiratory and circulatory support, leads to cardiac arrest. Such patients may not benefit from CPR, although ROSC may be achieved.<sup>[8]</sup> Progression of the COVID-19 disease or non-regression of pulmonary infiltrates may result in mortality later. In this survey, however, ten patients survived after IHCA despite ailing with severe lung disease.

HCWs must don level-3 PPE before undertaking any patient care activity in a confirmed COVID-19 patient.

All Code-Blue response team members must equip with full PPE and barrier precautions rigorously enforced to ensure their safety.<sup>[12]</sup> Teams assured of their safety will perform efficient and timely CPR. The overwhelming COVID-19 morbidity and mortality load has limited resuscitation resource availability. Staffing constraints and the need for level-3 PPE protection has limited the functioning of Code-Blue teams. As a consequence, in most cases, timely administration of CPR is restricted to patients managed in critical care units. Some survey responders have pointed out delays in initiating CPR as response teams took time to don the PPE. Some responders administered CPR with just N-95 as protection to ensure timely CPR. Delays in CPR associated with donning PPE reduces the likelihood of achievement of ROSC. Isolation restrictions also delay/limit access and hinder efficient CPR delivery. Level-3 PPE also restricts the swift movement of Code-Blue teams.

The use of aerosol containment devices, such as plastic sheets for separation and face-shields, helps mitigate aerosol spill risk. The Indian Society of Anaesthesiologists distributed reusable face shields to all its members. Most survey responders used these face-shields during CPR, and some covered the victims with a plastic sheet before initiating CPR.

Some respondents in the survey used mechanical compression devices. Mechanical CPR use is advocated when it is challenging to administer manual CPR. It can be administered as an alternative to prevent aerosol exposure.<sup>[13]</sup> Mechanical chest compression devices help keep the rescuer away from the patient and reduce the potential of exposure.<sup>[12]</sup> Although mechanical devices' efficacy has not been equated with manual chest compression in IHCA, their efficacy is reported equivalent to manual chest compression in out-of-hospital CPR.<sup>[14]</sup>

COLS is primarily recommended in bystander CPR for out-of-hospital cardiac arrest and is said to improve outcomes.<sup>[8]</sup> COLS may be administered for IHCA if the resuscitator is inexperienced at emergency intubation.<sup>[8]</sup> In 25% of patients in the survey were just COLS was administered, and ROSC was achieved in only 17.7%. Oddly, in these patients, ventilation support was not provided. In this survey, many responders

administered it for IHCA, despite wearing level-3 PPE, possibly due to the fear factor.

A limitation of our survey was that we did not seek data of complications during the hospital stay after resuscitation and the cause of death of these patients. Autopsy studies showed deep vein thrombosis in more than 50% of Covid-19 patients with 30% suffering from pulmonary embolization. It is recommended that thrombolysis be considered<sup>[15]</sup> and may even be performed during ongoing CPR.<sup>[16]</sup>

To conclude, this survey has shown reasonable survival rates after CPR administration in COVID-19 patients suffering from IHCA. We should not ignore the need to maximize live outcomes after CPR, even in COVID-19 patients. HCWs must strive to provide all interventions that may benefit the patient.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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# Cardiopulmonary Resuscitation in COVID patients

This survey is being conducted on behalf of the Indian Resuscitation Council.

There are currently no national or international guidelines on the conduct of CPR in patients with COVID infection.

The survey has been designed to determine the feasibility and efficacy of CPR in COVID-positive patients. The results of the survey may bring out very important information, which may change the course of resuscitation protocols in patients with COVID.

Kindly respond to the survey in case you have administered CPR to a diagnosed positive case of COVID. Kindly fill one form for one case of COVID positive CPR. The form may be filled up even if the CPR did not result in a successful outcome. There are no medico-legal or financial implications in filling these forms.

The contributing physician/healthcare worker's name will be included in the author list in the potential publication of the results of this survey.

Kindly fill in your email ID for communication for further inquiries or informing the progress of this survey.

**\*Required**

1. Email address \*

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2. Name of healthcare worker \*

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3. Email ID \*

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4. Hospital where CPR was performed including city \*

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## 5. Category of Healthcare Worker \*

*Mark only one oval.*

- Anesthesiologist
- Intensivist
- Emergency Physician
- Resident Doctor
- Paramedical Staff
- Other: \_\_\_\_\_

## 6. Age of patient on whom CPR was performed

*Mark only one oval.*

- < 30 years
- 30-50 years
- 50-60 years
- 60-80 years
- > 80 years

## 7. Gender of patient

*Mark only one oval.*

- Male
- Female

8. The COVID-positive diagnosis was based on \*

*Tick all that apply.*

RT-PCR

COVID-19 Antigen Kit

HR-CT finding

Other:  \_\_\_\_\_

9. Number of episodes of CPR administered \*

*Mark only one oval.*

1

2

3

More

10. The persons administering CPR were \*

*Mark only one oval.*

Wearing full prescribed PPE

Wearing grade N95 mask

Wearing surgical mask

Other: \_\_\_\_\_

11. During CPR the following were performed \*

*Mark only one oval.*

Only chest compression

Both chest compression and airway management



## 12. Immediate Outcome of CPR \*

*Mark only one oval.*

- Successful Return of Spontaneous Circulation (ROSC)
- No Return of Spontaneous Circulation (ROSC)
- Return of Spontaneous Circulation (ROSC) but didn't sustain

## 13. Final Outcome \*

*Mark only one oval.*

- Patient discharged to home
- Patient succumbed to disease later
- Patient could not be weaned off mechanical ventilation and succumbed to a secondary cause

## 14. Stage of lung disease at the time of the cardiac arrest \*

*Mark only one oval.*

- Diffuse lung infiltrates
- Mild lung disease
- No lung infiltrates
- Lung condition not known at that time

## 15. Any evidence of cardio-pulmonary involvement before the cardiac arrest?

*Tick all that apply.*

- Evidence of myocarditis present
- Evidence of pulmonary embolism
- Evidence of myocardial infarction
- None

Other:  \_\_\_\_\_



## 16. Comorbid diseases of the patient \*

*Tick all that apply.*

- Diabetes
- Hypertension
- Chronic kidney disease
- Chronic respiratory disease

Other:  \_\_\_\_\_

## 17. Any other major illness or any particular thing you would like to mention?

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