

Letters

RESEARCH LETTER

Clinical Outcomes of In-Hospital Cardiac Arrest in COVID-19

Before the outbreak of coronavirus disease 2019 (COVID-19), 25% of patients who underwent in-hospital cardiac arrest (IHCA) survived to discharge, with the initial rhythm being nonshockable in 81% of cases.¹ Despite the outbreak causing many deaths, to our knowledge, information on IHCA among this subset of patients in the US is lacking.

Methods | Between March 15 and April 3, 2020, 1309 patients with a diagnosis of COVID-19 were admitted to Beaumont Health (Royal Oak, Michigan). From this group, we identified patients who underwent cardiopulmonary resuscitation (CPR) for cardiac arrest. The exclusion criteria were an age younger than 18 years, do-not-resuscitate status, and comfort or hospice care enrollment. Primary outcomes aimed to identify the initial cardiac arrest rhythm, time to return of spontaneous circulation (ROSC), and overall survival to discharge. William Beaumont Hospital granted institutional review board approval and waived informed consent because of pandemic conditions.

Results | Among 1309 patients hospitalized with COVID-19, 60 (4.6%) developed IHCA and underwent CPR. Six patients were excluded for lack of CPR documentation, providing a sample size of 54. The initial rhythm was nonshockable for 52 patients (96.3%), with 44 (81.5%) with pulseless electrical activity and 8 (14.8%) with asystole. Two patients (3.7%) developed pulseless ventricular tachycardia, and none developed ventricular fibrillation. Return of spontaneous circulation was achieved in 29 patients (53.7%). The median time to achieve ROSC was 8 minutes (interquartile range [IQR], 4-10 minutes). Fifteen of 29 patients (51.7%) who achieved ROSC had their code status changed to do not resuscitate, while 14 patients (48.3%) were recoded, received additional CPR, and died. The median time to cardiac arrest from admission was 8 days (IQR, 4-12 days). The overall median duration of CPR was 10 minutes (IQR, 7-20 minutes). The survival to discharge was 0 of 54 (95% CI, 0-6.6).

The median age was 61.5 years and most patients were African American. Many patients had obesity, hypertension, or diabetes. At the time of cardiac arrest, 43 patients (79%) were receiving mechanical ventilation, 18 (33%) kidney replacement therapy, and 25 (46.3%) vasopressor support. Patient demographic characteristics, comorbidities, and CPR characteristics are summarized in the **Table**.

Discussion | There are limited data on the characteristics and outcomes of cardiac arrest in patients hospitalized with COVID-19 in the US. In our study of 54 patients with COVID-19, there was

Table. Patient Demographic Characteristics, Comorbidities, and CPR Characteristics

Characteristic	No. (%)
Sex	
Male	33/54 (61.1)
Female	21/54 (38.9)
Ethnicity	
African American	36/54 (66.7)
White	11/54 (20.3)
Asian	2/54 (3.7)
Other	5/54 (9.3)
Age, median (IQR), y	61.5 (50-68)
Comorbidities	
Hypertension	42/54 (77.8)
Diabetes	50/54 (55.6)
Hyperlipidemia	27/54 (50.0)
BMI, median (IQR), No.	33 (28-40)
CPR initial rhythm	
Pulseless electrical activity	44/54 (81.5)
Asystole	8/54 (14.8)
Pulseless ventricular tachycardia	2/54 (3.7)
Ventricular fibrillation	0/54 (0.0)
Achieved ROSC	
Overall	29/54 (53.7)
Pulseless electrical activity	24/44 (54.6)
Asystole	5/8 (62.5)
Pulseless ventricular tachycardia	0/2 (0.0)
Ventricular fibrillation	0/0 (0.0)
Time to ROSC, median (IQR), min, No.	8 (4-10)
No.	26
Duration of CPR, median (IQR), min, No.	10 (7-20)
No.	47
Survival to discharge	0/54 (0.0)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CPR, cardiopulmonary resuscitation; ROSC, return of spontaneous circulation.

a 100% mortality rate following CPR. The initial rhythm was nonshockable for 52 patients (96.3%), with pulseless electrical activity being the most common (44 [81.5%]). Despite 29 patients (53.7%) achieving ROSC, none survived to discharge.

The high mortality following CPR is likely multifactorial. The overall survival to discharge before the outbreak was 25%, with it being 11% in patients with a nonshockable rhythm.^{1,2} Given that most of the patients in this study developed a nonshockable rhythm, the outcome was likely to be poor. Additionally, at the time of cardiac arrest, many patients were either receiving mechanical ventilation, kidney replacement therapy, or vasopressor support, all factors previously shown to be associated with a poor outcome following IHCA.¹ This poor outcome is similar to that reported by Shao et al,³ in which the 30-

day survival rate was only 2.9%.³ While most of the patients in that study also had a nonshockable rhythm (94.1%), only 13% achieved ROSC.³

These outcomes warrant further investigation into the risks and benefits of performing prolonged CPR in this subset of patients, especially because the resuscitation process generates aerosols that may place health care personnel at a higher risk of contracting the virus. The transmission of severe acute respiratory syndrome coronavirus 1 to health care personnel during CPR has been previously documented.⁴ Exposure may be further compounded by the limited supply of personal protective equipment nationwide. Further studies in this area would be beneficial and potentially aid in informing CPR guidelines for this patient population.

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