

# Outcomes for Patients Receiving Cardiopulmonary Resuscitation During Novel Coronavirus Outbreak in the United States

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## Introduction

Since the start of the novel coronavirus outbreak in the U.S., the Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA) have introduced new cardiopulmonary resuscitation (CPR) guidelines involving increased precautions for protecting healthcare providers from infection. These precautions have been widely adopted for both known and potential COVID+ patients despite debate over increased strain on CPR providers and potentially inferior outcomes. In order to bridge the knowledge gap surrounding safe, effective CPR practices in the presence of COVID-19, patient outcomes for codes performed in The Medical Center since March 2020 were compared to those of the same timeframe last year.

## Methods

All analyses were conducted using SYSTAT, version 13. Continuous variables – age, BMI, code duration, arrest-to-treat and arrest-to-intubate times – were tested for normality within groups using a Komolgorov-Smirnov test with the Lilliefors option. Code duration, arrest-to-treat, and arrest-to-intubate were found to be non-normal. Code duration was log-transformed prior to analysis; arrest-to-treat and arrest-to-intubate could not be restored to normality through transformation.

Age, BMI, and code duration were tested for significant differences in means between groups using ANOVA; for variables showing an overall significant effect, pairwise comparisons were done using Tukey's HSD test. Arrest-to-treat and arrest-to-intubate were tested for significance using Kruskal-Wallis non-parametric ANOVA. Discrete variables – gender, comorbidity status, location, code-after-hours, survived-code status, discharged-alive status, RESQUPOD device usage, Lucas device usage, and rhythm type – were tested for significant differences between groups using chi-square tests of association.

Table 1. Characteristics and outcomes of patients receiving in-hospital CPR since COVID-19 outbreak

	2019 non-COVID (n = 41)	2020 non-COVID (n = 43)	2020 COVID+ (n = 10)	p-value
<b>Patient Demographics</b>				
Females – no. (%)	17 (41.5%)	19 (44.2)	5 (50.0)	0.833
Age – mean +/- SE	66.12 +/- 2.29	70.58 +/- 1.67	69.3 +/- 5.62	0.314
BMI – mean +/- SE	<b>28.80 +/- 1.61<sup>a</sup></b>	<b>26.40 +/- 1.18<sup>a</sup></b>	<b>36.17 +/- 4.25<sup>b</sup></b>	<b>0.014</b>
<b>Comorbidities</b>				
Hypertension – no. (%)	34 (82.9)	40 (93.0)	10 (100.0)	0.167
Hyperlipidemia – no. (%)	24 (58.5)	26 (60.5)	7 (70.0)	0.801
Diabetes – no. (%)	20 (48.8)	12 (27.9)	6 (60.0)	0.061
Cancer – no. (%)	15 (36.6)	17 (39.5)	2 (20.0)	0.510
Tobacco Use – no. (%)	10 (24.4)	12 (27.9)	1 (10.0)	0.495
CHF – no. (%)	22 (53.7)	25 (58.1)	4 (40.0)	0.581
CAD – no. (%)	29 (70.7)	25 (58.1)	4 (40.0)	0.162
COPD – no. (%)	18 (43.9)	19 (44.2)	3 (30.0)	0.297
CVD – no. (%)	11 (26.8)	16 (37.2)	4 (40.0)	0.529
<b>Code Characteristics</b>				
Code Duration (min.) – mean +/- SE	<b>20.90 +/- 3.58<sup>a</sup></b>	<b>18.42 +/- 2.58<sup>a</sup></b>	<b>35.68 +/- 5.22<sup>b</sup></b>	<b>0.017</b>
Arrest-to-Treat (min.) – mean +/- SE	0.20 +/- 0.09	0.37 +/- 0.16	0.20 +/- 0.13	0.533
Arrest-to-Intubate (min.) – mean +/- SE	5.14 +/- 0.83	6.48 +/- 1.08	7.40 +/- 2.40	0.519
Cardiac Arrest – no. (%)	40 (97.6)	41 (95.3)	10 (100.0)	0.704
Compressions – no. (%)	40 (97.6)	38 (88.4)	9 (90.0)	0.262
RESQUPOD – no. (%)	<b>26 (78.8)<sup>a</sup></b>	<b>18 (51.4)<sup>b</sup></b>	<b>4 of 8 (50.0)<sup>b</sup></b>	<b>0.047</b>
Lucas Device – no. (%)	13 of 40 (32.5)	12 of 40 (30.0)	6 of 9 (66.7)	0.104
Rhythm Type				0.779
PEA – no. (%)	21 (51.2)	22 (51.2)	7 (70.0)	
Asystole – no. (%)	17 (41.5)	18 (41.9)	2 (20.0)	
VT/VF – no. (%)	3 (7.3)	3 (6.9)	1 (10.0)	
<b>Patient Outcomes</b>				
Survived Code – no. (%)	26 (63.4)	28 (65.1)	5 (50.0)	0.668
Discharged Alive – no. (%)	8 of 35 (22.9)	10 of 36 (27.8)	1 (10.0)	0.499

  

	2019/20 non-COVID N = 84	2020 COVID+ (n = 10)	p-value
<b>Patient Demographics</b>			
BMI – mean +/- SE	27.50 +/- 19.63	36.17 +/- 4.25	0.007
<b>Code Characteristics</b>			
Code Duration (min.) – mean +/- SE	19.62 +/- 2.18	35.68 +/- 5.22 <sup>b</sup>	0.005
<b>Patient Outcomes</b>			
Survived Code – no. (%)	54 (64.3)	5 (50.0)	0.377
Discharged Alive – no. (%)	18 of 71 (25.4)	1 (10.0)	0.283

## Results

Groups well matched on patient characteristics. There were no significant differences in age or the incidence of hypertension, hyperlipidemia, diabetes, cancer, tobacco use, CHF, CAD, COPD, or CVD between groups. COVID+ patients did have a significantly higher BMI than did non-COVID patients ( $F_{1,79} = 7.65$ ,  $p = 0.007$ , Table 1).

There were no significant differences in rhythm type or incidence of Lucas device utilization between groups; there was a significant difference in RESQUPOD use among groups, though this was due to a difference between 2019 non-COVID

and 2020 non-COVID groups (Table 1). Code events were fairly-evenly distributed between critical care units and general hospital units, while (as expected) all COVID-19 code events occurred in a critical care unit ( $\chi^2 = 9.48$ ,  $df = 2$ ,  $p = 0.009$ ).

Code duration was significantly greater in the COVID+ group ( $38.00 \pm 4.48$  minutes vs.  $19.63 \pm 2.18$  minutes,  $t = 6.26$ ,  $df = 10.7$ ,  $p < 0.001$ ). Despite that, there was no significant difference in code survival among groups; 5 of 10 COVID+ patients (50%) survived the code event, while 54 of 84 (64%) non-COVID patients did so ( $\chi^2 = 0.780$ ,  $df = 1$ ,  $p = 0.377$ , Table 1).

Only 1 of 10 (10%) COVID+ patients was discharged alive vs. 18 of 71 non-COVID-19 patients (25%); while this difference was not significant ( $\chi^2 = 1.15$ ,  $df = 1$ ,  $p = 0.283$ , Table 1), it is perhaps suggestive and worthy of further attention.

## Conclusions

Patient outcomes between 2019 and 2020 were comparable, indicating that extra precautions taken by healthcare personnel during the COVID-19 outbreak are not degrading the quality of CPR administered. However, COVID+ patients had significantly longer code durations than non-COVID patients in both years, suggesting a greater difficulty in restoring spontaneous circulation within individuals in the virus group.

## References

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