Exploring the Changes in Code Status During the COVID-19 Pandemic and the Implications for Future Pandemic Care

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Abstract

Objective: We aim to explore patterns of inpatient code status during the COVID-19 pandemic compared with a similar timeframe the previous year, as well as utilization of palliative care services.

Methods: This is a retrospective cohort study using data from the Montefiore Health system of all inpatient admissions between March 15-May 31, 2019 and March 15-May 31, 2020. Univariate logistic regression was performed with full code status as the outcome. All statistically significant variables were included in the multivariable logistic regression.

Results: The total number of admissions declined during the pandemic (16844 vs 11637). A lower proportion of patients had full code status during the pandemic (85.1% vs 94%, P < .001) at the time of discharge/death. There was a 20% relative increase in the number of palliative care consultations during the pandemic (12.2% vs 10.5%, P < .001). Intubated patients were less often full code (66.5% vs 82.2%, P < .001) during the pandemic. Although a lower portion of COVID-19 positive patients had a full code status compared with non-COVID patients (77.6% vs 92.4%, P<.001), there was no statistically significant difference in code status at death (38.3% vs 38.3%, P = .96).

Conclusions: The proportion of full code patients was significantly lower during the pandemic. Age and COVID status were the key determinants of code status during the pandemic. There was a higher demand for palliative care services during the pandemic.

Introduction

The COVID-19 pandemic has caused disruptions in routine healthcare practices in the United States.[1] The severity of COVID-19 infection can range from mild and asymptomatic to severe respiratory distress and multiorgan failure resulting in cardiac arrest. Elderly patients and those with comorbidities infected with COVID-19 have had the worse prognosis and are at high risk of developing cardiac arrest.[2,3] Cardiopulmonary resuscitation (CPR) can sustain cardiac and respiratory function in patients suffering cardiac arrest due to a reversible condition. In patients with a terminal illness or an irreversible underlying condition, CPR can only prolong the dying process. Professional societies recommend that patient autonomy should be respected and physicians should have a discussion regarding CPR with patients.[4] Specifics about disease prognosis, patient's values, goals of care, nature of CPR, risks, benefits and possible outcomes of the receiving or not receiving CPR should be discussed with the patients. The discussions are commonly referred to as "code status" discussions.

Even though code status discussions are held during routine admissions and in ambulatory settings, the severity of the illness and decreased likelihood of survival following a cardiac arrest are the main drivers for continued code status discussions during hospitalization.[5,6] Due to the severity of COVID related illness in elderly and in patients with pre-existing comorbidities, it is likely that patients and their families would decide on a change in code status during hospitalization. It is therefore important to understand the code status trend in hospitalized COVID-19 patients as to better prepare strategies to adapt for future waves of this pandemic and understand how to best allocate resources to improve healthcare administration. We aim to explore the change in

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code status and utilization of palliative care consultation services during the COVID-19 pandemic compared with a similar timeframe the previous year, and particularly, the change in code status among hospitalized COVID-19 patients.

Methods

Study Population

The Montefiore Health System includes four inpatient academic tertiary hospitals in the Bronx, New York. The hospital system with more than 2000 beds mainly serves the multiethnic, underserved population of the Bronx County, in New York city. Clinical data related to inpatient admissions from these facilities were acquired. Patients over the age of 18 years admitted between March 15 to May 31, 2019 and March 15 to May 31, 2020 were included in the current analysis. The study was approved by the Albert Einstein College of Medicine institutional review board.

Variables and Outcome

Age at admission, gender, self-reported race were recorded. Clinical risk factors including history of diabetes, hypertension, heart failure, cerebrovascular accident, liver disease, kidney disease, malignancy and peripheral vascular disease were collected using ICD-10 codes and mapped diagnosis codes in the EPIC electronic medical record system. ICD-10 codes were as follows: diabetes E08-E13, hypertension I10-I16, heart failure I50, cerebrovascular accident G45.0, G45.1, G45.2, G45.8, G45.9, G46.0, G46.1, G46.2, I60, I61, I62 and I63, liver disease K70-K77, kidney disease N17-19, peripheral vascular disease I73. Current and prior history of diseases were included. In addition, COVID-19 status based on a nasal swab polymerase chain reaction (PCR) test, length of stay, and in-hospital mortality were extracted. The timing of the first code status order placed since hospital admission was collected and any subsequent changes in code status were recorded (Figure 1). Finally, code status at the time of discharge was documented for all patients. Temporal relationship between code status change and intubation was evaluated by calculating the difference between time of intubation and time to code status change from the time of admission. In order to understand the healthcare workers involved in the code status decision-making process, palliative care order placement was evaluated. The presence or absence of in-patient consultation to the Montefiore Palliative Care Service was recorded, along with the timing of the consult.

Change in Palliative Care Practice During the Pandemic

There were several changes in the practice of palliative care during the pandemic to avoid crisis level care. The palliative care service team approached conversations with family and patients differently. Center for Advancing Palliative Care (CAPC) created VitalTalk, (https://www.vitaltalk.org/guides/covid-19-communication-skills/) which provided this guidance on ways to change the conversation. (1) The team quickly shifted from consenting for DNR to assenting for DNR. This strategy was aimed at reducing PPE usage and ventilator usage (already in short supply) and risk of exposure during codes. (2) Although, all personnel in the division of palliative care were deployed to the consultation service, the demand for palliative services could not be met. The conversation guide was disseminated in addition to mitigate the increase in demand.

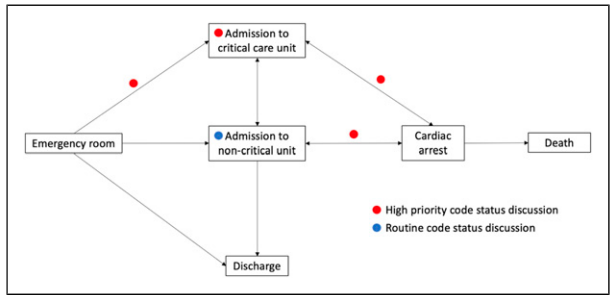

Figure 1. Schematic representation of timing of code status discussions during hospitalization.

Statistical Analysis

The continuous variables in the baseline characteristics of the study population were described using means ± standard deviation (SD) for normally distributed data and compared using t-test. Medians [25th −75th percentiles] were used for skewed data and compared with the Kruskal-Wallis test. Proportions were compared with a chi-square test. A univariate logistic regression with year of admission, COVID positive status, demographic variables, and confounders was performed with full code status as the outcome. All statistically significant variables were included in multivariate logistic regression analysis. A two tailed *P* value less than .05 was considered statistically significant. R version 3.6.1 was used for the statistical analysis.

Results

Between March 15 and May 31, 2020 there were 11,637 admissions, compared with 16,844 admissions during the same period in 2019, this corresponded to a 31% reduction in hospital admission. The mean age was not statistically different between the years, with average age being 59.39 ± 19.05 in 2019 and 59.44 ± 18.90 in 2020 (P = .82). A higher proportion of male patients were admitted in 2020 compared to that of 2019 (47.8% vs 42.5%, P < .001). A lower proportion of patients had history of heart failure during the pandemic (19% vs 22.4%, P < .001). Overall, the percentage of patients with full code status was lower (85.1% vs 94.0%, P < .001) during the pandemic (Supplementary Figure 2A). However, a higher percentage of patients had full code status at the time of death during the pandemic (38.2% vs 24.9%,

P < .001) (Supplementary Figure 3). In-hospital mortality was higher during the pandemic (12.5% vs 2.3%, P < .001). The mean length of stay was higher during the pandemic (5.71 vs 4.78 days, P < .001). There was a 20% increase in palliative care consults, while the number of full code patients declined by 9% in 2020 (Table 1). In the multivariate regression model, patients admitted to the hospital in 2020 had a lower odds for full code status [OR (95% CI) .32(.29 − .35), *P* value <.01] compared to the previous year after adjusting for age, gender, race, and comorbidities (Table 2).

Among the COVID-19 positive group, the proportion of full code patients was lower (77.6% vs 92.4%, P < .001) For

Table 1. Baseline characteristics between years 2019 and 2020.

	2019 N = 16844	2020 N = 11637	*P* value
Age (mean (SD))	59.39 (19.05)	59.44 (18.90)	.824
Sex – male n (%)	7155 (42.5)	5566 (47.8)	<.001
Race n (%)			<.001
African American	5743 (34.1)	4302 (37.0)	
White	2281 (13.5)	1396 (12.0)	
Other	7352 (43.6)	5050 (43.4)	
Unknown	1468 (8.7)	889 (7.6)	
Comorbidities			
Cerebrovascular accident %	6.4	6.5	.837
Myocardial infarction %	8.1	6.9	<.001
Peripheral vascular disease %	3.4	3.5	.668
Diabetes mellitus %	34.3	34.1	.689
Liver disease %	1.6	1.6	1.000
Hypertension %	47.7	43.7	<.001
Malignancy %	10.2	8.3	<.001
Kidney disease %	25.6	26.7	.044
Heart failure %	22.4	19.0	<.001
Intubations %	5.1	9.4	<.001
Remaining full code after intubation %	82.2	66.5	<.001
Palliative consult %	10.7	12.2	<.001
Full code %	94.0	85.1	<.001
In hospital mortality %	2.3	12.5	<.001
Full code at death %	24.9	38.2	<.001
Length of stay in days (mean (SD))	4.78 (6.10)	5.71 (5.10)	<.001

Table 2. Univariate and multivariate logistic regression for full code status including 2019 and 2020.

	Univariate Models		Multivariate Model[i]	
	OR(95% CI)[g]	p value[h]	OR(95% CI)[g]	p value[h]
Year[a]	.36 (.33 − .39)	<.01	.35 (.32 − .38)	<.01
Age[b]	.93 (.93 − .93)	<.01	.97 (.97 − .98)	<.01
Sex[c]	.93 (.86 − 1.01)	.11	1.04 (.96 − 1.13)	.27
Race (White)[d]	.59 (.52 − .66)	<.01	.82 (.72 − .93)	<.01
Race (other)[e]	1.05 (.96 − 1.15)	.264	.96 (.88 − 1.06)	.51
Race (unknown)[f]	1.02 (.87 − 1.19)	.80	1.03 (.89 − 1.19)	066
Elixhauser comorbidity index	1.00 (.99 − 1.00)	.34	1.00 (1.00 − 1.01)	.03

[a]2020 compared to 2019.
[b]Age in years.
[c]Male compared to Female.
[d]White compared to African American.
[e]Other compared to African American.
[f]Unknown race compared to African American.
[g]Odds ratio (95% Confidence interval).
[h]P value for Wald $\chi 2$ test of β coefficient in the logistic regression model.
[i]The multivariate model adjusts for age, gender, race, year and the comorbidity index.

intubated COVID-19 positive patients, there was a lower percentage who had a full code status, compared to intubated non-COVID patients (63.8% vs 72.9%, P < .001) (Supplementary Figure 3) (Table 3). In the multivariate regression model, COVID positive patients had lower odds for full code status [OR (95% CI) .33(.29 − .38), *P* value <.01] compared to non-COVID patients after adjusting for age, gender, race, and comorbidities (Table 4).

Table 3. Baseline characteristics between COVID and non-COVID patients in 2020.

	COVID Negative N = 5956	COVID Positive N = 5681	*P* value
Age (mean (SD))	55.45 (20.03)	63.63 (16.65)	<.001
Sex – male n (%)	2551 (42.8)	3015 (53.1)	<.001
			<.001
Race n (%)			
African American	2155 (36.2)	2147 (37.8)	
White	816 (13.7)	580 (10.2)	
Other	2582 (43.4)	2468 (43.4)	
Unknown	403 (6.8)	486 (8.6)	
Comorbidities			
Cerebrovascular accident %	7.4	5.4	<.001
Myocardial infarction %	8.1	5.6	<.001
Peripheral vascular disease %	3.7	3.3	.304
Diabetes mellitus %	29.9	38.4	<.001
Liver disease %	1.5	1.6	.585
Hypertension %	42.5	45.0	.007
Malignancy %	8.8	7.8	.059
Kidney disease %	23.4	30.1	<.001
Heart failure %	21.0	16.9	<.001
Intubations %	5.4	13.5	<.001
Remaining full code after intubation %	72.9	63.8	<.001
Palliative care consult %	8.5	16.1	<.001
Full code %	92.4	77.6	<.001
In hospital mortality %	3.9	21.5	<.001
Full code at death %	38.3	38.2	.96
Length of stay in days (mean (SD))	3.87 (3.75)	6.84 (5.47)	<.001

Table 4. Univariate and multivariate logistic regression for full code status at discharge during 2020.

	Univariate Models		Multivariate Model[i]	
	OR(95% CI)[g]	**p value[h]**	**OR(95% CI)[g]**	**p value[h]**
COVID-19[a]	.29 (.25 −.32)	<.01	.33 (.29 − .38)	<.01
Age[b]	.93 (.92 −.93)	<.01	.93 (.92 − .93)	<.01
Sex[c]	.89 (.80 −.99)	<.01	.97 (.87 − 1.09)	.70
Race (White)[d]	.59 (.51 − .69)	.01	.68 (.57 − .81)	<.01
Race (other)[e]	.82 (.74 − .90)	.76	.88 (.77 − 1.01)	.07
Race (unknown)[f]	.92 (.79 − 1.07)	.78	.82 (.67 − 1.01)	.06
Elixhauser comorbidity index	.99 (.99 − .01)	.49	.99 (.99 − 1.00)	.12

[a]COVID-19 PCR positive compared to PCR negative.
[b]Age in years.
[c]Male compared to Female.
[d]White compared to African American.
[e]Other compared to African American.
[f]Unknown race compared to African American.
[g]Odds ratio (95% Confidence interval).
[h]P value for Wald $\chi 2$ test of β coefficient in the logistic regression model.
[i]The multivariate model adjusts for age, gender, race, year and the comorbidity index.

Discussion

We studied inpatient code status pattern during the COVID-19 pandemic in relation to the same period in 2019 in the Montefiore academic medical centers in New York City. The important findings from our study are as follows: (1) There were fewer total hospitalizations during the pandemic (2) COVID positive patients (CPP) were more likely to be older, male, diabetic, and intubated and had higher mortality compared with COVID negative patients (3) Code status in 2020 was determined mainly by age and COVID-19 status (4) patients with full code status declined by 9.5% during the pandemic compared with the prior year, however there was a 20% relative increase in palliative care consults during the same period. (5) There was a 19% relative decline in the full code status among intubated patients during the pandemic.

Hospitalization Census and Patient Demographic Changes

There are multiple reasons for the decrease in the total number of hospitalizations during the pandemic. First, the length of stay (LOS) was significantly longer during the pandemic, mainly driven by prolonged time to recovery especially among sicker and intubated CPP. Patients hospitalized due to COVID were more likely older and had more comorbidities such as diabetes, which is consistent with published reports indicating more severe infection in elderly patients with comorbidities.[7] In addition, due to acute respiratory distress syndrome caused by COVID and increased rates of hypoxic respiratory failure, the percentage of intubations almost doubled compared to the prior year. This also contributed to an increase in LOS. Another reason for prolonged LOS was a bottleneck in discharging patients back to skilled nursing facilities due to inconsistent infection prevention guidelines at that time. Although the bed capacity was increased by more than 50% due to the New York state law mandates, the prolonged LOS increased bed occupancy and lowered number of total admissions. Second, elective procedures and surgeries were postponed to reallocate resources to mitigate the pandemic and reduce exposure to patients. Third, it has been demonstrated in prior reports that many of the sicker CNP patients stayed at home due to increased fear of contracting the virus.[8,9]

Determinants for Code Status

The key determinants for full code status during the pandemic were age, race and COVID infection status. Younger patients were more likely to be full code compared to older adults. This observation is consistent with the fact that older adults having a more severe COVID infection often lead to non-full code designation. COVID infection status was another independent determinant of code status. Only CPP with severe infection were hospitalized, and a lower chance of meaningful functional recovery could be one of the factors for a lower likelihood of full code status among CPP.

Race is another possible determinant of code status. The multivariate model suggests that Whites were less likely to identify among full code patients. With full code status at discharge in 2020 as the outcome and using a univariate model, Whites had an odds ratio of .59 (.52 − .69 CI, $P < .01$) when compared to African Americans. The reason for this interesting finding needs to be explored further in future research. The Elixhauser comorbidity index is a tool to adjust for baseline risk factors leading to increased in-hospital mortality using administrative data. Elixhauser comorbidity index was a not associated with code status during the pandemic, indicating that baseline comorbidities were not a major factor in code status decisions.

The decline in the proportion of full code patients was partially related to increased code status discussions occurred during the pandemic. Increased number of code discussions during the pandemic pose a number of challenges.[10] Even though internists are routinely trained in code discussions, palliative care input is often needed for more complex code discussions. Palliative care specialists also play an important role in communicating with the patient families, especially as a lower percentage of intubated patients remained full code.[11] Our study showed a 20% increase in the palliative care consults. This led to a shortage of palliative care specialists to meet the needs of patients and their families. Therefore, primary physicians(hospitalists) mainly carried out the code status discussions with a conversation guide during the pandemic (https://www.vitaltalk.org/guides/covid-19-communication-skills/). Other factors favoring the trend were that personal protective equipment was in short supply, prioritizing its allocation to healthcare providers coming in direct contact with the patients. There were also visitor restrictions, preventing family members from meeting their loved ones during hospitalization at the time of the pandemic to reduce risk to hospital staff and the public. Face-to-face discussion with the family members about the patient's condition were not possible. Hence, there was difficulty in accurately conveying the severity of the illness and prognosis of the critically ill patients.

Code status at the time of mortality has not been well studied during the pandemic. The relative increase in percentage of full code patients at the time of death poses a number of challenges and potential areas for system optimization. Surprisingly, COVID negativity and positivity had identical percentages of full code status at the time of death. This could have two possible explanations. First, palliative care services were strained and could not meet the demand. Second, and more likely possibility is that there were more unexpected deaths during the pandemic. The second explanation could explain a higher percentage of COVID positive patients having full code status at the time of death. However, this does not explain the increase of full code status during death among COVID negative patients.

Call for Action

A number of steps were taken to solve the aforementioned issues to deliver care to the patients, and this model can be followed in other centers for future surges in the number of admissions. Firstly, code status discussions and having difficult conversations with the family should be included in the training curriculum of internal medicine residents. This step will not only help in mitigating the current pandemic but empower these future physicians to carry out code discussions with confidence. This additional training could enable physicians to be aware of confounding factors, such as patient's cultural background, when guiding decision-making to ensure that healthcare delivery is fair and personalized.[8,12,13] An enhanced ability to educate patients and their families in a way that can foster trust will be critical to making sure each patient can make the best possible decision, which may include arranging for the inclusion of family members or members of a religious community in code discussions. Secondly, as a higher proportion of patients were full code at the time of death, there was increased workload on code teams. Cardiopulmonary resuscitation (CPR) carries an increased risk of exposure to health care providers.[14] Multidisciplinary code team members should be updated regarding the proper use of personal protective equipment and updated regarding the updated American Heart Association scientific statement on CPR during COVID pandemic.[14] Lastly, consideration of using "Do Not Resuscitate/allow natural death" instead of "Not Full code status" during conversations with patients and their family members.

Limitations

Despite the important findings noted above, a number of limitations should be noted. They are as follows: (1) Data on participants and the location of the code status discussion was not available in our study. (2) In-hospital cardiac arrest data was not available in our dataset, therefore code status discussions in relation to in-hospital cardiac arrest could not be evaluated (3) We used palliative care consults as the indicator that palliative care was involved in code status discussion, but this may not be strongly correlated. (4) New York was involved early during the pandemic so the study conditions may be unique due to the timeline. (5) Data on ethnicity was not available and race data was self-reported.

Conclusion

During the pandemic total number of hospitalizations decreased with increased all-cause mortality. The proportion of full code patients were significantly lower during the pandemic. Age and COVID status were the key determinants of code status during the pandemic. There was relative shortage of palliative care services during the pandemic which then led to primary teams adapting to have advance care planning discussions.

Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

References

1. Barach P, Fisher SD, Adams MJ, et al. Disruption of healthcare: Will the COVID pandemic worsen non-COVID outcomes and disease outbreaks? *Prog Pediatr Cardiol*. 2020; 59:101254.
2. Wynants L, Van Calster B, Collins GS, et al. Prediction models for diagnosis and prognosis of covid-19: systematic review and critical appraisal. *BMJ*. 2020;369:m1328.
3. Miles JA, Mejia M, Rios S, et al. Characteristics and outcomes of in-hospital cardiac arrest events during the COVID-19 pandemic: A single-center experience from a New York city public hospital. *Circ Cardiovasc Qual Outcomes*. 2020;13(11): e007303.
4. Guidelines for the appropriate use of do-not-resuscitate orders. Council on ethical and judicial affairs, American medical association. *JAMA*. 1991;265(14):1868-1871.
5. Curtis JR, Kross EK, Stapleton RD. The importance of addressing advance care planning and decisions about do-not-resuscitate orders during novel coronavirus 2019 (COVID-19). *JAMA*. 2020;323(18):1771-1772.
6. Patel K, Sinvani L, Patel V, et al. Do-not-resuscitate orders in older adults during hospitalization: A propensity score-matched analysis. *J Am Geriatr Soc*. 2018;66(5):924-929.
7. Wu C, Chen X, Cai Y, et al. Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. *JAMA Intern Med*. 2020;180(7):934-943.
8. Schirmer CM, Ringer AJ, Arthur AS, et al. Delayed presentation of acute ischemic strokes during the COVID-19 crisis. *J Neurointerventional Surg*. 2020;12(7): 639-642.
9. Czeisler ME, Marynak K, Clarke KEN, et al. Delay or avoidance of medical care because of COVID-19-related concerns - United States, June 2020. *Morbidity and Mortality Weekly Report*. 2020;69(36):1250-1257.

10. Chan Paul S, Berg Robert A, Nadkarni Vinay M. Code blue during the COVID-19 pandemic. *Circ Cardiovasc Qual Outcomes*. 2020;13(5):e006779.
11. Pérez Mdel V, Macchi MJ, Agranatti AF. Advance directives in the context of end-of-life palliative care. *Curr Opin Support Palliat Care*. 2013;7(4):406-410.
12. Chan PS, Berg RA, Nadkarni VM. Code blue during the COVID-19 pandemic. *Circ Cardiovasc Qual Outcomes*. 2020;13(5):e006779.
13. Chan CWH, Ng NHY, Chan HYL, Wong MMH, Chow KM. A systematic review of the effects of advance care planning facilitators training programs. *BMC Health Serv Res*. 2019;19(1):362.
14. Edelson Dana P, Sasson C, Chan Paul S, et al. Interim guidance for basic and advanced life support in adults, children, and neonates with suspected or confirmed COVID-19. *Circulation*. 2020;141(25):e933-e943.