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Impact of the COVID-19 Public Health Crisis and a Structured COVID Unit on Physician Behaviors in Code Status Ordering

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Abstract

Purpose: Code status orders are standard practice impacting end-of-life care for individuals. This study reviews the impact of a COVID unit on physician behaviors towards goal-concordant end-of-life care at an urban academic tertiary-care hospital.

Methods: We conducted a retrospective cohort study of code status ordering on adult inpatients comparing the pre-pandemic period to patients who tested positive, negative and were not tested during the pandemic from January 1, 2019, to December 31, 2020.

Results: We analyzed 59,471 unique patient encounters (n = 35,317 pre-pandemic and n = 24,154 during). 1,631 cases of COVID-19 were seen. The rate of code status orders among all inpatients increased from 22% pre-pandemic to 29% during the pandemic ($P < .001$). Code status orders increased for both patients who were COVID-negative (32% $P < .001$) and COVID-positive (65% $P < .001$). Being in a cohorted COVID unit increased code status ordering by an odds of 4.79 ($P < .001$). Compared to the pre-pandemic cohort, the COVID-positive cohort is less female (50% to 56% $P < .001$), more Black (66% to 61% $P < .001$), more Hispanic (6.5% to 5%) and less white (26% to 30% $P < .001$). Compared to Black patients, white patients had lower odds (.86) of code status ordering ($P < .001$). Other race/ethnicity categories were not significant.

Conclusions: Code status ordering remains low. Compared to pre-pandemic rates, the frequency of orders placed significantly increased for all patients during the pandemic. The largest increase occurred in patients with COVID-19. This increase likely occurred due to protocols in the COVID unit and disease uncertainty.

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Author Contributions
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Keywords

covid 19; advanced care planning; ACP; goals of care; GOC; code status; physician behaviors

Introduction

Code status ordering is considered a best practice in health care delivery for hospitalized patients,[1,2] yet low use leads to discordance with patient wishes, overtreatment and medicalization of death.[3–7] While code status ordering does not capture the nuance of goals of care and serious illness conversations[8] it provides important information to providers about patient preferences for resuscitation and intubation in a critical end-of-life event[9] as one facet of Advanced Care Planning (ACP). Documentation remains limited in the electronic medical record(EMR).[10,11] In this context, code status ordering imperfectly represents an effort from the medical team to record a patient's wishes.[12] The COVID-19 pandemic had a unique impact on how doctors approached code status ordering, discussion, and documentation due to the disease's initial uncertainty in prognosis and treatment.[13–17]

Ideally, code status preferences should be discussed prior to hospitalization.[14] Sentinel hospitalizations with new diagnoses or acute worsening of chronic conditions occur, during which goals of care (GOC) for end-of-life care may change.[18] The COVID-19 pandemic created such a scenario.[15,19–22] Due to time constraints, lack of training, and the sensitivity of the topic, inpatient providers often do not engage in adequate GOC conversations.[6,23–26] Patients may prefer to discuss with their subspecialists or primary care providers with whom they have a relationship.[24,27,28] Despite these barriers, code status discussions are critical during hospitalizations, which may require escalation of care.[29]

Ordering and documentation of code status preferences at each encounter should be standardized.[30] At our institution, code status orders are not mandated during hospitalization and orders reset at each encounter.[31–34] In the absence of a code status order, full resuscitation is the default.[35–38] Before the COVID-19 pandemic, the documentation of inpatient code status ranged from 20%-62%, with most studies reporting a rate under 50%.[7,39–42] During the seminal weeks of pandemic, many hospitals adopted an early intubation strategy,[43,44] patients rapidly decompensated without clinical signals, and resource limitations on life support services[45] put additional pressure on providers to have code status orders in place.[19]

Our institution created a COVID unit from March through June 2020. It was staffed by a group of volunteer providers who standardized having code status discussions on admission, EMR documentation through a templated phrase, placement of a code status order, and inclusion of code status in provider handoffs. By June 2020, COVID-19 inpatient volumes improved, mortality rates stabilized, the COVID-19 unit disbanded, and patients were admitted across inpatient floors.

The effects of the pandemic on physician behaviors towards code status ordering remains poorly understood.[21,46,47] In this retrospective cohort study, we sought to understand the effect of a COVID-19 diagnosis on code status ordering amongst hospitalized patients and examine the larger effects of the COVID-19 pandemic on physician ordering behaviors. We uniquely assess the impact of the COVID unit with its distinctive providers, culture and standardization of care on the impact on ordering.

Methods

Inpatients were identified using University of Chicago's Clinical Research Data Warehouse (CRDW), which contains EMR data for all patient encounters in our inpatient system. Deidentified data are analyzed at the encounter level. We analyzed all adult (age ≥ 18) inpatient encounters on all medical and surgical services from January 1st, 2019, through December 31st, 2020. All variables were defined based on information from the EMR (Epic; Epic Systems). Our focal outcome was code status order, treated as a binary variable (1 = code status ordered during encounter) to capture the overall rate of ordering regardless preference type (e.g., DNR, Full). Our focal predictor was whether the COVID-19 pandemic influenced code status ordering. We conceptualize the impact of the pandemic as one categorical variable identifying patients' COVID-19 test category. This variable, *C19TestCat*, is coded as (0) being admitted pre-pandemic (1) never tested for COVID-19 but admitted during the pandemic, (2) testing negative for COVID-19, and (3) testing positive for COVID-19. Pre-pandemic is defined as an admission prior to February 1, 2020, as no COVID-19 tests were performed prior to this time.

We adjusted for potential confounders, including patient demographics (age, gender, race, ethnicity) and health status variables, including length of stay (LOS), whether the patient had ever been transferred to the ICU, Charlson comorbidity index,[48] and admission to the COVID unit. Additional covariates included provider service lines by discharging provider's service: specialty, advance practice provider (APP), resident, ICU, and hospitalist. Non-medicine specialty services included burn, neurology, OB-GYN, and all surgical subspecialties. APP services included several oncology and gastroenterology services and patients expected to stay less than 24 hours on an APP short stay service. Internal Medicine resident teams included cardiology, oncology and general medicine services. Hospitalist teams included transplant and oncology teams in addition to standard general medicine and cardiology services.

Data was placed into a secure Microsoft Excel spreadsheet and uploaded into statistical software (STATA Version 17, Statacorp College Station, TX USA). Basic descriptive statistics were reviewed for all variables for the overall sample. Univariate logistic regression was performed to test the association between COVID-positive status and code status ordering. Multivariable logistic regression was performed to test the association between code status ordering and the set of covariates listed in Table 3. Similar univariate and multivariable logistic regression analyses were performed on patient subgroups who were admitted during the pandemic. A 2-sided $P < .05$ was considered to be statistically significant. The study was reviewed and approved by the University of Chicago Medical School Institutional Review Board (IRB21–0009) under expedited review policies and procedures.

Results

Patient Demographics

We retrieved 59,497 encounters, excluding 26 which lacked demographic data, resulting in an analytic sample of 59,471 encounters representing 17,053 unique patients. We first present sample characteristics by the variable *C19TestCat* (Table 1). We conducted t tests for continuous measures and chi-square tests for categorical variables. Most patients were Black (64%), 5% were Hispanic, and 25.9% were non-Hispanic white. Females made up 56% of the study population, 12% of all admissions resulted in a transfer to the ICU, and just over half (52.4%) of admissions involved a length of stay of 2–5 days. 25% of all inpatient admissions involved the ordering of a code status.

Pre- Pandemic vs Pandemic Patients

During the pandemic, the proportion of female and male patients testing positive for COVID-19 was (50%). Though, the proportion of hospitalized females with COVID-19 was significantly lower than the proportion of females hospitalized pre-pandemic (57%, $P < .001$). The proportion of Black inpatients with COVID-19 (80.6%) was higher than the proportion of Black inpatients in the pre-pandemic era (62.2%) ($P < .001$). A greater proportion of patients who were COVID-positive had longer lengths of stay (16.7% 11–20 days, 10.4% 21+ days, $P < .001$) and ICU transfers (28%, $P < .001$) compared to other pre- and during pandemic patient groups. Compared with code status orders for patient encounters pre-pandemic (22%), there was an increase in the proportion of encounters with a code status order for COVID-positive encounters (65%) and COVID-negative encounters (32%), $P < .001$. During the pandemic, there was a decrease in the proportion of encounters with a code status order for COVID never tested encounters ($P < .001$).

Predictors of Code Status Orders

Patients who were COVID-positive had a 6.73 unadjusted odds of code status ordering compared to pre-pandemic patients, while patients without COVID had unadjusted odds of 1.65 (Table 2). In the adjusted model, compared to pre-pandemic patients, patients who were COVID-positive showed 2.51 greater odds of code status orders, patients without COVID showed a 1.56 greater odds of code status orders, and never-tested patients showed a 1.16 greater odds of code status orders ($P < .001$ for all coefficients) compared to pre-pandemic patients (Table 3). Patients in the COVID unit had 4.89 increased odds of code status orders ($P < .001$). Compared to Black patients, white patients had lower odds (aOR .86) of code status orders ($P < .001$). Other race/ethnicity categories were not significant in the adjusted model. Females had a slightly higher (aOR 1.05) odds of having code status orders ($P < .001$). Those with an ICU admission, those with longer lengths of stay in the hospital, and those more comorbid conditions also had higher odds of code status orders (see Tables 2 and 3).

We then restricted our analytic sample to those admitted during the pandemic only (n = 26,684) in Models 3 and 4 (see Table 3). Our findings in both the unadjusted and adjusted models reflect that patients who were COVID-positive had greater odds of code status ordering as compared to other patients. In the adjusted model, compared to patients who were COVID-positive, patients without COVID (aOR .63) and patients who were never-tested (aOR .47) had reduced odds of ordering. Those in the COVID unit had an increased odds of code status ordering by nearly 5-fold (aOR 4.79). Black patients continued to have the greatest odds of having a code status ordered as compared to white (aOR .86) and Hispanic (aOR .84) patients. Patients with other races documented did not show significant differences. Like Model 2, Model 4 shows that those with more comorbidities, longer lengths of stay, and an ICU admission have greater odds of code status ordering.

Discussion

The COVID-19 pandemic immensely affected medical care and society; and the uncertainty of COVID-19 prognosis and risk of deterioration prompted physicians and patients to more frequently engage in code status and advanced planning discussions. In this study, pre-pandemic code status ordering was expectedly low at our institution.[30] During the pandemic, code status ordering increased amongst the majority of patients, most notably for those with COVID-19. Comorbidities, ICU care, and hospital length of stay were all associated with a higher odds of code status ordering, underscoring the importance of illness acuity in ordering. COVID-positive status and being hospitalized in the COVID unit remained significant predictors of code status orders irrespective of these covariates.

Our findings are consistent with other studies which found varied changes of ACP documentation during the pandemic. In one retrospective cohort at a tertiary-care hospital, among 730 patients, the rate of patients without a code status order decreased, from 33.5% prior to the pandemic and 14% during the pandemic.[46] ACP rates around the pandemic were similar as a retrospective cohort at a tertiary-care hospital and level-1 trauma center found only 5.6% of 365 patients had completed ACP forms.[47] However, another single center study found that patients without COVID were more likely to have expanded ACP documentation during the pandemic.[49] When institutions made documentation standard using note templates and system-wide guidelines, one study shows rates reached more than 90%.[20]

The uncertainty of the disease process, the initial use of early intubation and the outcomes seen first at other sites most affected by the pandemic prior to our institution motivated our institution’s COVID unit to prioritize code status conversations, establish protocols to standardize code status documentation and encourage communication about code status between providers at handoff. While this culture was built with a small number of providers, it can be adapted and set as a standard among any group of providers, particularly in the context of hospital medicine, Internal Medicine residents or ICU level care where cultures of practice can drive behavior for end-of-life care.[50] While disease uncertainty may have played a large role when poor outcomes were feared, interventions for influencing physician behavior can target patients at risk for poor outcomes, such as those with elevated early warning scores who are at risk of cardiac arrest, or those with a high 6-month mortality, prioritizing efforts for those where conversations are most needed.[51–53]

While we expected to see an increase in code status orders for patients who were COVID-positive, we also saw an increase for those that were COVID-negative. This could be because providers, when faced with the images of greater in-hospital deaths during the pandemic, were reminded of the importance of documenting patient wishes early. This could also be explained by the facet that providers--encouraged to document for their patients who were COVID-positive-brought this behavior into their encounters with their other patients, either because they understood the importance of the practice for general patient care or because they became more accustomed to implementing this behavior in their everyday medical practice. That a decrease occurred in non-tested patients suggests that the pandemic was the driving factor, however patients who were never tested were less likely to be cared for by internal medicine providers. A templated smart phrase was used for COVID documentation among both presumed COVID infections and diagnosed COVID infections. This smart phrase included a prompt for code status and timing of discussion. In addition, providers from the COVID unit may have carried their practices outside of the unit, or such practices could have diffused to other providers when caring for patients with COVID and those without. After the unit disbanded, patients with COVID remained more likely to have code status documentation than other patients.

The demographics and clinical course of our patient population was consistent with national trends early in the pandemic[54] with a COVID-positive hospitalized population that was more likely to be Black, Hispanic and male and more likely to have longer lengths of stay and require ICU level of care. Our hospital serves a predominantly Black population. During the pandemic, which highlighted the disproportionate impact of COVID-19 on the Black community, we saw an increase in Black patients with COVID compared to our general population. Being Black was associated with a greater increase in odds ratio of code status ordering as compared to other race groups. Notably, in pre-pandemic studies, race is often negatively associated with ACP discussions occurring and code status ordering.[55–57] Other studies have shown equal rates of ACP completion, including code status, during the pandemic.[58] One explanation for these mixed results may be that the pandemic had an outsized effect on ICU admission rates and disease severity for Black patients[59] and those factors outweighed race in physician behavior towards code status ordering.

Nationwide, the pandemic's urgency may have led patients, providers and hospital systems to prepare for the worst and prioritize important goals of care discussions with patients and their loved ones. Our results show that early in the pandemic, physicians were more likely to order a code status on a patient, which was potentially influced by the pandemic, the unknown disease process, and the COVID unit culture influence itself.

Limitations

We were limited in assessing overall rates of advance care planning and goals of care documentation in this work. Code status is just one example of an end-of-life care preference, and the far more nuanced process of advance care planning is more challenging to measure discreetly. Code status ordering has its own flaws as a surrogate. If emphasized without training and skill, it can be done poorly without proper reflection of patient wishes and lead to over-treatment of patients. This work is also limited in evaluating whether a code status was entered without a conversation with the patient, because we did not examine progress notes or other indicators of preference. A breakdown of a change in code status from full code to DNR could more accurately represent that a discussion occurred.

We did not review additional outcomes related to the sequelae of code status ordering such as ICU transfers, number of code-blues, or rapid responses called. This current dataset is limited in that we do not have the ability to identify specific providers. We believe that there are merits to incorporating within and between provider level effects to understand whether COVID unit providers, who voluntarily chose to work there, were more likely to already demonstrate certain behaviors or the extent which the pandemic affected individual behaviors. These results came at a time before vaccines were widely distributed and with less standardization of treatment plans with antivirals, monoclonal antibodies, steroids and other immunomodulating agents. We believe additional analyses to incorporate such covariates may play an important role. Additionally, more longitudinal follow up to measure behaviors after improved COVID-19 survival rates is warranted. Further, the number of patients with COVID is likely an undercount. In February and part of March, patients admitted to the hospital under suspicion of COVID-19 received a PCR test which was initially sent to CDC for processing aligned with nationwide protocols. These were soon adjusted to allow for local PCR testing, which expanded testing to more patients with quicker turnaround times. While during most waves of the pandemic every patient was tested for COVID-19 on admission to the hospital, occasional testing supply shortages restricted testing to only patients who were showing active influenza-like-illness symptoms.

In summary, our study examined the placement of code status orders for patients prior to and during the COVID-19 pandemic and the effects of COVID-19positivity and a COVID unit had on the frequency of code status ordering. Overall code status ordering increased for all patients during the pandemic, including both patients diagnosed with or those that tested negative for COVID-19. The COVID unit was a main driver of increase in code status orders early in the pandemic. More work is needed to study whether these behaviors have been sustained and how to apply lessons learned beyond the acute pandemic. Our institution is using the study's findings to develop targeted interventions on patients with high risk of deterioration, incongruent code status orders, and high sixth month mortality to ensure a code status order is placed, serious illness conversations are documented, and palliative care consults are made.

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Table 1.

Demographic Data.

	CI9TestCat					
	Total N = 59,471	**Pre-Pandemic** N = 32,787	**No COVID-19 Test** N = 8689	**COVID-19 Negative** N = 16,364	**COVID-19 Positive** N = 1631	***P*-Value**
Age, mean (SD)	54.7 (19.6)	54.7 (19.4)	54.7 (18.5)	54.2 (20.3)	59.6 (19.0)	<.001
Female (%)	56.0	57.0	56.0	56.0	50.0	<.001
Race/ethnicity (%)						<.001
Black	64	62.2	51.9	72.2	80.6	
White, non-Hispanic	25.9	27.7	36.7	18.5	8.5	
Hispanic	5.0	5.1	5.0	4.7	6.5	
Other	2.8	2.9	3.2	2.5	2.0	
LOS in days (%)						<.001
0–1	12.7	12.2	21.8	9.6	4.7	
2–5	52.4	53.9	52.1	51.1	38.4	
6–10	20.6	20.3	17.1	22.2	29.7	
11–20	10.0	9.6	7.2	11.8	16.7	
21 +	4.2	4.0	1.9	5.3	10.4	
Charlson index (%)						<.001
0	28.7	29.3	31.1	26.7	22.5	
1–2	30.2	30.1	30.5	29.6	35.8	
3–5	22.2	21.7	19.2	24.4	25.4	
6+	18.1	17.8	17.2	19.2	16.2	
Missing	1.00	1.1	2.0	0.1	0.1	
ICU Flag (5%)	12.0	13.0	9.0	10.0	28.0	<.001
Service line (%)						<.001
APN	5.1	4.5	5.1	6.5	3.2	
Burn, gyn, neuro, surgery	42.1	42.7	57.4	36	10.8	
Medical resident	24.2	25.7	16.4	24.9	27.3	
Hospitalist	24.6	23	16.8	29.2	53.2	
ICU	1.5	1.4	0.8	1.8	5.0	

			CI9TestCat			
	Total	Pre-Pandemic	No COVID-19 Test	COVID-19 Negative	COVID-19 Positive	
	N = 59,471	N = 32,787	N = 8689	N = 16,364	N = 1631	*P*-Value
Other ICU	0.5	0.5	0.4	0.5	0.1	
COVID unit (%)	1.0	0.0	1.0	0.0	43.0	<.001
Code status order (%)	25.0	22.0	18.0	32.0	65.0	<.001

Table 2.

Logistic Regression of Code Status Documentation and Differences in Patient COVID Test Category.

	Model I[a]	Model 2[b]
COVID-19 test category$_1$		
No COVID-19 test	[.75, .85] .80***	[1.08, 1.24] 1.16***
Negative COVID-19 test	[1.58, 1.72] 1.65***	[1.48, 1.63] 1.56***
Positive COVID-19 test	[6.06, 7.48] 6.74***	[2.18, 2.89] 2.51***
Age$_2$		
40–64		[1.22, 1.40] 1.31***
65+		[1.77, 2.03] 1.90***
Race/ethnicity$_3$		
White, non-Hispanic		[.82, .91] .86***
Hispanic		[.83, 1.03] .92
Other		[.87, 1.15] 1.00
LOS (days)$_4$		
2–5		[1.01, 1.20] 1.10*
6–10		[1.27, 1.53] 1.40***
11–20		[1.42, 1.75] 1.58***
21 +		[1.74, 2.26] 1.98***
Charlson index$_5$		
1–2		[1.00, 1.15] 1.07
3–5		[1.09, 1.28] 1.18***
6+		[1.44, 1.68] 1.56***
ICU Transfer		[1.22, 1.39] 1.30***
Service line$_6$		
APN		[1.51, 1.78] 1.64***
Burn, gyn, neuro, surgery		[.08, .1] .09***

	Model 1[a]	Model 2[b]
Medical resident		[1.31, 1.45] 1.38***
ICU		[2.93, 4.05] 3.45***
Other ICU		[.80, 1.35] 1.04
COVID unit		[3.92, 6.11] 4.89***

Notes. Odds ratios and 95% confidence intervals are reported. Statistical significance denoted as

*** $P < .001$,

** $P < .01$,

* $P < .05$. Reference groups are 1- prepandemic (cl9TestCat), 2– 18-39 (age), 3- Black (race/ethnicity), 4– 0-1 days (LOS), 5– 0 (Charlson), 6- Hospital medicine (Service Line).

[a] Unadjusted odds are based on single variable logistic regression models.

[b] Adjusted odds are based on multivariable logistic regression models controlling for all covariates.

Table 3.

Logistic Regression of Code Status Documentation and Patient Test Category Differences, Pandemic Patient Analytic Sample.

	Model 3[a]	**Model 4[b]**
COVID-19 test Category1		
No COVID-19 test	[.11, 1.33] .12***	[.40, .54] .47***
Negative COVID-19 test	[.22, .27] .24***	[.54, .72] .63***
Age2		
40–64		[1.23, 1.49] 1.35***
65+		[1.69, 2.07] 1.87***
Race/ethnicity3		
White, non-Hispanic		[.79, .93] .86***
Hispanic		[.72, .98] .84*
Other		[.88, 1.32] 1.08
LOS (days)4		
2–5		[.94, 1.20] 1.06
6–10		[1.22, 1.59] 1.40***
11–20		[1.36, 1.82] 1.57***
21+		[1.53, 2.21] 1.84***
Charlson Index5		
1–2		[1.01, 1.25] 1.13***
3–5		[1.06, 1.32] 1.18***
6+		[1.38, 1.74] 1.55***
ICU Transfer		[1.17, 1.45] 1.30***
Service Line6		
APN		[1.01, 1.39] 1.24***
Burn, gyn, neuro, surgery		[.08, .10] .09***
Medical resident		[1.35, 1.56] 1.45***
ICU		[2.67, 4.31] 3.39***

	Model 3[a]	Model 4[b]
Other ICU		[.71, 1.61] 1.07
COVID unit		[3.83, 5.99] 4.79***

Notes. Odds ratios and 95% confidence intervals are reported. Statistical significance denoted as

***P<.001,

**P<.0l,

*P<.05. Reference groups are 1- COVID- positive (cl9TestCat), 2– 18-39 (age), 3- Black (race/ethnicity), 4– 0-1 days (LOS), 5– 0 (Charlson), 6- Hospital medicine (Service Line).

[a]Unadjusted odds are based on single variable logistic regression models.

[b]Adjusted odds are based on multivariable logistic regression models controlling for all covariates.