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### Introduction

Guidelines for managing pandemics recommend provision of palliative care to patients dying either directly from the disease or due to a determination of non-candidacy for life sustaining interventions (1). A third group of patients that also warrant palliative care consultation during a pandemic are those diagnosed with the pandemic virus and are receiving a trial of disease-directed treatment, and concurrently have a need for symptom management and/or goals of care planning. This latter category of patients constitutes the largest group of patients in need of specialist palliative care. Therefore, guidelines tend to under-appreciate the patient populations served by specialist palliative care during pandemic. This report describes changes in characteristics amongst hospitalized palliative care patients with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) infection during the initial stage of the COVID-19 pandemic in metropolitan New York.

### Methods

This is a repeated cross sectional, observational study describing differences in characteristics and outcomes of subjects seen by inpatient palliative care across three New York University (NYU) Langone Hospitals before and during the initial surge of COVID-19 patients in New York.

The NYU institutional review board approved this study as minimal-risk research and exempt from requirements of informed consent. All variables were collected by chart abstraction using the electronic health record (Epic; Epic Systems Corporation). All hospitalized patients age 18 years and older, seen by the palliative care consultation services, before the COVID-19 pandemic from January 4, 2020 to February 28, 2020 (Pre-outbreak group) and during the COVID-19 outbreak from March 5, 2020 to April 30, 2020 (Outbreak group) were included. The outbreak group was further subdivided into patients who had a positive nasopharyngeal polymerase chain reaction (PCR) test for severe acute

respiratory syndrome coronavirus 2 infection (COVID-19 positive) and those who tested negative or were not tested (COVID-19 negative). These two subgroups were compared to the pre-outbreak group separately. Clinical outcomes were monitored until June 18, 2020.

Data analysis was conducted using version 3.5.2 of the R programming language (R Project for Statistical Computing; R Foundation). Standard descriptive methods (e.g. means and standard deviations for continuous variables, counts and percentage for categorical variables) were used to summarize data. The Chi-square test was used for comparisons of categorical variables. Shapiro-Wilk test was used to test continuous variables for normality and Wilcoxon Rank Sum test was used to compare nonparametric data. Multivariate logistic regression was conducted to calculate adjusted odds ratios.

## Results

### **Pre-Outbreak** - January 4, 2020 to February 28, 2020:

During the pre-outbreak period, our three medical centers recorded 15,800 unique hospitalized patients making up 17,073 separate admissions. Of these hospitalizations, our palliative care service conducted 678 consultations (4% of total admissions). Demographic information of pre-outbreak palliative care consults is displayed in Table 1. The median age for these patients was 74.7 years old [IQR 63 - 86.3] with 51.4% being female. Most of the consults were on Caucasian (62.9%) patients which parallels the percentage seen among all hospitalized patients (59%). The most common comorbidities in our pre-outbreak patients was hypertension (67.9%), hyperlipidemia (51.9%), and cancer (44%). Of the patients seen by our inpatient consult team, 14.5% were seen previously by our outpatient service.

Hospitalization information for our palliative care patients is displayed in Table 2. About a third of our patients (33.9%), prior to the outbreak, were admitted to the ICU with a median length of stay of 9 days and median time to palliative care consultation of 3 days. Most of our patients (77.6%) were full code at time of admission. The most common discharge destinations for palliative care patients was to home (36.3%), skilled nursing facility (17.6%), and inpatient hospice (15.8%).

**COVID-19 Outbreak** - March 5, 2020 to April 30, 2020:

During the COVID-19 surge, our hospitals admitted 10,197 unique patients accounting for 10,830 hospitalizations, which was a significant decrease from pre-outbreak numbers ( $p < 0.01$ ). Among all admissions, 3,663 (36%) tested positive for COVID-19. The median age of all hospitalized patients dropped from 69 years old before COVID-19 to 58 ( $p < 0.01$ ) during the outbreak. The percentage of Hispanic (17.1% vs 20.5%;  $p < 0.01$ ) and Black patients (12.4% vs 13.9%;  $p < 0.01$ ) went up while the rate of Caucasian patients (59% vs 47.5%;  $p < 0.01$ ) decreased during the outbreak. Despite the drop in total admissions, our inpatient palliative care team completed 1,081 consultations (10% of total admissions), a 59% increase from the pre-outbreak period.

Covariates associated with increased odds of palliative care consultation included COVID-19 positive status (OR = 2.7; 95% CI = 2.28 – 3.2), history of cancer (OR = 1.71; 95% CI = 1.43 – 2.04), ICU admission (OR = 6.12; 95% CI = 5.14 – 7.29), and “Do-Not-Resuscitate (DNR)” order at time of admission (OR = 3.23; 95% CI = 2.56 – 4.06).

*COVID-19 Positive Palliative Care Patients*

The COVID-19 positive palliative care subgroup contained 695 patients who tested positive for the virus, making up 63.4% of our total consults during the outbreak. This group was compared to the pre-outbreak consultation group and found to have a significant increase in the percentage of males (60.7% vs 48.6%;  $p < 0.01$ ), and Latino patients (21.3% vs 13.3%;  $p < 0.01$ ), with a decrease in the number of Caucasian patients from 62.9% to 48.8% ( $p < 0.01$ ). We observed no difference in the rates of Black or Asian patients between the groups. The COVID-19 positive group had increased rates of obesity and diabetes with decreased rates of advanced organ failure and cancer. The COVID-19 positive group was also less likely to have been seen by palliative care as an outpatient prior to admission (4.7% vs 14.5%;  $p < 0.01$ ).

The COVID-19 positive group was found to have a higher rate of ICU admissions (58.9% vs 33.9%;  $p < 0.01$ ), longer length of stay (11 days vs 9 days;  $p < 0.01$ ), and a higher inpatient mortality rate (57.4% vs 13.1%;  $p < 0.01$ ) than the pre-outbreak group. The rate of mechanical ventilation was 58.9% and rate of dialysis was 23.6% (Table 3). Most patients in the COVID-19 positive group were full code on admission (86.1%), a significant increase from 77.6% ( $p < 0.01$ ) observed prior to the outbreak. We saw a decrease in discharges to home hospice, skilled nursing facilities, and home care in this group with no difference in the amount of inpatient hospice utilization. There were increased odds of mortality in palliative care patients who were positive for COVID-19 (OR = 3.21; 95% CI = 2.43-4.24) and for those that were admitted to the ICU (OR = 1.45; 95% CI = 1.11 – 1.9).

#### COVID-19 Negative Palliative Care Patients

We further compared the COVID-19 negative patients seen by palliative care during the outbreak with the pre-outbreak palliative care consult group. These two groups were similar in demographic and hospitalization characteristics. The COVID-19 negative group was slightly younger (72.7 vs 74.7 years old;  $p = 0.04$ ) and had an increased rate of obesity (34.5% vs 23.3%;  $p < 0.01$ ) when compared to the pre-outbreak group. We observed no difference in gender, race, ethnicity, or previous outpatient palliative care visits between the two groups.

The COVID-19 negative palliative care subgroup had similar hospitalization characteristics to the pre-outbreak palliative care consults. There was no difference in ICU admissions, admission-code status, or discharge plan. The COVID-19 negative subgroup did have a longer length of stay (10.2 vs 9 days;  $p < 0.01$ ) and increased mortality rate (22.2% vs 13.1%;  $p < 0.01$ ), in addition to a decrease in the time to palliative care consult (2 days vs 3 days;  $p = 0.02$ ) when compared to the pre-outbreak group. The rate of mechanical ventilation was 26.4% and rate of dialysis was 8.1% in the COVID-19 negative group.

#### **Discussion**

Our study provides a unique perspective on inpatient palliative care consultations from a large health system during the initial COVID-19 outbreak in New York. By comparing patients seen during the outbreak with patients seen before the outbreak, we describe some major differences between the two palliative care populations.

The palliative care consultation service saw a significant increase of 59% in the number of consultations during the outbreak with 67% of these consults being positive for COVID-19. Penetration rates, defined as the percent of all hospital discharges receiving palliative consultation, rose by two and a half times. The COVID-19 positive patients were much more likely to be male and Latino. These findings are consistent with changes seen in our total hospital population and with New York State-level data (2). Our services did not see an increase in the proportion of Black patients despite increases in the percentage of admitted Black patients during the outbreak. It is unclear whether lower rates of palliative consultation for Black patients were due to clinician-dependent variables, patients' preferences, or other factors (3,4).

When looking at pre-hospitalization comorbidities, the rates of advanced disease states like heart failure, chronic obstructive pulmonary disease, and cancer were higher in our pre-outbreak group while metabolic disorders like obesity and diabetes were higher in the COVID-19 positive patients. Only 4% of the COVID-19 positive patients had seen outpatient palliative care compared to 14.5% before the outbreak, which suggests that the COVID-19 positive population was relatively healthier prior to hospitalization than baseline palliative patients.

The COVID-19 positive patients were more acutely ill than the baseline palliative patient population. COVID-19 positive patients had the highest rate of mortality and ICU stays, as well as longest length of stay. Both COVID-19 and ICU admission statuses were found to be associated with higher odds of inpatient mortality. Over half of the patients from the COVID-19 group required mechanical ventilation and just under a quarter of patients needed dialysis. Despite greater mortality, we saw no

increase rise in the use of either inpatient or home hospice which is consistent with the relatively healthier baseline and significantly higher rates of “Full-Code” status on admission. The large drop in referral to home hospice amongst this group was likely in part due disease severity and rapid deterioration after election for comfort focused care. It is possible that plans for home hospice were made more difficult due to the prevalence of COVID illnesses among family members.

Although there were some differences between the pre-outbreak group and the COVID-19 negative groups, these two cohorts were very similar. The significant increase in the rate of obesity in this group, coupled with previous studies illustrating obesity as a risk factor for hospitalization from COVID-19, may suggest that some of these patients had false negative tests or otherwise undiagnosed COVID-19 infections (5,6). The COVID-19 negative group did have an increase in length of hospitalization as well as mortality rate which could very well be from disruption from usual care from surging number of patients in the hospital during that time. Moreover, primary teams likely had a lower threshold to consult our service for this group as the median time to consult decreased.

This description of a COVID-19 positive palliative care population has several limitations. Comparing the outbreak group with a population during the corresponding period in 2019 may have yielded a more accurate depiction of our baseline population however, this was not possible given a recent change in the electronic medical record platform in one of our hospitals. The large sample sizes precluded extracting non-categorical data such as reason for consult and degree of symptom burden. We were also unable to extract baseline rates of mechanical ventilation and dialysis rates in our pre-outbreak group because of changes in collecting that data from the medical record. Furthermore, the retrospective nature of the study allows us to make observations about the populations but does not explain why these changes occurred.

In summary, palliative services may expect a large surge in consultation volume during viral epidemic and should prepare for a high proportion of critical ill patients and for high mortality. Most of these consultations were not triggered by limitations in life-sustaining resources.

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Table 1: Demographic Data	Before Outbreak  (n = 588)	During Outbreak			
		COVID-19 Negative/Not Tested		COVID-19 Positive	
		(n = 329)	p-value	(n = 695)	p-value
<b>Age (years): median [IQR]</b>	74.7 [63 - 86.3]	72.74 [59.1 - 84]	<b>0.04</b>	73.18 (63 - 83.3)	0.08
<b>Gender: n (%)</b>					
Female	302 (51.4)	170 (51.7)		273 (39.3)	
Male	286 (48.6)	159 (48.3)	0.92	422 (60.7)	< 0.01
<b>Ethnicity: n (%)</b>					
Hispanic or Latino	78 (13.3)	40 (12.2)		148 (21.3)	
Non-Hispanic or Non-Latino	498 (84.7)	281 (85.4)		484 (69.6)	
Unknown/Not Reported	12 (2.0)	8 (2.4)	0.83	63 (9.1)	< 0.01
<b>Race: n (%)</b>					
Caucasian	370 (62.9)	205 (62.3)	0.85	339 (48.8)	< 0.01
Black	83 (14.1)	34 (10.3)	0.12	91 (13.1)	0.65
Asian	44 (7.5)	33 (10.0)	0.22	51 (7.3)	1
Other or Unknown	91 (15.5)	56 (17)	0.64	214 (31)	< 0.01
<b>Comorbidities: n (%)</b>					
Hyperlipidemia	305 (51.9)	151 (45.9)	0.1	357 (51.4)	0.9
Hypertension	399 (67.9)	204 (62)	0.09	487 (70.1)	0.43
Obesity	135/579 (23.3)	111/322 (34.5)	< 0.01	358/678 (52.8)	< 0.01
COPD	98 (16.7)	44 (13.4)	0.21	81 (11.7)	0.01
Heart Failure	170 (28.9)	75 (22.8)	<b>0.05</b>	98 (14.1)	< 0.01
Coronary Artery Disease	129 (21.9)	62 (18.8)	0.31	153 (22.1)	1
Peripheral Vascular Disease	45 (7.7)	28 (8.5)	0.74	59 (8.5)	0.66
Diabetes	182 (31.0)	83 (25.2)	0.08	284 (40.7)	< 0.01
Asthma	53 (9.0)	36 (10.9)	0.41	65 (9.4)	0.91
CKD	117 (19.9)	71 (21.6)	0.66	138 (19.9)	1
Cancer	259 (44.0)	133 (40.4)	0.32	134 (19.3)	< 0.01
Cirrhosis	25 (4.3)	19 (5.8)	0.38	10 (1.4)	< 0.01
Autoimmune Disorder	38 (6.5)	15 (4.6)	0.3	31 (4.5)	0.14
<b>Previously Seen by Outpatient Palliative Care: n (%)</b>	85 (14.5)	47 (14.3)	1	33 (4.7)	< 0.01

Table 2: Hospital Characteristics	Before Outbreak (n = 678)	During Outbreak			
		COVID-19 Negative/Not Tested (n = 356)		COVID-19 Positive (n = 725)	
			p-value		p-value
<b>Intensive Care Unit: n (%)</b>	230 (33.9)	140 (39.3)	0.1	427 (58.9)	< 0.01
<b>Length of Stay (Days): Median [IQR]</b>	9 [5-15]	10.2 [3-12]	< 0.01	11 [6-22]	< 0.01
<b>Time to Palliative Care Consult (Days): Median [IQR]</b>	3 [1-6]	2 [1-5]	0.02	5 [2-12]	< 0.01
<b>Code Status: n (%)</b>					
Admission – Full Code	562 (77.6)	272 (76.4)		624 (86.1)	
Admission – Do Not Resuscitate	147 (21.7)	83 (23.3)	0.63	100 (13.8)	< 0.01
<b>Disposition: n (%)</b>					
Home/Self-Care	246 (36.3)	123 (34.6)	0.58	69 (9.5)	< 0.01
Skilled Nursing Facility	119 (17.6)	48 (13.5)	0.09	59 (8.1)	< 0.01
Acute Rehab Facility	19 (2.8)	8 (2.3)	0.59	22 (3)	0.8
Long Term Acute Care (LTAC)	2 (0.3)	3 (0.8)	0.23	6 (0.83)	0.19
Inpatient Hospice	107 (15.8)	53 (14.9)	0.71	96 (13.2)	0.18
Home Hospice	83 (12.2)	34 (9.6)	0.19	3 (0.4)	< 0.01
Deceased	89 (13.1)	79 (22.2)	< 0.01	416 (57.4)	< 0.01
Still Admitted	3 (0.4)	2 (0.56)	0.79	52 (7.2)	< 0.01

Table 3: Advanced Intervention Utilization in Palliative Care Patients During Outbreak	<b>COVID-19 Negative/Not Tested (n = 356)</b>	<b>COVID-19 Positive (n = 725)</b>
<b>Invasive Mechanical Ventilation:</b> n (%)	94 (26.4)	426 (58.8)
<b>Dialysis:</b> n (%)		
Continuous Renal Replacement	9 (2.4)	75 (10.3)
Hemodialysis	19 (5.3)	88 (12.1)
Peritoneal	1 (0.3)	8 (1.1)
Total	29 (8.1)	171 (23.6)