

Outcomes among 6721 Hospitalized COVID-19 Patients across the New York City Public Hospital System: a Retrospective Cohort Study



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BACKGROUND

Coronavirus-19 (COVID-19) has become a leading cause of death in the USA. New York City was heavily impacted by the virus, with hospitalizations and deaths disproportionately concentrated among lower income and minority communities.¹ Clinical outcomes among such populations and within safety net care settings remain largely undescribed or methodologically constrained by short follow-up periods and large proportions of patients still hospitalized.^{2–5} Accordingly, we describe 30-day hospital outcomes among COVID-19 patients admitted to an 11-hospital public health care system in New York City.

METHODS

We conducted a retrospective cohort study of adults 18 years and older with laboratory-confirmed COVID-19 by real-time reverse transcriptase–polymerase chain reaction (RT-PCR) assay of nasopharyngeal swab specimens. The cohort included all admitted patients within 11 public hospitals in four boroughs of New York City during the period of the pandemic between March 1 and April 13, 2020. Data was collected through May 12 to allow this study period to enable a 30-day follow-up for those patients admitted on April 13. This allowed avoidance of underreporting of mortality by including patients too early in their clinical course for meaningful outcome evaluation. We included only the most recent admission per patient, attributing transfers between study hospitals to the final hospital's borough.

Primary outcomes were hospital discharge, death or discharge to hospice, or ongoing hospitalization at 30 days after admission. By outcome, we described distributions of demographic and geographic characteristics, rates of intubation, and rates of renal replacement therapy (RRT); we further stratified patients by intubation status, RRT, and age. To characterize

the degree to which mortality reflected patient goals to avoid life-sustaining treatments, we reviewed documented admission and final code status among patients who died or went to hospice to quantify the percent admitted as Do Not Resuscitate (DNR), transitioned to DNR during hospitalization, and maintained as full code up until study endpoint. Data were obtained from the electronic medical record. The study was exempted by the Biomedical Research Alliance of New York (BRANY) institutional review board.

RESULTS

During the study period, 6721 patients with laboratory-confirmed COVID-19 were admitted at study hospitals, including 5113 (76.1%) over age 50, 4130 (61.4%) male, 2579 (38.4%) non-English preferring, and 2786 (41.5%) on Medicaid or self-pay (uninsured) (Table 1). During their hospitalization, 1683 (25.0%) required intubation and 703 (10.5%) RRT. By 30 days, 3984 (59.3%) had been discharged, 2306 (34.3%) had died or gone to hospice, and only 431 (6.4%) remained hospitalized.

Outcomes varied by patient characteristics. Mortality strongly paralleled age (Table 1). Non-English and non-Spanish-preferring patients had higher mortality (43.7%) than English- (35.2%) or Spanish-preferring (30.2%) ones, as did uninsured patients (34.9%) compared to those with Medicaid (22.0%) or commercial (21.9%) insurance. Markedly higher mortality was observed among intubated patients (72.0%) and those requiring RRT (57.2%) (Table 1), compared to neither (21.1%) (Table 2); for example, mortality among patients younger than 40 was 2.6% without intubation or RRT, climbing to 71.9% requiring both. One-quarter (25.2%) of intubated patients requiring RRT remained in-hospital at 30 days. Among 2306 patients who died, 409 (17.7%) were DNR upon admission, with the rest full code (39.7%) or made DNR during hospitalization (42.6%).

DISCUSSION

At 30 days, one in three patients admitted with COVID-19 at New York City public hospitals had expired or gone to hospice. Our use of 30-day outcomes minimizes mortality underreporting in other studies due to shorter follow-up

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Table 1 Patient Characteristics and 30-Day In-Hospital Outcomes Among Laboratory-Confirmed COVID-19 Patients Admitted to 11 Public Hospitals in New York City

	Total, N (%) [*]	Hospital outcome, N (%) [†]		
		Discharged [‡]	Died or hospice	In hospital
Total	6721 (100.0)	3984 (59.3)	2306 (34.3)	431 (6.4)
Age, N (%) [†]				
18–39	756 (11.2)	633 (83.7)	89 (11.8)	34 (4.5)
40–49	852 (12.7)	632 (74.2)	156 (18.3)	64 (7.5)
50–59	1362 (20.3)	917 (67.3)	326 (23.9)	119 (8.7)
60–69	1526 (22.7)	873 (57.2)	519 (34.0)	134 (8.8)
70–79	1264 (18.8)	598 (47.3)	604 (47.8)	62 (4.9)
80+	961 (14.3)	331 (34.4)	612 (63.7)	18 (1.9)
Sex, N (%)				
Female	2590 (38.5)	1596 (61.6)	852 (32.9)	142 (5.5)
Male	4130 (61.4)	2388 (57.8)	1454 (35.2)	288 (7.0)
Unknown or other	1 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Race/ethnicity, N (%)				
Asian or Pacific Islander	385 (5.7)	213 (55.3)	142 (36.9)	30 (7.8)
Hispanic	751 (11.2)	467 (62.2)	232 (30.9)	52 (6.9)
Non-Hispanic White	609 (9.1)	306 (50.2)	283 (46.5)	20 (3.3)
Non-Hispanic Black	2084 (31.0)	1286 (61.7)	686 (32.9)	112 (5.4)
Other or unknown	2892 (43.0)	1712 (59.2)	963 (33.3)	217 (7.5)
Preferred language, N (%)				
English	4142 (61.6)	2452 (59.2)	1460 (35.2)	230 (5.6)
Spanish	2082 (31.0)	1287 (61.8)	629 (30.2)	166 (8.0)
Other or unknown	497 (7.4)	245 (49.3)	217 (43.7)	35 (7.0)
Borough, N (%)				
Bronx	1826 (27.2)	1120 (61.3)	599 (32.8)	107 (5.9)
Brooklyn	1779 (26.5)	993 (55.8)	695 (39.1)	91 (5.1)
Manhattan	1495 (22.2)	945 (63.2)	403 (27.0)	147 (9.8)
Queens	1621 (24.1)	926 (57.1)	609 (37.6)	86 (5.3)
Primary payer, N (%)				
Medicare	2641 (39.3)	1165 (44.1)	1345 (50.9)	131 (5.0)
Medicaid	2291 (34.1)	1598 (69.8)	505 (22.0)	188 (8.2)
Commercial	1270 (18.9)	911 (71.7)	278 (21.9)	81 (6.4)
Self-pay (uninsured)	495 (7.4)	293 (59.2)	173 (34.9)	29 (5.9)
Other	24 (0.4)	17 (70.8)	5 (20.8)	2 (8.3)
Intubated, N (%)				
Yes	1683 (25.0)	177 (10.5)	1212 (72.0)	294 (17.5)
No	5038 (75.0)	3807 (75.6)	1094 (21.7)	137 (2.7)
Renal replacement, N (%)				
Yes	703 (10.5)	174 (24.8)	402 (57.2)	127 (18.1)
No	6018 (89.5)	3810 (63.3)	1904 (31.6)	304 (5.1)

^{*}Percentages reported in aggregate are of column totals; [†]Percentages reported by endpoint are of row totals. [‡]Discharge includes patients discharged to home, skilled nursing, rehabilitation, long-term acute care, or other intermediate care levels

Table 2 Thirty-Day In-Hospital Outcomes Among Recipients and Non-recipients of Intubation and Renal Replacement Therapy Among Patients with COVID-19 Admitted to 11 Public Hospitals in New York City

	Hospital outcome, N (%) [*]		
	Discharged [†] , N=3984	Died or hospice, N=2306	In hospital, N=431
Intubated			
Renal replacement therapy			
Total	18 (4.0)	320 (70.8)	114 (25.2)
Age, N (%)			
18–39	3 (9.4)	23 (71.9)	6 (18.8)
40–49	3 (6.0)	30 (60.0)	17 (34.0)
50–59	4 (3.6)	73 (65.8)	34 (30.6)
60–69	5 (3.2)	112 (71.3)	40 (25.5)
70–79	3 (3.8)	64 (80.0)	13 (16.3)
80+	0 (0.0)	18 (81.8)	4 (18.2)
No renal replacement therapy			
Total	159 (12.9)	892 (72.5)	180 (14.6)
Age, N (%)			
18–39	36 (37.5)	49 (51.0)	11 (11.5)
40–49	30 (21.6)	81 (58.3)	28 (20.1)
50–59	37 (15.2)	155 (63.8)	51 (21.0)
60–69	34 (10.3)	239 (72.2)	58 (17.5)
70–79	17 (6.1)	238 (85.0)	25 (8.9)
80+	5 (3.5)	130 (91.5)	7 (4.9)
Not intubated			
Renal replacement therapy			
Total	156 (62.2)	82 (32.7)	13 (5.2)
Age, N (%)			
18–39	11 (91.7)	1 (8.3)	0 (0.0)
40–49	26 (86.7)	2 (6.7)	2 (6.7)
50–59	42 (71.2)	13 (22.0)	4 (6.8)
60–69	38 (62.3)	20 (32.8)	3 (4.9)
70–79	33 (54.1)	25 (41.0)	3 (4.9)
80+	6 (21.4)	21 (75.0)	1 (3.6)
No renal replacement therapy			
Total	3651 (76.3)	1012 (21.1)	124 (2.6)
Age, N (%)			
18–39	583 (94.6)	16 (2.6)	17 (2.8)
40–49	573 (90.5)	43 (6.8)	17 (2.7)
50–59	834 (87.9)	85 (9.0)	30 (3.2)
60–69	796 (81.5)	148 (15.1)	33 (3.4)
70–79	545 (64.7)	277 (32.9)	21 (2.5)
80+	320 (41.6)	443 (57.6)	6 (0.8)

^{*}Percentages reported by endpoint are of row totals. [†]Discharge includes patients discharged to skilled nursing, rehabilitation, long-term acute care, or other intermediate care levels

periods or high proportions of patients remaining in-hospital.^{2,3} Higher rates of intubation and RRT in the hospitals studied than elsewhere may suggest more advanced disease

or greater underlying medical risk among our patient population.²⁻⁵ Furthermore, greater uninsurance and underinsurance, linguistic diversity, and social risk among public hospital patients may have provoked delays seeking care, worsening outcomes. Finally, a large proportion of patients who died—nearly one in five—were admitted as DNR, warranting comparison across care settings. There were several limitations to this descriptive study: the lack of data on known cause of death; therapeutics given did not allow for statistical analysis of the cohort to determine impacts of such outcomes. Despite this, COVID-19's substantial impact on public hospitals suggests the need to identify solutions to increase access to timely care and mitigate outcome disparities among lower income and minority populations.⁶

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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