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Characteristics and mortality outcomes among COVID-19 outpatients and inpatients in the United States

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INTRODUCTION

- The number of deaths attributed to COVID-19 in the US has exceeded 590,000 as of June 3, 2021, with more than 600 additional deaths reported weekly.[1]
- Initial studies indicate that patient characteristics, including age, race, and comorbidity burden are associated with poorer clinical outcomes and higher mortality.[2]
- To achieve better understanding of the burden of COVID-19, it is important to assess outcomes from the time of diagnosis in outpatient and inpatient care setting.

AIM

To assess patient characteristics and mortality outcomes among adults with COVID-19 by their highest level of care in the US

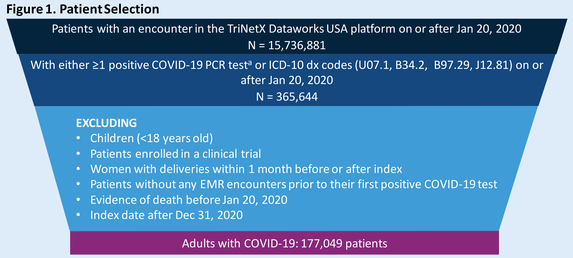
METHOD

Study Design: Retrospective cohort study

Data Source

- TriNetX Dataworks USA, a federated electronic medical record (EMR) network of 44 Healthcare Organizations (HCOs) across the U.S. treating 60+ million de-identified patients
- HCOs contributing both inpatient and outpatient data were included
- Study Period: January 20, 2020 - January 25, 2021
- Index date: the first COVID-19 diagnosis (ICD-10 codes: U07.1, B34.2, B97.29, J12.81) or positive SAR-CoV-2 PCR test, whichever occurs first by 12/31/2020
- Baseline period: up to 1 year before and including the index date
- Follow-up period: earliest of death, end of patient record, or end of study

Figure 1. Patient Selection



[a]LOINC: 41458-1, 94307-6, 94308-4, 94309-2, 94310-0, 94314-2, 94315-9, 94316-7, 94500-6, 94502-2, 94533-7, 94534-5, 94558-4, 94559-2, 94565-9

Patient Characteristics

- Demographics: age group, sex, and race
- Index date calendar quarter
- Baseline comorbidities[3] and proportion with ≥1 comorbidity
- The highest level of care: outpatient, inpatient stay (without ICU), intensive care unit (ICU) only, or ICU with invasive mechanical ventilation (IMV) / extracorporeal membrane oxygenation (ECMO)

Mortality

- As reported by the treating HCO and supplemented by patient linkage for a subset of HCOs to Datavant mortality data.

Analysis

- Summary statistics for all measures reported as count and proportion
- Mortality outcome was calculated using Kaplan-Meier curves (to account for censoring data) by highest level of care and race, differences between strata are described using log-rank tests

RESULTS

- The study cohort of 177,049 patients had a mean age of 48 years, 55.9% female, 61.7% White, and 18.8% Black or African American (Table 1).
- The mean (SD) duration of the baseline and follow-up periods were 5.8 (5.0) months and 4.4 (2.9) months, respectively
- Of 177,049 patients with COVID-19, 173,304 had a record of any health care resource utilization (HCRU) over the follow up period. Of the 173,304 patients, 15.1% (26,338/173,304) had at least 1 hospitalization. Of those who were hospitalized, 17.5% received care in ICU with or without IMV/ECMO . For those ≥ 65 year, 31.2% were hospitalized.
- Patients receiving care in the ICU with or without IMV/ECMO, were more likely to be older (52.2% and 46.7%), male (58.4% and 58.5%), and Black (25.9% ad 32.5%) compared to patients in an outpatient or inpatient settings without ICU.

Table 1. Demographic Characteristics

Demographics	All Patients		Highest Level of Care (follow-up period)							
			Outpatient		Inpatient (w/o ICU)		ICU		ICU with IMV/ECMO	
	N	%	N	%	N	%	N	%	N	%
	177,049	100%	150,711	85.1%	18,470	10.4%	3,617	2.0%	4,251	2.4%
Age Groups, n (%)										
18-34	50,033	28.3%	47,550	31.6%	2,017	10.9%	205	5.7%	261	6.1%
35-49	43,378	24.5%	39,191	26.0%	3,117	16.8%	457	12.6%	613	14.4%
50-64	45,363	25.6%	37,601	25.0%	5,303	28.6%	1,067	29.5%	1,392	32.7%
65+	38,275	21.6%	26,369	17.5%	8,033	43.4%	1,888	52.2%	1,985	46.7%
Calendar Time, n (%)										
1Q2020	10,192	5.8%	7,090	4.7%	1,709	9.2%	543	15.0%	850	20.0%
2Q2020	45,525	25.7%	37,297	24.8%	5,304	28.6%	1,201	33.2%	1,723	40.5%
3Q2020	53,740	30.4%	47,565	31.6%	4,640	25.1%	755	20.9%	780	18.3%
4Q2020	67,592	38.2%	58,759	39.0%	6,817	36.8%	1,118	30.9%	898	21.1%
Sex, n (%)										
Female	98,980	55.9%	86,174	57.2%	9,540	51.5%	1,502	41.5%	1,764	41.5%
Male	77,276	43.6%	63,788	42.3%	8,891	48.0%	2,112	58.4%	2,485	58.5%
Unknown	793	0.4%	749	0.5%	39	0.2%	3	0.1%	2	0.05%
Race, n (%)										
White	109,187	61.7%	94,020	62.4%	11,175	60.4%	2,066	57.1%	1,926	45.3%
Black or African American	33,296	18.8%	26,666	17.7%	4,312	23.3%	937	25.9%	1,381	32.5%
Other	5,083	2.9%	4,221	2.8%	532	2.9%	121	3.3%	209	4.9%
Unknown	29,483	16.7%	25,804	17.1%	2,451	13.2%	493	13.6%	735	17.3%

Table 2. Baseline Comorbidities

Baseline comorbidities	All Patients	
	N	%
	177,049	100%
≥1 comorbidities	72,735	41.1%
Asthma	12,169	6.9%
Cancer	8,497	4.8%
Cerebrovascular disease	6,100	3.4%
Chronic kidney disease	9,939	5.6%
COPD	9,276	5.2%
Type 2 Diabetes	22,525	12.7%
Hypertension	44,249	25.0%
Obesity	3,750	2.1%
Pregnancy	4,292	2.4%
Serious heart conditions	17,094	9.7%
Solid organ transplant	5,397	3.0%

Figure 2. High Risk Baseline Comorbidities by Highest Level of Care

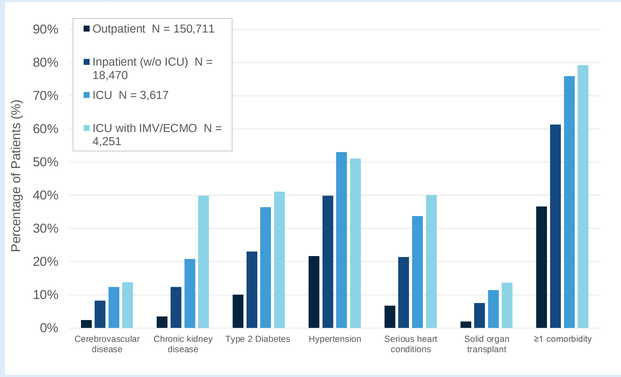
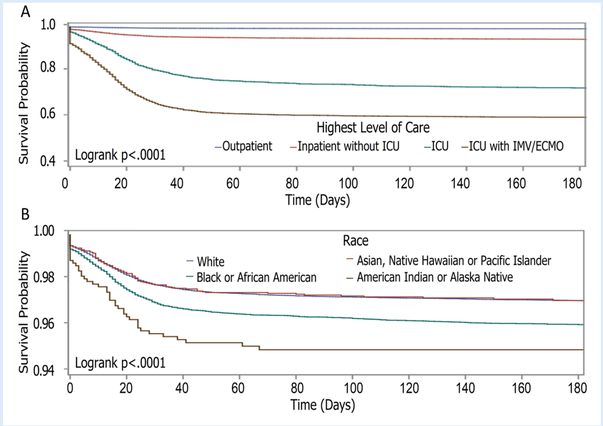


Figure 3. Kaplan-Meier plots of Overall Survival by (A) Highest Level of Care (B) Race



Note: Figure 3B does not include the 28,675 individuals who did not have race recorded in their EMR

- Hypertension (25.0%), type 2 diabetes (12.7%), and serious heart conditions (9.7%) were the most prevalent comorbidities (Table 2 and Figure 2).
- One or more baseline comorbidities was associated with a higher level of care, with a prevalence ranging from 36.7% among Outpatient to 79.2% among patients in the ICU with IMV/ECMO.
- Overall, the probability of all-cause 180-day mortality is 2.9%
- The probability of all-cause 180-day mortality increased with greater levels of care received, 0.9% outpatient, 5.5% inpatient (without ICU), 26.7% ICU (without IMV/ECMO), and 39.4% ICU with IMV/ECMO (p<0.001) (Figure 3A)
- The probability of all-cause 180-day mortality was significantly higher in males (3.9%) vs. females (2.2%), and in American Indian or Alaska Native (5.0%) and Black or African American (3.9%) races compared to White or Asian, Native Hawaiian or Pacific Islander races (both, 2.9%) (p<0.001) (Figure 3B)

CONCLUSIONS

- This large real-world US study found 15% of the COVID-19 cohort required hospitalization. Among those who were hospitalized, 17.5% required ICU with or without or without IMV/ECMO.
- All-cause 180-day mortality was 2.9%, ranging from 5.5% inpatient (without ICU) to 39.4% ICU with IMV/ECMO. Higher mortality were associated with older age, male, and in American Indian/Alaska Native and Black populations.
- Additional COVID-19 treatment options for patients in outpatient and inpatient settings are needed to prevent hospitalizations and improve clinical outcomes

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2. Gallo Marin B et al. "Predictors of COVID-19 severity: A literature review." Rev Med Virol 2021; 31: e2146
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