Racial and Ethnic Disparities in COVID-19 Treatments in the United States

Poster # 663

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Conclusions

- Black patients were less likely to receive COVID-19 treatment compared to White and Asian patients after accounting for differences in comorbidity burden and demographics
- The finding was consistent across all levels of COVID-19 severity, as measured using baseline supplemental oxygen requirement
- These findings are indicative of both under- and overtreatment according to patient race.
  - For example, White patients with NSOc were significantly more likely to receive corticosteroids and baricitinib than Black patients, despite clinical guidelines recommending against initiating these treatments in patients with NSOc
  - Conversely, White patients with LFO were more likely to receive remdesivir treatment than Black patients, which was indicative of undertreatment of Black patients.
- While remdesivir is selectively recommended for initiation among patients with HFO/NIV, growing evidence indicates its likely beneficial role among patients with and without hypoxemia[3, 4]
- The finding of inequitable delivery of life-saving treatments is likely to be an important contributor to the well-documented racial disparities in COVID-19 outcomes
- Few differences in the administration of COVID-19 treatments were observed between Hispanic and non-Hispanic patient populations, with the exception of tocilizumab
  - This lack of consistent trend in treatment initiation according to ethnicity is likely to reflect the considerable heterogeneity of the non-Hispanic and Hispanic patient populations

References:
1. Clemans-Cope L., B.G.A., McMorrow S. How Should We Measure and Interpret Racial and Ethnic Disparities in Health Care? 2023. Accessed 15-Jul-2023]; Available from: https://ssrn.com/abstract=4376574.
2. Rubin-Miller, L., et al. Kaiser Family Foundation, 2020. **2020916**.
3. Mozaffari, E., et al. Clin Infect Dis, 2021.
4. Mozaffari, E., et al. Open Forum Infectious Diseases, 2023.

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Background

- Long-standing differential access to goods, services and opportunities according to race and ethnicity has led to widespread and well-documented disparities in health status and medical care in the United States (US).[1, 2]
- The COVID-19 pandemic has magnified these racial and ethnic disparities, with heightened risk for COVID-19 incidence, morbidity and mortality demonstrated in many minority populations.[2]
- The rate of hospitalization of Black patients due to COVID-19 has been shown to be more than three times higher, and for Hispanic patients over four times higher, compared to White patients.[2]
- There is a necessity to examine and identify differences in the delivery of appropriate and potentially life-saving COVID-19 therapies according to race and ethnicity, so efforts can be made to ensure the delivery of equitable healthcare and lessen inequities in COVID-19 outcomes.
- The objective of the study was to characterize disparities in the administration of evidence-based COVID-19 treatments among patients hospitalized for COVID-19.

Methods

Study Design

- Retrospective cohort study
- **Study period**: May 2020-April 2022
- **Data source**: PINC AI Healthcare Database (formerly Premier Healthcare Database)
  - U.S. hospital-based, service-level, all-payer (Commercial, Medicare, Medicaid, others) database
  - Covers ~25% of all US hospitalizations from 48 states.
  - Includes information on billed services and activities for each day of the hospitalization
  - Underlying dataset included >700,000 COVID-19 hospitalizations with a primary diagnosis of COVID-19 from 954 hospitals during the study period, providing rich source of information and large sample size for each subgroup analysis considered

Table 1. Study design

Inclusion criteria	✓ First admission to the hospital between 1st May 2020 and 30th April 2022
	✓ ***Primary* discharge diagnosis of COVID-19** (ICD-10-CM: U07.1) flagged for being "present-on-admission"
	✓ Age ≥18 years old
Exclusion criteria	x Pregnant
	x Had incomplete data/ erroneous data fields
	x Transferred from hospice or another hospital
	x Unknown gender
	x Admitted for elective procedures
	x Admitted with no supplemental oxygen (NSOc) on admission to a hospital that did not report any low flow oxygen (LFO)
	x Patients with extracorporeal membrane oxygenation (ECMO) in the first two days of hospitalization
	x COVID-19 diagnosis not flagged as "Present on admission"

- **Primary End Point**: Initiation of any guideline-recommended COVID-19 treatments within two days of hospitalization (corticosteroid, remdesivir, baricitinib and tocilizumab)
- Patients were categorized according to their recorded race (White, Black, Asian, Other) and their recorded ethnicity (Hispanic, Non-Hispanic, Unknown).

Statistical analysis

- **Descriptive analyses:**
  - Baseline characteristics of study cohort overall and according to race
  - Baseline characteristics of study cohort overall and according to ethnicity
- **Multivariate logistic regression:**
  - Outcome: receiving any COVID-19 treatment within 2 days of hospitalization
  - Covariates: age, gender, hospital size, rural/urban, teaching hospital status, geographic region, primary payer, admission month/variant time period, renal disease, immunocompromised conditions, categories of CCI, and hospital ward upon admission

Results

Study population

- There were 454,761 adults hospitalized for COVID-19 between May 2020 and April 2022
  - White: 70%, Black: 17%, Asian: 2%, Other: 11%
  - Non-Hispanic: 72.6%, Hispanic: 16.3%, Unknown: 11.1%
- White patients were older, with a lower proportion admitted during the pre-Delta period, and had a lower comorbidity burden than Black, Asian, and other patients (**Table 2**)
- White patients were more likely to receive COVID-19 treatments, and specifically corticosteroids, compared to Black, Asian, and other patients (COVID-19 treatment: 87% vs. 81% vs. 85% vs. 84%, corticosteroids: 85% vs. 79% vs. 82% vs. 82%) (**Table 2**)
- White patients were less likely than Asian patients to have remdesivir (53% vs. 56%) initiated but considerably more likely than Black patients (53% vs. 43%) (**Table 2**)
- Hispanic patients were, younger, and had a lower comorbidity burden than non-Hispanic patients (**Table 2**)
- The proportion of patients receiving any COVID-19 treatment within 2 days of admission was similar across each ethnic grouping (Hispanic: 86%, Non-Hispanic: 86) (**Table 2**)

Multivariable analyses

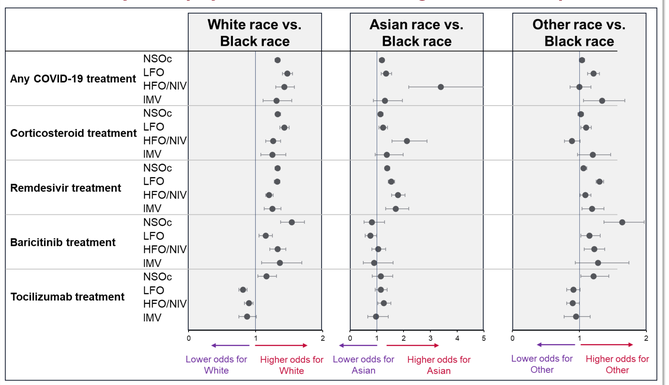
- White patients were significantly more likely to receive any COVID-19 treatment than Black patients across all supplemental oxygen levels
  - NSOc aOR: 1.33 (95% CI: 1.29 – 1.36), LFO aOR: 1.47 (1.40 – 1.55), HFO/NIV aOR: 1.43 (1.30 – 1.58), IMV aOR: 1.31 (1.11 – 1.54) (**Figure 1**)
- White patients were also statistically significantly more likely than Black patients to receive corticosteroids, remdesivir, and baricitinib treatment across all baseline supplemental oxygen levels, including among patients with NSOc (**Figure 1**)
- In contrast, White patients with LFO, HFO/NIV or IMV were less likely to receive tocilizumab treatment than Black patients (**Figure 1**)
  - LFO aOR: 0.81 (0.75 – 0.87), HFO/NIV aOR: 0.90 (0.83 – 0.96), IMV aOR: 0.87 (0.75 – 1.01)
- Asian patients were more likely to receive remdesivir treatment than Black patients across all supplemental oxygen (**Figure 1**)
  - NSOc aOR: 1.39 (1.30 – 1.48), LFO aOR: 1.54 (1.43 – 1.67), HFO/NIV aOR: 1.79 (1.56 – 2.06), IMV aOR: 1.71 (1.33 – 2.20)
- Asian patients with LFO or HFO/NIV were also more likely to receive any COVID-19 treatment and corticosteroids than Black patients (**Figure 1**)
- Differences in the administration of COVID-19 treatment between Hispanic and non-Hispanic patients varied considerably according to treatment type and baseline supplemental oxygen after multivariable adjustment (**Figure 2**)

Table 2. Baseline characteristics of study cohort overall and according to race and ethnicity

		Overall	White	Black	Asian	Hispanic	Non-Hispanic
# Patients		**454,761**	**317,928**	**76,715**	**9,297**	**74,199**	**329,940**
Age (years)	Median (IQR)	64 (52-75)	66 (54-77)	60 (48-70)	63 (50-74)	57 (45-70)	65 (54-76)
Age group	18-49 years	21%	18%	28%	25%	33%	18%
	50-64 years	30%	29%	35%	30%	33%	30%
	65+ years	49%	54%	38%	45%	34%	52%
Gender	Male	52%	53%	45%	54%	54%	51%
Race	White	70%	100%	0%	0%	65%	71%
	Black	17%	0%	100%	0%	2%	21%
	Asian	2%	0%	0%	100%	0%	2%
	Other[1]	11%	0%	0%	0%	33%	5%
Ethnicity	Hispanic	16%	15%	2%	2%	100%	0%
	Non-Hispanic	73%	74%	90%	86%	0%	100%
	Unknown	11%	11%	8%	12%	0%	0%
Primary Payer	Commercial	29%	28%	28%	34%	30%	29%
	Medicare	51%	55%	46%	40%	34%	54%
	Medicaid	11%	8%	17%	18%	16%	9%
	Other Payer	10%	9%	9%	8%	19%	8%
Hospital location	Urban	86%	84%	90%	92%	93%	85%
	Rural	14%	16%	10%	8%	7%	15%
Hospital Bed size	<100	7%	8%	4%	5%	4%	8%
	100-199	17%	18%	13%	16%	22%	17%
	200-299	20%	20%	19%	22%	15%	20%
	300-399	19%	18%	23%	19%	14%	20%
	400-499	10%	10%	6%	8%	11%	9%
	>=500	27%	25%	34%	29%	34%	26%
Hospital teaching status	Yes	39%	38%	45%	47%	44%	38%
Hospital region	Midwest	21%	23%	19%	17%	8%	25%
	Northeast	9%	8%	9%	14%	8%	9%
	South	55%	54%	68%	29%	67%	56%
	West	14%	14%	5%	40%	17%	10%
Admission month	Pre-Delta	60%	58%	63%	70%	65%	57%
	Delta	33%	35%	31%	26%	31%	35%
	Omicron	7%	7%	6%	5%	5%	8%
CCI	0	30%	31%	26%	35%	38%	29%
	1 to 3	50%	51%	49%	49%	48%	51%
	≥4	19%	19%	25%	16%	14%	20%
Key comorbidities	Immunocompromised condition	10%	11%	11%	8%	8%	11%
	Renal disease	19%	18%	27%	18%	13%	21%
Baseline supplemental oxygen	NSOc	44%	42%	53%	47%	47%	42%
	LFO	38%	40%	31%	36%	38%	39%
	HFO/NIV	15%	15%	14%	13%	13%	15%
	IMV	3%	3%	3%	3%	3%	3%
Baseline ICU admission		18%	18%	18%	16%	25%	17%
COVID-19 treatment initiation upon hospital admission	Any COVID-19 treatment	86%	87%	81%	85%	86%	86%
	Corticosteroids	84%	85%	79%	82%	84%	84%
	Remdesivir	52%	53%	43%	56%	54%	52%
	Baricitinib	4%	4%	3%	2%	3%	4%
	Tocilizumab	4%	4%	4%	4%	4%	4%

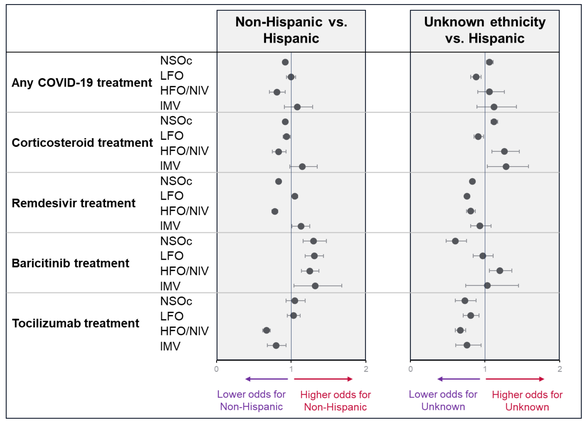
[1]Other race includes race designations that have been rolled into "other" to ensure that the dataset confirms to regulatory requirements as well as race designations of "unable to determine". *CCI: Charlson Comorbidity Index; IQR: inter-quartile range; NSOc: supplemental oxygen charges; LFO: low-flow oxygen; HFO/NIV: high-flow oxygen/non-invasive ventilation; IMV: invasive mechanical ventilation*

Figure 1. Likelihood of receiving COVID-19 treatment upon hospital admission by race (adjusted multivariable regression model)



Model adjusted for age group, gender, ethnicity, hospital bed size, hospital location, teaching hospital, hospital region, payer type, variant period, CCI categories, ICU use at baseline, renal disease at baseline, immunocompromised condition at baseline.
NSOc: No supplemental oxygen charges; LFO: low-flow oxygen; HFO/NIV: high-flow oxygen/non-invasive ventilation; IMV: invasive mechanical ventilation

Figure 2. Likelihood of receiving COVID-19 treatment upon hospital admission by ethnicity (adjusted multivariable regression model)



Model adjusted for age group, gender, race, hospital bed size, hospital location, teaching hospital, hospital region, payer type, variant period, CCI categories, ICU use at baseline, renal disease at baseline, immunocompromised condition at baseline.
NSOc: No supplemental oxygen charges; LFO: low-flow oxygen; HFO/NIV: high-flow oxygen/non-invasive ventilation; IMV: invasive mechanical ventilation