

Association Between Clinical Outcomes and Patient Characteristics Among Hospitalized Adult Patients with COVID-19

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Key Findings

A total of 178,924 patients over the age of 18 were hospitalized for COVID-19 across >300 hospitals in the US with a median LOS of 7 days and 16% requiring ICU care.

Hospitalized patients were more likely to be >60 years of age (59%), male (51.5%), primarily admitted in the South (48%), and the point of origin was most commonly home (77%).

Patients between 50-84 were more likely to receive MV than those under 49. Patients who received care in the Northeast and West were more likely to receive MV compared to those in the South. The probability of initiating MV among patients hospitalized for 27 days is 50%.

Patients with higher comorbidities (ECI >0 and <13) were 1.1 times more likely to require MV, and those with an ECI > 0 were 1.2 to 1.3 times more likely to die than those with a score <0.

Patients over the age of 50 had a higher risk of mortality with patients over 85 nearly 7 times more likely to die. Patients originating from Hospice or SNF were at a higher risk of mortality than those admitted from home.

The probability of death for patients hospitalized for 4 weeks was 50%.

Conclusions

COVID-19 hospitalizations generated significant resource utilization.

Risk factors of severe negative outcomes, death, and MV included older age (>50), male gender, and higher ECI.

Further investigation is needed to examine if these differences remain consistent over time and variants.

Introduction

The COVID-19 pandemic has resulted in approximately 76 million cases and >899,000 deaths in the United States.¹

- Persons ≥65 years of age and those of minority racial and ethnic groups have disproportionately represented COVID-associated deaths.
- Characterizing the changes in clinical outcomes for patients who were hospitalized with COVID-19 is crucial to better understand the disease and assist in mitigation efforts focused on prevention and early detection to minimize mortality.

Objectives

The goal of this study is to characterize hospitalized patients with COVID-19 between April 2020 and December 2020 and better understand events through the course of hospitalization and factors impacted throughout.

- The primary objective of the study was to explore and quantify the association between demographics, comorbidities, treatment strategies, and regional differences and time to event-outcomes.

Methods

This retrospective, observational study utilized deidentified US hospital chargemaster data from April to December 2020 (N=178,924).

- The ICD-10 code of U07.1 was used to identify patients with COVID-19.
- De-identified patient-level data included demographics, point of origin and clinical related data abstracted at the time of hospitalization.
- The Elixhauser Comorbidity Index (ECI) is a method of categorizing comorbidities as predictors of mortality in patients where higher scores indicate higher association between comorbidity and death.²
- Index date was defined as the admission date of hospitalization with a primary diagnosis of U07.1.
- Outcomes of interest included in hospital all-cause mortality and use of mechanical ventilation (MV).
- Clinical course and subsequent discharge or death was documented. Kaplan Meier curves displaying the time to event and the numbers at risk across time were produced for time to MV and all-cause mortality.
- HR and corresponding confidence intervals were estimated against hospitalization and death.
- Results are summarized for continuous measures using descriptive statistics while categorical variables are displayed with counts and percentages.
- Fine and Gray competing risk proportional hazard models were utilized.

Results

A total of 178,924 patients had a primary diagnosis code of U07.1 and were hospitalized between April and December 2020.

- Most patients were male, aged 60+ and from the South. Median length of stay was 7 days with 16% requiring intensive care. The point of origin for 77% of people was home, and in kind, 63% were discharged to their home, while 15% were discharged to a long-term or skilled care facility and 14% died (Table 1). The highest mortality rates were for males (16.1%) and patients 60+ (19.6%) (unpictured).
- In an HR model, patients 85+ were .82 times less likely to receive MV than patients 18-49 (Figure 1). Patients with an ECI >0 and <13 were approximately 1.1 times more likely to require MV, while patients with a score >13 were at no greater risk than those with a score <0. The Kaplan Meier curve shows 50% of patients needed MV within 27 days (Figure 2).
- Patients 50+ were more likely to die than patients 18-49 years of age (Figure 3). The median survival of COVID-19 patients was 4.14 weeks with approximately half of the deaths occurring within the first four weeks of hospitalization (Figure 4).

Table 1. Characteristics of hospitalized COVID-19 patients

Characteristics	Total (n=178,924)	Characteristics	Total (n=178,924)
Age group, n (%)		Total duration of hospital stay (days)	
18-40	24,323 (13.6)	Median (n)	7.0 (178,884)
41-60	49,448 (27.6)	Min - Max	1.0-222.0
>60	105,153 (58.8)		
Gender, n (%)		Point of Origin, n (%)	
Female	86,689 (48.5)	Home	137,329 (76.8)
Male	92,235 (51.5)	Hospital Transfer	12,261 (6.9)
		Clinic/Physician	8,684 (4.9)
		Other*	11,421 (6.4)
		Unknown	30,564 (17.1)
Census Region, n (%)		Elixhauser comorbidity index	
Midwest	12,958 (7.2)	Median (n)	0.0 (178,924)
Northeast	34,250 (19.1)	Min - Max	-26 - 85.0
South	85,317 (47.7)		
West	46,399 (25.9)	Discharge Disposition	
		Home	113,390 (63.4)
Complications, n (%)		Long-term or skilled care facility	26,851 (15.0)
Acute Respiratory Failure	58,815 (32.9)	Death	24,851 (13.9)
Acute Kidney Injury	33,457 (18.7)	Other**	11,433 (6.4)
Sepsis	28,835 (16.1)	Unknown	2,399 (1.3)
ICU level of care, n (%)			
	29,154 (16.3)		

*Other: Ambulatory Surgical Center, Hospice, Law Enforcement, Other Transfer, SNF Transfer, and Transfer Unit
 **Other: AMA (n=1,909, Hospice (n=5,154), Transfer to a different hospital (n=4,370)

Figure 1. Adjusted hazard ratios of Mechanical Ventilation need among COVID-19 inpatients

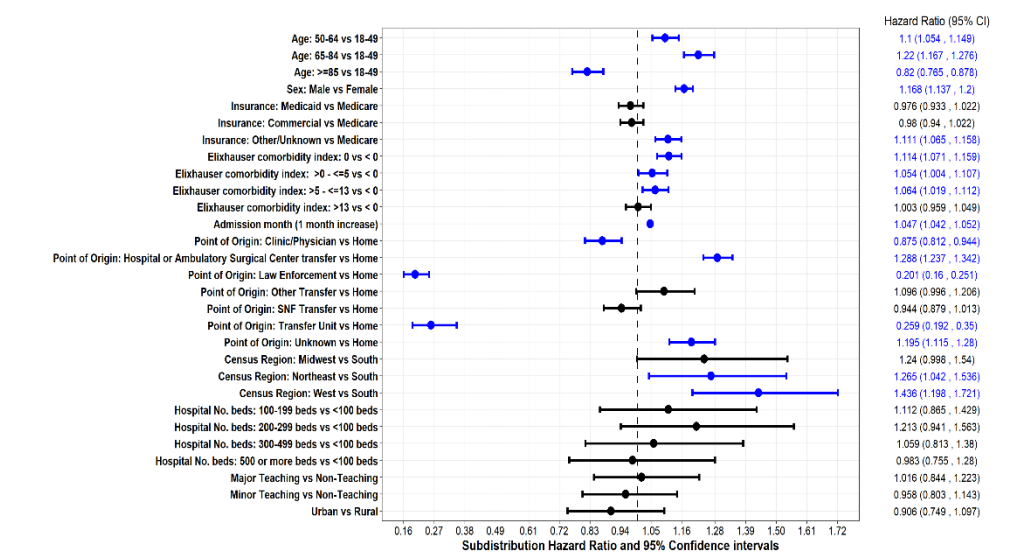


Figure 2. Kaplan-Meier curve of the time to Mechanical Ventilation among hospitalized COVID-19 Inpatients

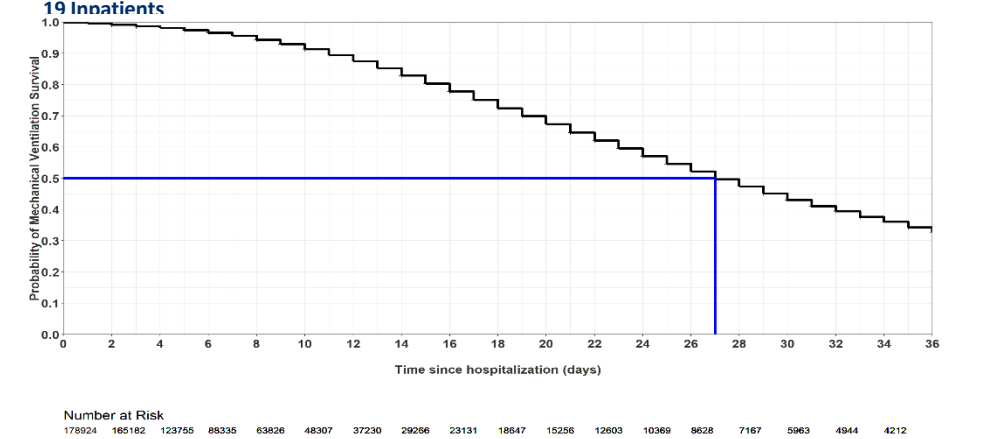


Figure 3. Adjusted hazard-ratios of in-hospital all-cause mortality among hospitalized patients with COVID-19

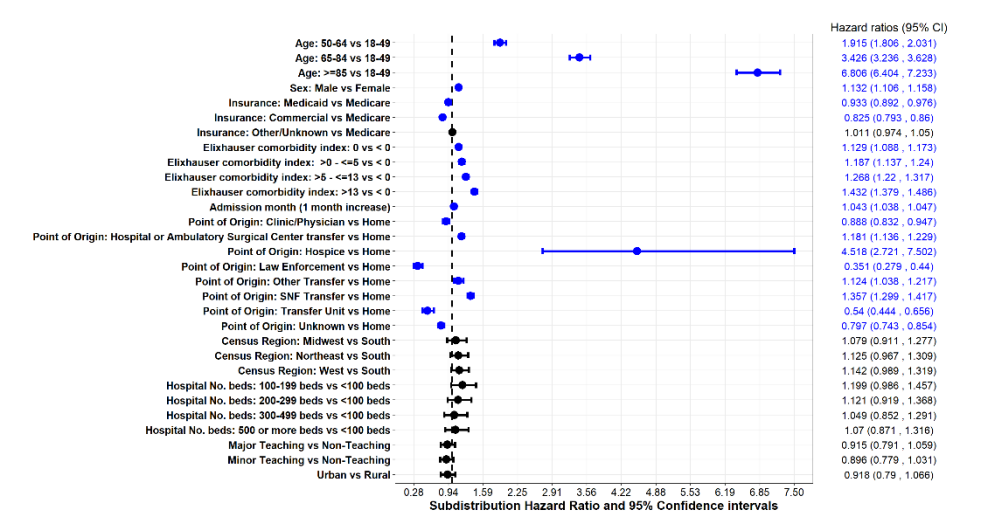
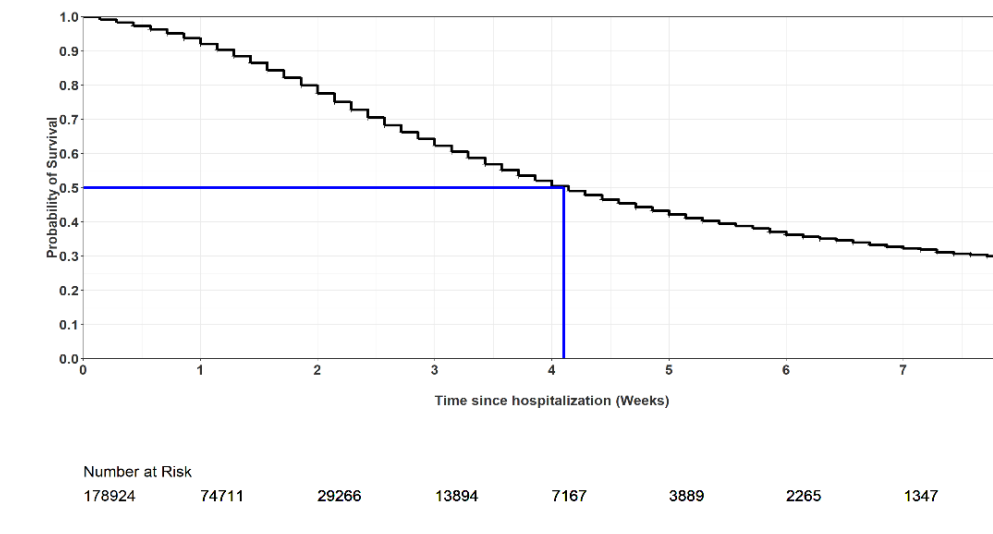


Figure 4. Kaplan-Meier curve of the time to death among hospitalized patients with COVID-19



Abbreviations
 COVID-19 – Coronavirus Disease 2019
 ECI – Elixhauser Comorbidity Index
 HR – Hazard ratio

LOS – Length of Stay
 MV – Mechanical ventilation

References
 1. Centers for Disease Control and Prevention. (2022, February 8). COVID-19. <https://www.cdc.gov/coronavirus/2019-nCoV/index.html>
 2. Van Walraven C, Austin PC, Jennings A, Quan H, Forster AJ. A modification of the Elixhauser comorbidity measures into a point system for hospital death using administrative data. *Med Care* 2009; 47(6): 626-633.

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 Target RWE is a health evidence solutions company headquartered in Durham, NC.