



Prospective Monitoring of Patients with COVID-19 Vaccination for Outcomes of Hospitalization Using Electronic Medical Record Network

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OBJECTIVES

Beginning in December 2020, the first vaccines for COVID-19 were released for the prevention of COVID-19 disease. The COVID-19 vaccine is administered intramuscularly as a series of 2 doses given 3 weeks apart for fully vaccinated patients. In September of 2021, bivalent booster doses also became available for the prevention of COVID-19 disease. Data has shown that COVID-19 vaccination is associated with the prevention of COVID-19-associated hospitalization. This study aims to assess if patients that received two doses of COVID-19 vaccination were at higher risk for hospitalization compared to patients who received an additional booster vaccine using real-world data from an electronic medical record network (EMR).

METHODS

This prospective cohort study identified COVID-19 vaccination populations using the TriNetX federated network of deidentified health data and patient populations were identified through the platform’s Dataworks-USA network. Potential patients receiving doses of the COVID-19 vaccine were identified using a combination of a CVX vaccination term or a CPT, ICD-10-PCS, or SNOMED procedural term for the vaccine occurring. TriNetX identified 2,840,266 potential patients receiving a COVID-19 vaccine as of October 26, 2022. From this cohort of all potential vaccinated patients, we identified a sub-cohort of fully vaccinated patients and a sub-cohort of patients that had also received a booster vaccine. We identified 1,995,566 patients in our fully vaccinated cohort, defined as patients that had exactly two instances of the COVID-19 vaccine occurring in their medical record. Additionally, we identified 1,639,750 patients in our booster vaccine cohort, defined as patients that had greater than or equal to 3 instances of the COVID-19 vaccine occurring in their medical record. Fully vaccinated patients and booster vaccine-receiving patients were analyzed and 1:1 propensity score-matched to adjust for potential confounders. Risk ratios (RR) and hazard ratios (HR) were evaluated for significance using 95% confidence intervals (CI). These patients were prospectively monitored from October 26, 2022–November 26, 2022.

RESULTS

After one month of prospective monitoring, fully vaccinated patients were associated with an increased risk of being hospitalized when compared to booster vaccine patients (RR=1.089, 95% CI=1.079, 1.1; p<0.0001). The adjusted HR with 95% CI was 1.091 (1.08, 1.101). This pairwise comparison suggests an increased risk of hospitalization for fully vaccinated patients compared to patients that received an additional booster vaccination. The Kaplan-Meier survival curve of both cohorts shows a lower survival probability in the fully vaccinated cohort, indicating more patients that were hospitalized in the time window.

Figure 1. COVID-19 Vaccine Patient Density Map

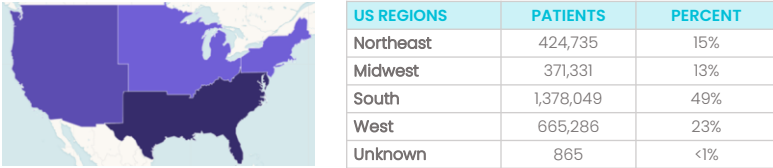


Figure 2. Measures of Association

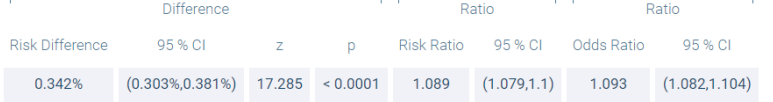


Figure 3. Kaplan-Meier Survival Curve

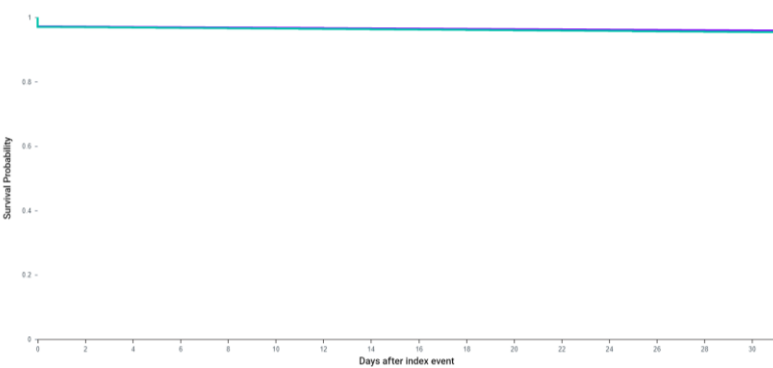


Table 1. Baseline Patients Characteristics

DEMOGRAPHICS	FULLY VACCINATED	BOOSTER VACCINE
Age, years (mean ± SD)	52 (22)	54 (22)
Male sex (%)	44	44
Female sex (%)	56	56
White (%)	68	69
Asian (%)	13	12
Black or African American (%)	4	4
American Indian or Alaska Native	1	1
Native Hawaiian or Other Pacific Islander (%)	0	0
Unknown race (%)	14	14
Hispanic or Latino (%)	11	11
Not Hispanic or Latino (%)	74	76
Unknown Ethnicity (%)	15	13

Table 2. Kaplan-Meier Survival

Kaplan - Meier survival analysis					
Cohort	Patients in cohort	Patients with outcome			
1 With booster vaccine	1,639,750	77,326			
2 Fully vaccinated patients	1,995,566	78,974			
		χ^2	df	p	
Log-Rank Test		298.936	1	0.000	
		Hazard Ratio	95% CI	χ^2	df
Hazard Ratio and Proportionality		1.091	(1.080, 1.101)	219.905	1
		p			
		0.000			

CONCLUSIONS

Using a real-world electronic medical record network data source, there was a statistically significant increased risk of hospitalization found among fully vaccinated patients compared with booster vaccine receiving patients. This may be indicative of long-term outcomes for COVID-19 vaccinated patients, making this cohort ideal for extended prospective cohort monitoring.