



# READMISSIONS AFTER INDEX HOSPITALIZATIONS FOR COVID-19

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## BACKGROUND

The natural history of Coronavirus Disease 2019 (COVID-19) has presented various challenges to healthcare systems, including complications leading to repeat healthcare encounters. Several studies have examined post-acute care readmissions rates, including a review conducted by the United States Center for Disease Control (CDC) that found that of over 100,000 patients discharged after an acute care episode for COVID-19, 9.5% experienced same-hospital readmission within 60 days.<sup>1</sup> Smaller studies have reported similar readmission rates, but these studies lack granular data on the reasons for readmission.<sup>2-5</sup> We examined 30-day readmissions after an acute inpatient care episode for COVID-19 at a single large academic center in order to provide a more detailed landscape of readmission diagnoses that may help design targeted interventions to reduce post-discharge complications.

## METHODS

- All patients aged 18 years or older discharged from University of Colorado Health (UCH) – Anschutz Medical campus with PCR-confirmed COVID-19 infection readmitted to a UCH system hospital within 30 days of index hospitalization between 3/1/2020 – 2/23/2021
- Dataset was prospectively collected with the following data: sex, age, race, and ethnicity as reported in the electronic medical record, date of initial admission and discharge, date of readmission, and presence of the following co-morbidities: hypertension, cardiac disease, chronic pulmonary disease, cancer, diabetes mellitus, tobacco use, obesity, chronic kidney disease, and immunosuppression
- We recorded the indication for readmission and whether it was related to COVID-19
  - Indications for the readmission were determined to be sequelae of COVID-19 if it was a known COVID-19 complication or was documented so by the patients' providers.
- We performed a post-hoc exploratory analysis to compare readmission latency between those who were deemed to have COVID-19 related readmission and those who were readmitted for other reasons. We used two-sample t-test with unequal variance with the assumption that COVID-19-related readmissions may cluster in a shorter interval given the disease's natural history.

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## RESULTS AND DISCUSSION

### Demographics

During the study period, 2,328 patients were discharged from the hospital after acute care for COVID-19-related illness. The characteristics of these patients are provided in Table 1.

### Readmission rates and indications

The 30-day readmission rate after index hospitalization discharge was 7.8% (183/2328), which is similar to that reported previously in the literature.<sup>1-5</sup> Sixteen patients (0.6%) were readmitted twice, and one patient was readmitted three times. 90 patients (49.2%) were readmitted for indications determined to be related to COVID-19 and the most common reason for readmission was worsening COVID-19 pneumonia. These indications is listed in Table 1. Among patients readmitted for indications deemed to not be related to COVID-19,

17/183 (9.3%) were readmitted for bacterial infection (excluding pneumonia), and 9/183 (4.9%) each for obstetric indications, malignancy, and hypervolemia. Since approximately half of the readmissions examined were deemed to be related to COVID-19, future interventions targeting readmissions related to late COVID-19 complications and sequela may only partially address the continued healthcare needs for these patient populations.

**Table 1: Characteristics of readmitted patients**

	Patients (N=183)
<b>Age</b>	
Median (IQR)	57 (42-72)
Mean (SD)	56.4 (18.5)
<b>Sex</b>	
Female	99 (54.1)
Male	84 (45.9)
Unknown/other	0(0)
<b>Race</b>	
White	87 (45.7)
Other/unknown	52 (28.4)
Black or African American	30 (16.4)
Asian	10 (5.5)
American Indian or Native Alaskan	1 (1.1)
Native Hawaiian	2 (1.1)
<b>Ethnicity</b>	
Non-Hispanic	112 (61.2)
Hispanic	71 (38.8)
<b>Co-morbidity</b>	
Hypertension	83 (45.4)
Obesity	70 (38.3)
Diabetes mellitus	58 (31.7)
Heart disease	44 (24.0)
Immunosuppressed	44 (24.0)
Lung disease	40 (21.9)
Chronic kidney disease	37 (20.2)
Cancer	14 (7.7)
Tobacco use disorder	14 (7.7)
<b>Number of co-morbidities</b>	
0	33 (18.0)
1	59 (32.2)
2	45 (24.6)
3 or more	46 (25.1)

IQR= interquartile range, SD = standard deviation

**Table 2: Reasons for COVID-19 related 30-day readmissions**

Diagnosis at readmission	Patients (N=183) N (%)
Worsening COVID-19 pneumonia	70 (38.6)
Venous thromboembolism	5 (2.7)
Bacterial pneumonia	4 (2.2)
Gastrointestinal symptoms	4 (2.2)
Pneumothorax	2 (1.1)
Pneumatocele	1 (0.5)
Atrial fibrillation	1 (0.5)
Myocarditis	1 (0.5)
Tachycardia	1 (0.5)
Aortic arch thrombus	1 (0.5)
<b>Potentially related to COVID-19</b>	<b>90 (49.2)</b>

### Readmission latency

The mean number of days between index hospitalization discharge and first readmission was 9 (SD 7.7) and the median was 7 (IQR 3 - 14). The mean latency among those with COVID-19-related readmission was shorter (mean 6.0 days, 95% CI 4.96 to 6.97) than for those unrelated to COVID-19 (12.0 days, 95% CI 10.2 to 13.8), *P* value <0.0001 (Figure 1). Given the natural history of COVID-19, many patients experience respiratory decompensation 10 or more days after the initial symptom onset, which may explain the difference in latency between the groups.

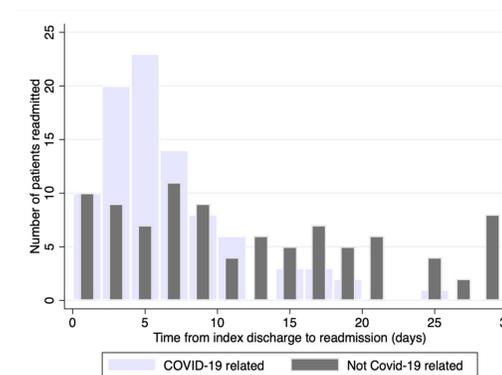


Figure 1: Readmission latency stratified by readmission reason

### Limitations

This a descriptive report without a control population, thus we cannot draw any inference. Second, due to limited resources, we did not perform a detailed chart review of every discharged patient to abstract data on comorbidities; thus, meaningful comparisons between those who were readmitted and those who were not cannot be made. Third, we only examined readmissions that occurred within the same hospital system and did not investigate return visits to the emergency department. Fourth, we did not use a validated and precise definition for “COVID-19-related” readmission as such judgment was left to the chart reviewer’s discretion. We tried to minimize the bias by double-entering data in a blinded fashion on the initial cohort of patients to ensure inter-reviewer agreement. We did not perform a formal statistical inter-rater reliability assessment with weighted Kappa. Fifth, the comparison of readmission latency between the groups with COVID-19-related readmission and those who were readmitted for other reasons were post-hoc and exploratory.

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