

## DATA HIGHLIGHT: DECEMBER 2021 COVID-19 National Emergency: Early Trends in Hospitalizations for Hospital Readmissions Reduction Program Health Conditions and 30-Day Readmission Rates

#### Introduction

Hospital readmissions are costly and are often associated with poor health outcomes.<sup>1–3</sup> Historically, nearly 20% of Medicare beneficiaries admitted to hospitals were readmitted within 30 days of discharge.<sup>2</sup> In 2012, the Centers for Medicare & Medicaid Services (CMS) implemented the Hospital Readmissions Reduction Program (HRRP) to reduce excess 30-day readmissions for four high-volume, high-cost conditions and two surgical procedures. The four health conditions are acute myocardial infarction (AMI), chronic obstructive pulmonary disease (COPD), heart failure, and pneumonia. The two surgical procedures are coronary artery bypass and elective primary total hip and/or knee arthroplasty. <sup>3,4</sup>

#### **Definition of Key Terms and Events**

**COVID-19 Public Health Emergency:** Announced on January 1, 2020. Allowed local authorities more flexibility in allocating federal public health resources.

**COVID-19 National Emergency and enactment of key legislation:** National Emergency announced on March 13, 2020, followed immediately by passage of the CARES Act, including Medicare waivers and telehealth service expansion.

**COVID-19 Emergency Measures:** A term describing the combination of federal, state, and local legislation, recommendations, and regulations to suspend elective surgeries and implement additional safety protocols in ambulatory care, as well as stay-at-home orders, masking requirements, and other measures aimed at mitigating risk of COVID-19. Many of these measures began taking effect in March 2020.

Although multiple studies have demonstrated that the HRRP has reduced 30-day readmission rates,<sup>5-8</sup> rates among Medicare beneficiaries admitted for HRRP health conditions remain relatively high.<sup>9-11</sup> Historically underserved populations, including racial and ethnic minorities,<sup>6,12</sup> those with Medicaid-Medicare eligibility, and beneficiaries with lower incomes and lower educational

## **Key Findings:**

- Hospitalizations for Hospital Readmissions Reductions Program (HRRP) health conditions declined sharply in April 2020 and remained lower than pre-onset of COVID-19 levels through September 2020.
- Thirty-day readmission rates after hospitalization for HRRP health conditions decreased sharply in March 2020 but returned to pre-COVID levels by April 2020.
- Sociodemographic disparities in 30-day readmission rates do not appear to have been exacerbated by the COVID-19 Public Health Emergency through September 2020.
- However, 30-day mortality rates after hospitalization for an HRRP health condition increased with the onset of COVID-19 and spikes were prominent among historically underserved populations.

attainment<sup>13,14</sup> are readmitted at higher rates relative to their more privileged counterparts. Persistent disparities in 30-day readmission rates by sociodemographic factors raise questions about whether and to what extent additional pressure on the healthcare system could exacerbate longstanding differences in this important quality indicator.

The COVID-19 pandemic caused profound disruptions in both healthcare delivery and health-seeking behaviors, and these changes were concurrent with, and possibly the result of, rapidly evolving federal and local measures aimed at responding to emerging pandemic-related challenges.<sup>15-17</sup> Although the January 31, 2020 Public Health Emergency declaration allowed local authorities more flexibility in reassigning federally funded personnel to respond to COVID-19,<sup>18</sup> it did not change reimbursement policy. A National Emergency was declared on March 13, 2020,<sup>19</sup> and this declaration was soon followed by enactment of key legislation (e.g. the CARES Act) and related waivers of regulations and the institution of certain emergency regulations that lifted certain restrictions on services available for all Medicare beneficiaries (including, but not limited to, fee-for-service beneficiaries) and expanded reimbursement for services such as telehealth.<sup>20</sup> This legislation was accompanied by numerous federal recommendations that, for example, called for the suspension of elective surgeries and implementation of new infection prevention protocols in ambulatory care settings.<sup>21-23</sup> Supplementing federal guidance were state and local regulations that addressed the use of face masks, outdoor activities, travel, and other factors. Taken as a whole, these COVID-19 emergency measures had a profound impact on healthcare delivery, and they also impacted how patients perceived and utilized healthcare.

Studies describing the early months of the COVID-19 pandemic showed sudden decreases in outpatient services, as well as emergency department and inpatient hospital visits.<sup>15,17,24</sup> Data describing the impact of COVID-19 emergency measures on HRRP hospitalizations and 30-day readmission rates are still emerging. There is also limited information on how patients hospitalized for COVID-19 fit into this framework and whether and how sociodemographic factors interact with these complex relationships.<sup>25</sup> Important questions also remain concerning whether post-discharge mortality after implementation of COVID-19 emergency measures represents a competing risk with 30-day readmission. That is, whether FFS beneficiaries died at higher rates shortly after an HRRP hospitalization and if these deaths impact interpretation of 30-day readmission rates during COVID-19.

This data highlight aims to:

- Describe monthly trends in hospitalizations of Medicare FFS beneficiaries for HRRP health conditions overall and by condition, before and after implementation of COVID-19 emergency measures.
- Describe monthly trends in unadjusted 30-day readmission rates after hospitalization for HRRP conditions before and after implementation of COVID-19 emergency measures and whether these rates differ by sociodemographic characteristics.
- Describe how competing mortality impacted 30-day readmission rates after implementation of COVID-19 emergency measures.
- Identify opportunities for policies or interventions to enhance post-discharge follow-up and reduce readmission rates.

#### Methods

This study used Medicare administrative claims for FFS beneficiaries that covered the period from April 1, 2019 through September 30, 2020. Inpatient, outpatient, and carrier files were obtained from CMS's Chronic Conditions Warehouse (CCW). These data were used to obtain readmission rates at the hospitalization level, and were merged with information from the Master Beneficiary Summary File (MBSF), which describes beneficiary-level sociodemographic characteristics.<sup>1</sup>

i The CCW is a virtual environment that contains claim files and MBSF data and is only accessible by approved individuals with a license. For more information on the CCW, visit Home - Chronic Conditions Data Warehouse at ccwdata.org. For documents on data dictionaries, refer to Data Dictionaries - Chronic Conditions Data Warehouse at ccwdata.org.

Results are based on all hospitalizations of Medicare FFS beneficiaries aged 18 and older who were hospitalized for any of the four HRRP health conditions (i.e. AMI, COPD, heart failure, and pneumonia) and discharged from shortterm and critical access hospitals to home or home health care. HRRP health conditions were identified with ICD-10 codes using guidance from CMS's hospital-level 30-day risk-standardized readmission measures.26 For context, we also examined hospitalizations for COVID-19 beginning in April 2020.<sup>II</sup> We excluded hospitalizations for which there was no 30-day observation window post-discharge (i.e., due to post-discharge death, loss of coverage in Medicare Part A and B, or enrollment in Medicare Part C). Hospitalizations for cancer medical treatment and for which beneficiaries were discharged against medical advice were also excluded.

A hospital readmission was defined as an unplanned, all-cause inpatient admission within 30 days of the index hospital discharge date, using the algorithm published in the 2018 All-Cause Hospital Wide Measure Updates and Specifications Report.<sup>26</sup> Hospitalizations were stratified by beneficiary sociodemographic characteristics (age, race and ethnicity, Medicaid-Medicare dual eligibility status, rurality, and social deprivation index (SDI)). Four rurality categories (metropolitan, micropolitan, small town, rural) were examined using Rural-Urban Commuting Area Codes linked to beneficiaries' ZIP codes.<sup>27</sup> An index measure accounting for social deprivation was examined by linking beneficiary data with zip code-level data on poverty, education, family structure, housing, and employment.28 SDI was categorized by quartile (Q1 [lowest social deprivation]: -1.89 to < 0.39; Q2: -0.39 to <0.12; Q3: 0.12 to <0.75; Q4 [highest social deprivation]: 0.75-7.58).

Descriptive statistics were produced for monthly trends in hospitalizations overall and by HRRP health condition 12 months prior to and six months post-implementation of COVID-19 emergency measures in March 2020. Unadjusted 30-day readmission rates were also examined overall, by HRRP health condition, and by sociodemographic characteristics. Finally unadjusted all-cause mortality during the 30-day post discharge period was examined at the beneficiary level throughout the study period to understand how competing risks may impact interpretation of 30-day readmission during the COVID-19 National Emergency.

All analyses were conducted using SAS Enterprise Guide 7.12 between December 7, 2020, and March 16, 2021.

## Results

The analysis sample included N=1,319,554 eligible hospitalizations for the four HRRP health conditions. Hospitalizations for all HRRP health conditions decreased sharply after COVID-19 emergency measures were implemented in March 2020, and they remained lower than pre-COVID-19 levels through September 2020. Although hospitalizations for heart failure began to rebound quickly after the emergency measures were implemented, hospitalizations for COPD and pneumonia did not follow this pattern, remaining at much lower levels through September 2020. Of the four HRRP health conditions, hospitalizations for AMI changed the least before and after implementation of COVID-19 emergency measures. Thirty-day readmission rates for HRRP health conditions dipped in March 2020 but quickly rebounded to pre-COVID levels, and there was no apparent evidence of COVID-19-related exacerbation of disparities in readmission rates for underserved populations. Between April and September 2020, there were about 10,000 hospitalizations each month for COVID-19. During this period, 30-day post-discharge mortality rates were higher for beneficiaries hospitalized for heart failure, COPD, and pneumonia, and there were notable spikes in mortality among beneficiaries who were Hispanic, living in rural areas, or in areas with the most social deprivation.

ii COVID-19 hospitalizations were identified using ICD-10 diagnosis code U07.1.

## I. Trends in Hospitalizations for HRRP Health Conditions, April 2019-September 2020

The number of hospitalizations for HRRP health conditions decreased by approximately 44% between March and April 2020, and they remained considerably lower than pre-COVID levels through September 2020 (Figure 1). Hospitalization trends seen in April through September 2020 are not consistent with seasonal variation identified in prior years (data not shown).

# Figure 1. Number of HRRP Health Conditions Hospitalizations Among Medicare FFS Beneficiaries, April 2019-September 2020



#### Hospitalizations by HRRP Health Condition (Figure 2)

- Although hospitalizations decreased for all HRRP health conditions after COVID-19 emergency measures were implemented, the decreases were steeper for heart failure, COPD, and pneumonia than for AMI.
- AMI hospitalizations rebounded quickly after emergency measures were implemented, and hospitalizations for heart failure were trending upward toward pre-COVID levels through September 2020.
- However, after emergency measures were implemented, the decreases in hospitalizations for COPD and pneumonia remained at or near their lowest levels through September 2020.
- Heart failure accounted for the largest share of hospitalizations among the four HRRP health conditions before and after implementation of COVID-19 emergency measures.





#### Hospitalizations for COVID-19 (Figure 3)

Between April and September 2020—the period during which COPD and pneumonia hospitalizations decreased significantly—an average of 10,000 hospitalizations for COVID-19 occurred each month.

#### Figure 3. Monthly Trends in Hospitalizations for COPD, Pneumonia, and COVID-19, April 2019-September 2020



### II. Trends in 30-Day Readmission Rates After Hospitalization for an HRRP Health Condition, April 2019–September 2020

The 30-day hospital readmission rate dropped sharply in March 2020 following implementation of COVID-19
emergency measures but quickly rebounded in April 2020 and remained at pre-COVID levels through September of
2020 (Figure 4).

#### Figure 4. Number of HRRP Health Conditions Hospitalizations and 30-Day Readmission Rates, April 2019-September 2020



#### Thirty-Day Readmission Rates by HRRP Condition (Figure 5).

- Before, during, and after implementation of COVID-19 emergency measures, 30-day readmission rates were highest following hospitalization for heart failure, lowest for AMI, and intermediate for COPD and pneumonia.
- Consistent with the overall pattern in readmission rates immediately after implementation of COVID-19 emergency measures, readmission rates dropped and quickly rebounded for each HRRP health condition.
- For AMI and heart failure hospitalizations, 30-day readmission rates were on average similar before and after implementation of COVID-19 emergency measures, but for COPD and pneumonia, readmission rates were slightly higher after the emergency measures were implemented.

Figure 5. Thirty-Day Readmission Rates by HRRP Health Condition at Index Hospitalization, April 2019-September 2020



#### III. Thirty-Day Readmission Rates by Beneficiary Sociodemographic Characteristics

There did not appear to be exacerbation of sociodemographic disparities in 30-day readmission rates following implementation of COVID-19 emergency measures.

#### Thirty-Day Readmission Rates by Dual Eligibility Status (Figure 6)

 Compared to hospitalizations among non-dually eligible beneficiaries, hospitalizations among beneficiaries who were dually eligible for Medicare and Medicaid had consistently higher 30-day readmission rates before and after COVID-19 emergency measures were implemented, and this difference ranged between 6% and 9% throughout the study period.

## Figure 6. Thirty-Day Readmission Rates Following Hospitalizations for HRRP Health Conditions, by Dual Eligibility Status, April 2019-September 2020



#### Thirty-Day Readmission Rates by Age Group (Figure 7)

 Differences in readmission rates by age group were similar before and after implementation of COVID-19 emergency measures. Readmission rates were much the same for hospitalizations among beneficiaries aged 65-84 and those aged 85 and older; these rates were consistently 6% to 9% lower than corresponding rates for hospitalizations of beneficiaries <65 years of age.</li>



# Figure 7. Thirty-Day Readmission Rates Following Hospitalizations for HRRP Health Conditions, by Age Group, April 2019–September 2020

#### Thirty-Day Readmission Rates by Race and Ethnicity (Figure 8)

- Before and after implementation of COVID-19 emergency measures, hospitalizations of Black/African American beneficiaries were associated with the highest 30-day readmission rates, averaging approximately 25% during the study period. Beneficiaries who identified as Asian/Pacific Islander generally had the lowest rates, averaging about 19%.
- Thirty-day readmission rates dropped suddenly and temporarily for all race and ethnicity groups when COVID-19 emergency measures were implemented, but pre-COVID differences in these rates were evident across race/ethnicity groups during this time.





#### Thirty-Day Readmission Rates by Rurality (Figure 9)

- Before and after implementation of COVID-19 emergency measures, metropolitan areas had the highest 30-day
  readmission rates, and rural areas generally had the lowest rates with an urban-rural difference of approximately 3% to
  4% throughout the study period.
- Differences by rurality in 30-day readmission rates were temporarily reduced immediately following implementation
  of COVID-19 emergency measures, but these differences quickly reemerged and followed pre-COVID patterns through
  September 2020.

## Figure 9. Thirty-Day Readmission Rates Following Hospitalizations for HRRP Health Conditions, by Rurality, April 2019-September 2020



#### Thirty-Day Readmission Rates by Area Social Deprivation (Figure 10)

 Readmission rates by area social deprivation followed a consistent pattern before and after implementation of COVID-19 emergency measures, with hospitalizations of beneficiaries in the most socially deprived areas (highest SDI quartile) having the highest rate of 30-day readmission and those in the least socially deprived areas (lowest SDI quartile) having the lowest rate. The difference in readmission rates between the most and least socially deprived areas was steady throughout the study period, ranging between 4% and 5%.

# Figure 10. Thirty-Day Readmission Rates Following Hospitalizations for HRRP Health Conditions, by Quartile of Social Deprivation Index, April 2019-September 2020



#### IV. Thirty-day Mortality Rates after Hospitalization for an HRRP Health Condition, April 2019–September 2020

For all HRRP health conditions, unadjusted all-cause 30-day post-discharge mortality rates among beneficiaries began to increase shortly before COVID-19 emergency measures were implemented.

- Steep increases in mortality were observed immediately after implementation of emergency measures among beneficiaries hospitalized for heart failure, pneumonia, and COPD (Figure 11).
  - » Increased mortality among beneficiaries hospitalized for heart failure, pneumonia, and COPD began to level-off in May 2020, and these levels were trending downward toward pre-COVID levels through September 2020.
- Mortality among beneficiaries hospitalized for AMI was relatively stable before and after implementation of COVID-19 emergency measures.





Although increases in unadjusted all-cause 30-day post-discharge mortality were observed across all sociodemographic characteristics following implementation of COVID-19 emergency measures, spikes in mortality were observed for some historically underserved populations with notable disparities by race and ethnicity, rurality, and area social deprivation.

#### Mortality by Race and Ethnicity (Figure 12)

• Before implementation of the emergency measures, all-cause mortality within 30-days of hospital discharge was generally highest among non-Hispanic White beneficiaries, but once emergency measures were implemented, mortality spiked among Black/African American and Hispanic beneficiaries.

#### Figure 12. Trends in Unadjusted 30-Day Mortality Rates, by Race and Ethnicity, April 2019- September 2020



#### Mortality by Rurality (Figure 13)

Although all-cause 30-day post-discharge mortality was generally higher among beneficiaries in rural areas throughout the study period, a spike in mortality among rural beneficiaries was observed after COVID-19 emergency measures were implemented.



#### Figure 13. Trends in Unadjusted 30-Day Mortality, by Rurality, April 2019-September 2020

#### Mortality by Area Social Deprivation (Figure 14)

• All-cause 30-day post-discharge mortality was generally lower among beneficiaries living in the most socially deprived areas, but additional spikes in mortality were also observed among beneficiaries living in the most socially deprived areas after the emergency measures were implemented.

#### Figure 14. Trends in Unadjusted 30-Day Mortality, by Quartile of Social Deprivation Index, April 2019-September 2020



## Discussion

Announcement of the COVID-19 National Emergency in March 2020 was accompanied by numerous federal, state, and local measures to reduce community transmission of COVID-19 and facilitate the ability of hospitals to care for a surge in critically ill patients. Stay-at-home orders, media coverage of struggling hospitals, and fear of COVID-19 infection contributed to a sudden drop in health-seeking behavior. Between April 23 and May 5, 2020, the U.S. Census Bureau conducted the first of a yearlong series of surveys to assess the impact of COVID-19 on multiple aspects of U.S. adults' lives. In the first survey, respondents were asked if, over the preceding four weeks, they had delayed getting medical care because of the COVID-19 pandemic; approximately 26 million adults over the age of 60 indicated that they had. In the same survey, approximately 20 million adults over the age of 60 reported needing medical care for something other than COVID-19 but not getting it.29 Census data therefore suggest that decreased healthcare utilization in the period immediately following the onset of the National Emergency resulted from a combination of older adults' decisions not to seek care and their inability to obtain needed care. Importantly, the period covered by these early Census Bureau data overlap with the sudden dip in hospitalizations for HRRP health conditions that are detailed in this report.

Although there was a sudden dip in hospitalizations for all HRRP health conditions, AMI hospitalizations quickly returned to pre-COVID levels and hospitalizations for heart failure were trending upward by September 2020. However, hospitalizations for COPD and pneumonia—both respiratory conditions—remained markedly lower than pre-COVID levels through the end of the study period. There are several potential explanations for this observation. It is possible that seasonality in hospitalization for respiratory conditions accounted for some of the reduction in COPD and pneumonia hospitalizations between April 2020 and September 2020.30 However, seasonality is unlikely to be the sole explanation because hospitalizations were lower than pre-COVID levels in the same period the prior year. A second explanation is that reduced hospitalization for COPD and pneumonia may be an ancillary benefit of mask mandates and other COVID-19 emergency measures on these respiratory conditions.23,31–33 A third explanation for this persistent reduction is that some hospitalizations among patients with COPD or pneumonia, whose underlying condition puts them at higher risk for COVID-19, were categorized as a COVID-19 discharge if both conditions were present.34

Consistent with the drop in HRRP health condition hospitalizations that occurred when COVID-19 emergency measures were implemented, a sudden drop in 30-day readmission rates was also observed. However, unlike hospitalizations for which there were marked differences across HRRP conditions after emergency measures were implemented, 30-day readmission rates generally returned to pre-COVID levels for all conditions after the initial pandemic-shock.

There was no clear evidence that implementation of COVID-19 emergency measures exacerbated pre-COVID disparities in 30-day readmission rates by sociodemographic characteristics such as age, race and ethnicity, rurality, dual eligibility, or area social deprivation. However, analyses of trends of 30-day mortality rates suggested that competing mortality in the post-discharge period should be considered when interpreting 30-day readmission data in the setting of COVID-19. As emergency measures were being implemented, there were marked increases in 30-day post-discharge mortality among Medicare FFS beneficiaries admitted for COPD, heart failure, and pneumonia. Although mortality among beneficiaries hospitalized for these conditions began to level-off by summer 2020, these deaths remained higher than pre-COVID levels through September 2020.

Moreover, although no new differences in readmission rates were observed by sociodemographic characteristics after implementation of COVID-19 emergency measures, unadjusted all-cause 30-day post-discharge mortality was higher among Black/African American, Hispanic, and rural beneficiaries, as well as those living in the most socially deprived areas. These results raise important questions about how to frame sociodemographic disparities

among Medicare FFS beneficiaries in the context of COVID-19 emergency measures. Although 30-day readmission rates provide valuable and policy-relevant information for the HRRP, this quality indicator may miss the impact of competing mortality risk on underserved populations in the COVID-19 era. The interplay among 30-day readmission rates, 30-day mortality, and sociodemographic characteristics during the COVID-19 pandemic warrants further investigation.

While data describing the impact of COVID-19 on the HRRP are still emerging, results of this study offer preliminary information that may have implications for readmission policy in the context of a public health emergency that has disproportionately affected underserved communities:

- Although longstanding disparities in 30-day readmission rates for HRRP health conditions did not appear to be exacerbated by the COVID-19 National Emergency, additional studies may identify policy levers that can be applied to mitigate these persistent disparities.
- Higher 30-day post-discharge mortality among underserved populations raises several policy-relevant points:
  - The absence of sociodemographic disparities in 30-day readmission rates during the COVID-19 National Emergency should be interpreted with caution, as these may have been impacted by competing mortality; disproportionate death among disadvantaged groups may have contributed to reduced 30-day readmission rates. If it is the case that differential mortality is masking important issues, then payment models associated with the HRRP should be adjusted to account for these differences so as not to unfairly penalize already strained hospitals who serve these populations.
  - » In the context of the COVID-19 National Emergency where many older adults may choose not to seek care and/or are unable to access needed care, it may be useful to implement supplemental post-discharge support measures to ensure that these social determinants do not have a disproportionate impact on post-discharge mortality among underserved populations. Related work35 suggests that supportive measures (such as providing virtual follow-up care via telehealth) may be effective in mitigating readmissions among vulnerable groups.
  - » If competing mortality masks sociodemographic disparities in outcomes following HRRP hospitalizations during a public health emergency, it may also be prudent to consider the value of 30-day post-discharge mortality as an indicator of the quality of care delivery following discharge.

## Limitations

Several important limitations should be considered when interpreting the findings of this study. First, analyses are descriptive and do not demonstrate cause-and-effect between the onset of COVID-19 emergency measures and changes in either hospitalizations or 30-day readmissions. Although we can purport that the large decrease in hospitalizations, and temporary decrease in readmissions rates, is related to COVID-19, the causal effect of COVID-19 on these changes could not be determined in this study. Second, because emergency measures were not implemented simultaneously or consistently across jurisdictions, there is not a definitive single point in time that is associated with the changes in health-seeking behaviors or healthcare access challenges that may have impacted findings. Local and state variation in emergency measures were not accounted for in this analysis of national data. Third, this descriptive study did not adjust for clinical status associated with each hospitalization. Readmission rates could be influenced by illness severity or other clinical characteristics. A fourth limitation relates to how the study cohort was constructed, which may have implications for generalizing readmission rates with different inclusion/ exclusion criteria. A fifth limitation is the possibility that coding substitutions may have occurred, for example, among COPD, pneumonia, and COVID-19 that impacted both the number of hospitalizations and readmission rates for COPD and pneumonia. Finally, competing mortality among beneficiaries hospitalized for HRRP conditions may have impacted 30-day readmission rates.

#### Keywords

Chronic Conditions Warehouse, Medicare Feefor-Service, Sociodemographic Characteristics, Chronic Conditions, Readmissions, Mortality

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