

Learning About 30-Day Readmissions From Patients With Repeated Hospitalizations

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The finding that nearly 1 in 5 Medicare beneficiaries treated in a hospital is readmitted within 30 days has captured the attention of policy makers concerned with both the cost and quality of health services. Hospital readmissions gained widespread attention with the Medicare Payment Advisory Commission's June 2007 Report to Congress, which stated that 13.3% of all Medicare 30-day readmissions were potentially preventable and suggested that \$12 billion could have been saved in a single year.¹ The focus on readmissions intensified with the publication of Steven Jencks' landmark 2009 paper in the *New England Journal of Medicine*,² in which he and his coauthors estimated that unplanned 30-day rehospitalizations cost Medicare \$17.4 billion in 2004. Also beginning in 2009, the Hospital Compare website created by CMS began to publish risk-standardized 30-day readmission rates by hospital for Medicare fee-for-service (FFS) patients discharged with a principal diagnosis of heart failure, acute myocardial infarction, or pneumonia. In October 2012, the Medicare Hospital Readmissions Reduction Program (HRRP) began penalizing hospitals for "excessive" readmission rates for these 3 conditions. The National Quality Forum subsequently endorsed a new 30-day readmission metric, the Hospital-Wide All-Cause Readmission Measure, which identifies and excludes specific conditions and procedures for which a hospitalization would be considered planned or expected.³ This measure, added to the Hospital Compare website in 2013, was developed to be applicable to all adult patients, not just those 65 years and older, so it can be used by payers other than Medicare.

National and regional initiatives launched to reduce readmissions to the Society for Hospital Medicine's Project BOOST (Better Outcomes for Older adults through Safe Transitions),⁴ State Action on Avoidable Rehospitalizations (STAAR),⁵ the HHS "Partnership for Patients,"⁶ and the care transitions project facilitated by the CMS Quality Improvement Organizations (QIOs) in 14 communities.⁷ Despite all

ABSTRACT

Objectives

To examine the population of inpatients with multiple hospitalizations at a large urban medical center in order to understand the types of patients who are at highest risk for 30-day readmission.

Study Design

Descriptive retrospective cohort analysis using hospital administrative data.

Methods

Bivariate analysis of clinical and sociodemographic characteristics of 19,049 adult inpatients discharged with a medical MS-DRG between July 1, 2009, and December 2010, and all subsequent inpatient admissions in the 180 days following each index discharge.

Results

Patients with 6 or more stays (very frequent readmissions) represented 0.8% of patients and 17.3% of 30-day readmissions. Those with 3 to 5 stays (frequent readmissions) comprised 9.4% of patients and 54.3% of 30-day readmissions. These patients differed significantly from those who had fewer hospitalizations with respect to age, race/ethnicity, gender, English proficiency, and insurance type.

Conclusions

Most 30-day readmissions are experienced by patients who have multiple, frequent hospital admissions. Efforts to reduce readmissions must look beyond the current focus on a single hospital discharge and transition period.

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these efforts, between 2007 and 2011, the national Medicare readmission rate remained unchanged; preliminary data for calendar year 2012 show a slight decrease.⁸

CMS, when finalizing the 3 readmission measures to be used in the HRRP, noted that the 30-day time frame “is a clinically meaningful period for hospitals, in collaboration with their medical communities, to reduce readmission risk. This time period for assessing readmission is an accepted standard in research and measurement.”⁹ This focus on a single 30-day period has resulted in analyses that assume a patient discharged from the hospital is at risk for a single rehospitalization. It ignores the fact that 25% of Medicare beneficiaries represent 85% of total expenditures.¹⁰ Jencks’ analysis was based not on unique patients but on hospital discharges. This traditional encounter-based approach is not patient-centered. It does not reflect the trajectory experienced by some patients who have repeated rehospitalizations. Hospital clinicians are only too aware that certain patients return to their emergency departments (EDs) and nursing units over and over again, but there is a lack of evidence regarding the extent to which these frequently readmitted patients contribute to 30-day readmission rates, whether they differ from other patients, and how those differences may indicate a need for additional or different approaches to prevent their readmissions.

OBJECTIVES

The objective of this descriptive analysis was to understand the population of inpatients with a pattern of repeated hospitalizations at a large urban medical center in order to gain insight into the types of patients who were at the highest risk of readmission and consumed the most inpatient resources. This activity was undertaken as part of a quality improvement initiative and thus was deemed non-reviewable by the medical center’s Institutional Review Board.

METHODS

A retrospective cohort of 19,049 adult patients (18 years and older) with an inpatient medical discharge between July 1, 2009, and December 31, 2010, was constructed using the medical center’s administrative data warehouse. Medical discharges were defined as a medical Medicare

Take-Away Points

Most 30-day readmissions are experienced by patients who experience frequent hospital stays.

- Efforts to reduce readmissions must look beyond the current focus on a single hospital discharge and 30-day transition period.
- Commonly recommended transition care solutions may not be sufficient to prevent many readmissions.
- Patients with frequent readmissions are more likely to be members of minority groups, to be non-English-speaking, and to have Medicaid insurance, along with complex medical problems complicated by mental illness or substance abuse.
- Reducing readmissions among the most complex patients is likely to require new forms of care in the community.

Severity-Diagnosis-Related Group (MS-DRG). The index hospitalization was restricted to those with medical MS-DRGs in order to focus on readmissions associated with chronic medical conditions, not surgical complications. Clinical and sociodemographic data from the index hospitalization, plus all subsequent admissions that occurred within 180 days after the index discharge, were extracted from the data warehouse. Sociodemographic variables included age, race, Hispanic ethnicity, preferred language, primary and secondary payer, and residence zip code. Subsequent admissions could include any nonobstetric MS-DRG; however, solid organ transplant patients were excluded to make the results more generalizable. Transplant patients were identified based on *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* procedure, complication, and status codes. Multiple admissions for the same patient were linked using the patient’s medical record number. The population of interest was defined as patients who had at least 2 subsequent hospital admissions within the 6-month period following the index discharge (ie, a total of 3 or more stays). This population was divided into 2 subgroups: those with 3 to 5 inpatient stays (frequent readmissions) and those with 6 or more (very frequent readmissions). The subgroup of patients with 1 or 2 hospitalizations was the comparison group. For each subgroup, the additional hospital admissions could occur at any interval within the 6-month period. The principal diagnoses for each stay were categorized using the chronic condition definitions developed by Iezzoni,¹¹ as modified by the Dartmouth Atlas (the 9 Iezzoni/Dartmouth Atlas chronic conditions are: congestive heart failure, cancer with poor prognosis, chronic pulmonary disease, coronary artery disease, chronic renal disease, peripheral vascular disease, dementia, diabetes with end organ damage, and severe chronic liver disease).¹² HIV/AIDS and sickle cell anemia were added because these conditions were known to have a high prevalence of returning

■ **Table 1.** Distribution of Patients and Utilization by Readmission Category

Readmission Category	Total	Comparison (1 or 2 IP stays)		Frequent Readmissions (3 to 5 IP stays)		Very Frequent Readmissions (≥6 stays)	
		No.	%	No.	%	No.	%
Patients	19,049	17,119	89.9	1785	9.4	145	0.8
Utilization indicator							
Stays	27,640	20,430	73.9	6171	22.3	1039	3.8
Total days	145,345	95,441	65.7	43,065	29.6	6839	4.7
30-day readmissions	4278	1216	28.4	2322	54.3	740	17.3

IP indicates inpatient.

patients at the medical center. For each hospitalization, 9 secondary diagnoses also were examined for the presence of mental health and substance abuse conditions, which were identified using the ICD-9-CM mapping developed by the Agency for Healthcare Research and Quality's Hospital Cost and Utilization Project,¹³ and for codes indicating lack of housing, tobacco-use disorder, and morbid obesity (body mass index ≥ 40 kg/m²). Patients' chronic conditions were categorized using 3 approaches: by the principal diagnosis of the index stay, by the principal diagnosis of all hospital stays, and by whether the patient had at least 1 stay with a principal diagnosis associated with the chronic condition. The second and third approaches recognize that the patient's major chronic condition might not be the principal reason for the index stay captured in our cohort. The third approach allowed patients to be counted more than once. Bivariate differences were tested among the subgroups across selected sociodemographic variables as well as the clinical conditions, using χ^2 tests for categorical variables and the *t* test for differences in group means for the continuous variable, age. Differences were considered statistically significant at $P < .05$. All statistical analyses were conducted using Stata, version 11.2 (StataCorp LP, College Station, Texas).¹⁴

RESULTS

Patients with 3 or more hospitalizations made up 10.1% of the total cohort, 26.1% of the hospital stays, and 34.3% of the hospital days used. They also incurred 71.6% of the 30-day readmissions (Table 1). The very frequent readmissions subgroup with 6 or more stays comprised only 0.8% of all patients in the cohort, but they accounted for 17.3% of the 30-day readmissions. The patients with multiple readmissions differed significantly from the comparison patients who had 1 or 2 inpatient stays with respect to multiple sociodemographic characteristics (Table 2). The very frequent readmission subgroup was significantly

younger (mean age 53.5 years) compared with the frequent readmissions subgroup (mean age 65.8 years) and the comparison group (mean age 62.4 years). Both frequent readmissions subgroups included a significantly larger proportion of patients whose preferred language was not English. The most common non-English languages were Russian, Farsi (Persian), and Spanish, which each represented approximately 5% of patients with 3 or more hospital stays. Overall, Hispanics did not have more frequent readmissions; although the proportion in the subgroup with very frequent readmissions appears larger, there were only 20 Hispanic patients in this subgroup. African Americans and other black patients comprised 28.3% of the very frequent readmission subgroup and 21.1% of the frequent readmission subgroup versus 17.3% of the comparison group.

Patients with Medicaid coverage alone made up 27.6% of the very frequent readmission group, more than double the proportion among the frequent readmission subgroup (13.4%), while only 10.0% of the comparison patients with 1 or 2 hospital stays had Medicaid coverage. The proportion of dual-eligible patients also was significantly higher in the frequent readmissions subgroups. The geographic distribution of patients with frequent readmissions was generally similar to that of the comparison patients. There was a trend toward a larger proportion of those with 3 to 5 hospitalizations living in the area immediately surrounding the hospital, while a smaller percentage of those in the very frequent readmission subgroup lived in this core service area. A significantly higher proportion of patients in the very frequent readmission subgroup did not live within the hospital's primary service area, but further away within the county.

Just 2.4% of the total cohort died during the index stay. The highest proportion of in-hospital deaths was found in the frequent readmissions subgroup (7.7%), significantly higher than the 6.9% of patients with 6 or more stays who died. Within the comparison group, 3.4% of patients

■ **Table 2.** Demographic Characteristics of Patients by Readmission Category

Patient Characteristic	Comparison (1 or 2 IP stays)	Frequent Readmissions (3 to 5 IP stays)	Very Frequent Readmissions (≥6 IP stays)
% Male	46.7	48.5	49.7
Mean age (years)	62.4	65.8 ^{a,b}	53.5 ^{a,b}
% Hispanic	10.3	9.9	13.8
% Non-English-Speaking	13.2	16.5 ^a	15.2
% Black or African American	17.3	21.1 ^{a,b}	28.3 ^{a,b}
% Living in core service area	58.9	61.1	53.1
% Died during last stay if total stays >1 ^c	6.1	7.7 ^a	6.9
Payer			
% Dual-eligible	20.2	29.2 ^a	26.9 ^a
% Medicare (not dual)	33.3	36.5 ^b	18.6 ^{a,b}
% Medi-Cal only	10.0	13.4 ^{a,b}	27.6 ^{a,b}
% Private insurance	28.9	18.0 ^a	22.1

IP indicates inpatient.
^aSubgroup statistically different from comparison ($P < .05$).
^bSubgroups statistically different from each other ($P < .05$).
^c3.4% of those with a single stay died.

with a single hospital stay died, while 6.1% of those with 1 rehospitalization died during that second stay. Only 11.7% of the index stays in the comparison subgroup had principal diagnoses associated with any of the 10 chronic conditions. A larger percentage of patients in the 2 frequent readmission subgroups had an index hospital stay for all but 1 of these conditions; the exception was coronary artery disease (CAD). For example, 93.6% of patients with an index stay for CAD were in the subgroup with 1 or 2 inpatient stays in 6 months, whereas 76.3% of patients with a chronic renal failure index stay and 60.3% of patients with a sickle cell anemia index were in this subgroup. Nevertheless, only 26.9% of the patients with very frequent readmissions were categorized as having any chronic condition as the principal diagnosis for their index stay. Using the principal diagnosis of all of the hospitalizations resulted in an even smaller proportion associated with chronic conditions, although this approach showed that sickle cell anemia and HIV/AIDS were among the most common principal diagnoses for patients with very frequent readmissions (5.0% and 4.0%, respectively), in addition to malignancies with poor prognosis (4.0%) and heart failure (3.9%). For patients in the frequent readmissions subgroup (3 to 5 stays in 6 months), the most prevalent principal diagnoses were heart failure (6.7%), malignancies with poor prognosis (5.2%), and chronic pulmonary disease (2.3%). Finally, categorizing patients according to the principal diagnosis of any stay (which allowed patients to be counted more than once) resulted in 55.2% of patients with very frequent readmissions

and 42.5% of those with frequent readmissions being associated with a chronic condition, versus only 13.7% of comparison group patients.

Although heart failure was the most prevalent chronic condition in the cohort, the 726 patients whose index stay had a principal diagnosis of heart failure comprised only 3.8% of all cohort patients. As shown in **Table 3**, 19.0% of these patients had 3 or more hospital stays in 6 months. However, an additional 216 patients (1.1% of the cohort) had an index stay for some other diagnosis and subsequently had a heart failure stay. A much larger proportion of these patients (57.9%) had 3 or more hospitalizations. For both groups of patients with at least 1 hospitalization for heart failure, the table shows that as the number of total hospitalizations increased, the proportion attributable primarily to heart failure decreased.

Examination of secondary diagnoses also revealed significant differences among the subgroups. The overall prevalence of mental health diagnoses coded from the medical record was 21.0%, but 43.5% of patients with very frequent readmissions had such diagnoses, compared with 34.7% of those with 3 to 5 hospital stays and 19.3% of those with 1 or 2 stays. The corresponding prevalence of substance abuse diagnoses was 27.6%, 9.9%, and 6.3%. Patients with very frequent readmissions also had a significantly higher prevalence of documented morbid obesity (9.0%) compared with the frequent readmission subgroup (6.0%) and the comparison subgroup (3.3%). A different pattern was observed in the prevalence of documented tobacco-use disorder, which was 6.0% in the compari-

■ **Table 3.** Patients and Hospital Stays With Principal Diagnosis of Heart Failure, by Readmission Category

Readmission Category	Total	Comparison (1 or 2 IP stays)		Frequent Readmissions (3 to 5 IP stays)		Very Frequent Readmissions (≥6 stays)	
		No.	%	No.	%	No.	%
Patients							
Patients with HF index stay	726	588	81.0	129	17.8	9	1.2
Other patients with any HF stay, not index	216	91	42.1	117	54.2	8	3.7
IP stays by patients with HF index stay							
HF IP stays	940	662	70.4	258	27.4	20	2.1
Total IP stays	1305	782	59.9	460	35.2	63	4.8
% of IP stays that are HF	72.0		84.7		56.1		31.7
IP stays by patients with non-HF index stay							
HF IP stays	265	91	34.3	154	58.1	20	7.5
Total IP stays	677	182	26.9	426	62.9	69	10.2
% of IP stays that are HF	39.1		50.0		36.2		29.0
HF indicates heart failure; IP, inpatient.							

son subgroup, 4.4% in the subgroup with 3 to 5 hospital stays, and 2.8% in the subgroup with very frequent readmissions. This finding was associated with the fact that a higher proportion of patients with an index stay for CAD had a documented diagnosis of tobacco-use disorder than did patients with other index diagnoses, and nearly all of the CAD patients were in the comparison subgroup. The proportion of patients documented as lacking housing using a diagnosis code was too small to report.

Patients in the frequent and very frequent readmissions subgroups also had a higher proportion of 30-day readmissions following their index stay. **Table 4** shows the rate of readmission within 30 days after the index stay for all patients in the cohort who were discharged alive from their index stay, as well as for patients whose index admission diagnoses were heart failure, chronic pulmonary disease, or not attributable to any chronic condition. Although patients with only 1 or 2 hospital stays did have a higher 30-day readmission rate when their index stay was for heart failure, the 30-day readmission rate among patients with frequent readmissions was similar for patients with heart failure and for those whose index stay was not primarily associated with any chronic condition.

DISCUSSION

This analysis affirmed the common finding that a small proportion of patients accounts for a disproportionate share of resource use: in our analysis, 10% of a cohort of patients initially hospitalized with a medical diagnosis incurred 72% of the 30-day readmissions that

occurred within 180 days of the initial discharge. Of the 3 conditions currently targeted by the HRRP, heart failure has received the most attention. Given the intense national focus on reducing 30-day readmissions among patients with heart failure, one might expect them to comprise a large share of such rehospitalizations. This is not the case. Jencks' analysis of Medicare FFS claims in 2003-2004 showed that patients with an index DRG of heart failure accounted for 7.6% of 30-day readmissions.² Our cohort included all adult patients, not just those with Medicare coverage, but the relative magnitude of the population with heart failure was consistent with Jencks' findings. Heart failure was the most prevalent chronic condition in our cohort, but the more notable finding was that 87.3% of index hospital stays could not be categorized as any chronic condition based on the patient's principal diagnosis. Although it had seemed reasonable to assume that most nonsurgical patients with frequent hospitalizations were suffering from a chronic condition, the principal diagnosis code for the inpatient stay did not perform well in identifying these conditions. Even when the principal diagnosis for every hospitalization was included, about half the patients with 3 or more hospitalizations remained uncategorized. Is it plausible that the hospitalizations of patients with multiple inpatient stays in 6 months were not associated with any major chronic condition? Probably not. More likely, this finding illustrates that the principal diagnosis obtained from administrative data reflects the acute manifestations and complications—or the side effects of treatment—that led to the hospitalization, rather than the underlying disease

Table 4. Readmission Rate Within 30 Days of Index Hospitalization, by Readmission Category

Chronic Condition Category	Index Patients ^a	Comparison (1 or 2 IP stays)		Frequent Readmissions (3 to 5 IP stays)		Very Frequent Readmissions (≥6 stays)	
		No. Readmitted	Rate ^b	No. Readmitted	Rate ^b	No. Readmitted	Rate ^b
All patients	18,234	1216	7.4%	899	54.6%	117	86.7%
Patients with Heart Failure index	671	59	10.7%	58	51.3%	7	77.8%
Patients with Chronic Pulmonary Disease index	370	22	6.7%	16	41.0%	3	75.0%
Patient with no chronic condition at index	16,024	1019	7.0%	712	53.9%	87	88.8%

IP indicates inpatient.
^aDischarged alive from index stay.
^bDenominator excludes patients who died during index stay.

itself. This, in turn, results from a coding system based on individual body systems that is applied for reimbursement purposes.

This analysis has several implications for efforts to reduce readmissions. Overall, it suggests that intervention strategies should take into account patients' readmission histories. Attempts to target patients by condition using inpatient MS-DRGs or ICD-9 codes are unlikely to be successful. Numerous efforts have been made to develop an algorithm to predict which patients are at highest risk of a single 30-day readmission. Most of the resulting models have had rather poor discriminative ability and have not been able to generate predictions in real time.¹⁵ This may be due in part to the heterogeneity of patients categorized on the basis of a single index discharge, as illustrated by this analysis. The Hospital Compare rate for 30-day readmissions following a heart failure discharge at the medical center combines patients with few readmissions, the majority of which are for heart failure, and patients with both multiple conditions and multiple hospitalizations. This analysis does suggest a simple way to identify which patients are at greatest risk of multiple 30-day readmissions: those who have already had 2 or more hospitalizations in the previous 6 months. The real challenge is not in predicting which patients are at highest risk, but in identifying which interventions are likely to be most effective for specific patients.

Many of the recommended approaches have been those that can be implemented by hospitals alone, such as improving inpatient education and discharge instructions, medication reconciliation, making a timely post-discharge follow-up physician appointment, prompt transmission of the discharge summary to the patient's primary physician, and postdischarge phone calls to patients. Much of the evidence regarding the effectiveness of these strategies, however, lacks rigor and/or consists

of single institutions' descriptions of quality improvement projects.¹⁶⁻¹⁹ While these interventions have not achieved noticeable reductions in total readmissions, it is possible they may be sufficient for some patients who do not have a prior history of readmissions. This is an empirical question that has not been addressed, because nearly all assessments of readmissions have focused on the occurrence of a single 30-day readmission, without considering prior hospitalizations or readmissions that occur beyond the 30-day period.

A better strategy to reduce overall 30-day readmission rates may be to identify patients with multiple hospitalizations and stop their cycle of repeated readmissions. The best opportunity for doing this may be found with individuals in the subgroup that has a moderate number of readmissions. In the medical center, these patients were older, with a high proportion dually eligible for Medicare and Medicaid. They may benefit from the Patient Centered Medical Home approach to assure that their multiple medical conditions are addressed, including mental health issues; care is coordinated among specialists and across sites of care; polypharmacy is managed; and patients and caregivers are engaged as partners in their care. Other approaches to reducing readmissions in this subgroup are better coordination between hospitals and skilled nursing facilities,²⁰ improved transitional care that incorporates elements of the integrated geriatric care model,²¹ and greater access to services that identify and address patients' functional limitations.²²

This analysis suggests that achieving lasting readmission reductions would be the most challenging and resource-intensive among the very frequent users. Patients in this subgroup may have multiple comorbidities that are difficult to manage. They are more likely to be members of minority groups, to be non-English-speaking, and to have Medicaid insurance, all of which makes accessing

non-hospital care difficult. Thinking more holistically may help the people in both frequent readmission subgroups. This could include expanding the boundaries of traditional hospital social work services to address issues such as food insecurity and housing-related problems that increase the risk of morbidity and need for medical care services.^{23,24} There is also growing recognition that if clinicians encourage discussion of patient goals and educate patients and families about options, they may choose supportive care rather than repeated acute care interventions.²⁵

The very frequent readmission group also includes individuals whose medical problems are complicated by substance abuse and/or mental illness. This is the high-risk population targeted by the Camden Coalition.²⁶ Reducing readmissions and improving quality of life should be possible for many of these patients, but it will require hospitals to do the hard work of initiating and sustaining relationships with other community-based organizations.^{7,17} There is also the possibility that appropriate interventions may not yet exist for some patients with complex problems. New community resources may be required, such as partial hospitalization/day programs, rehabilitation programs, transitional living centers for medically fragile patients, etc. Finding the resources to make such community investments will be difficult, especially while the dominant fee-for-service reimbursement model means that savings from reducing hospital utilization flow to payers and not to providers or communities.

This study has a number of limitations. First, the data are drawn from a single large urban teaching hospital that serves as both a referral center and a community hospital. As a result, the findings may not be relevant to smaller, non-urban hospitals. Patients whose only hospitalizations were for surgical MS-DRGs were excluded, so “index” admissions in the cohort may have been preceded by other hospital stays within the prior 6 months. Only readmissions to the same medical center were captured. Therefore, total hospital utilization by patients with very frequent readmissions is likely to be understated; because a larger proportion lived outside of the medical center’s primary service area, they may have sought additional care from other hospitals near where they live. Like other analyses based on administrative data, this study could not investigate the association between readmissions and personal characteristics such as functional status, social support, food insecurity, access to transportation, or neighborhood resources, which may be even more important determinants of readmission patterns than patients’

basic demographic or diagnostic profiles.

CONCLUSIONS

Patients with frequent admissions represented a small proportion of all adult medical patients but accounted for the majority of 30-day readmissions. Therefore, a focus on these patients is an important component of efforts to reduce hospital readmissions. Patients with a pattern of repeated admissions differ from other patients in significant ways that suggest different approaches to care management, transitional care, and community-based services may be needed.

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Authorship Information: Concept and design; analysis and interpretation of data; drafting of the manuscript; critical revision of the manuscript for important intellectual content; statistical analysis.

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