



Motor and Cognitive Functional Status Are Associated with 30-day Unplanned Rehospitalization Following Post-Acute Care in Medicare Fee-for-Service Beneficiaries

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BACKGROUND: The *Improving Medicare Post-Acute Care Transformation* (IMPACT) Act of 2014 stipulates that standardized functional status (self-care and mobility) and cognitive function data will be used for quality reporting in post-acute care settings. Thirty-day post-discharge unplanned rehospitalization is an established quality metric that has recently been extended to post-acute settings. The relationships between the functional domains in the IMPACT Act and 30-day unplanned rehospitalization are poorly understood.

OBJECTIVE: To determine the degree to which discharge mobility, self-care, and cognitive function are associated with 30-day unplanned rehospitalization following discharge from post-acute care.

DESIGN: This was a retrospective cohort study.

SETTING: Inpatient rehabilitation facilities submitting claims and assessment data to the Centers for Medicare and Medicaid Services in 2012–2013.

PARTICIPANTS: Medicare fee-for-service enrollees discharged from post-acute rehabilitation in 2012–2013. The sample included community-dwelling adults admitted for rehabilitation following an acute care stay who survived for 32 days following discharge ($N = 252,406$).

INTERVENTIONS: Not applicable.

MAIN MEASURES: Thirty-day unplanned rehospitalization following post-acute rehabilitation.

KEY RESULTS: The unadjusted 30-day unplanned rehospitalization rate was 12.0 % ($n = 30,179$). Overall, patients dependent at discharge for mobility had a 50 % increased odds of rehospitalization (OR = 1.50, 95 % CI: 1.42–1.59), patients dependent for self-care a 36 % increased odds (OR = 1.36, 95 % CI: 1.27–1.47), and patients dependent for cognition a 19 % increased odds (OR = 1.19, 95 % CI: 1.09–1.29). Patients dependent for both self-care and mobility at discharge ($n = 8312$, 3.3 %) had a 16.1 % (95 % CI: 15.3–17.0 %) adjusted rehospitalization rate versus 8.5 % (95 % CI: 8.3–8.8 %) for those independent for both ($n = 74,641$; 29.6 %).

CONCLUSIONS: The functional domains identified in the IMPACT Act were associated with 30-day unplanned rehospitalization following post-acute care in this large national sample. Further research is needed to better understand and improve the functional measures, and to determine if their association with rehospitalizations varies across post-acute settings, patient populations, or episodes of care.

KEY WORDS: rehabilitation; functional status; health care reform; health services research; medicare.

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INTRODUCTION

Payment reforms are transforming the delivery of post-acute care services.¹ Value-based purchasing, for example, rewards efficient high-quality care.² Secretary Burwell has stated “Our goal is to have 85 % of all Medicare fee-for-service payments tied to quality or value by 2016, and 90 % by 2018.”^{3p. 897} Measures of functional status are widely recognized as important indicators of quality care in acute and post-acute settings.⁴ The importance of function as a quality indicator is reflected in the passage of the *Improving Medicare Post-Acute Care Transformation* (IMPACT) Act of 2014.⁵ The IMPACT Act mandates the development of standard functional status (self-care and mobility) and cognitive function data elements for use in post-acute settings, including skilled nursing facilities, inpatient rehabilitation facilities, home health agencies, and long-term acute care hospitals.⁴ These standardized functional data elements will be used to assess quality of care and become part of a unified post-acute payment system in which payment rates will be based on standardized expected needs of patients rather than the settings in which they receive care.⁵ The implementation of the IMPACT Act and the development and use of standard functional measures have important implications for patient outcomes and payment in both acute and post-acute settings.⁶

Thirty-day unplanned rehospitalization is an established quality metric in acute care and has recently been extended to post-

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acute settings.⁷ Rehospitalization doubles the cost per episode for patients with conditions commonly treated in post-acute care⁶ and is associated with increased risk of 1-year mortality in community-dwelling older adults.⁸ Functional status is a key post-acute outcome and is associated with risk of rehospitalization.^{9–12} However, the relationship between the functional domains identified in the IMPACT Act (self-care, mobility, and cognition) and rehospitalization following post-acute care have not been investigated in a large national sample.¹³

The three functional domains listed in the IMPACT Act are largely discipline-specific (mobility – physical therapy; self-care – occupational therapy; cognition – occupational and/or speech/language therapy) when measured in post-acute inpatient rehabilitation settings. Thus, information on domain-specific contributions to an individual's risk for rehospitalization may help inform targeted, multidisciplinary interventions. The primary objective of this study was to determine the degree to which discharge self-care, mobility, and cognitive function were associated with 30-day unplanned rehospitalization in Medicare fee-for-service patients following post-acute rehabilitation. We selected inpatient rehabilitation facilities as the post-acute setting for the following reasons: 1) function is assessed at admission and discharge using items from a standardized instrument with established reliability and validity^{14,15}; 2) clinical and sociodemographic data are included in the Medicare rehabilitation file; and 3) services are provided to persons from a wide range of impairment groups at high risk for rehospitalization, e.g., stroke, hip fracture.

METHODS

Data Sources

Data were extracted from 100 % Medicare files: Inpatient Rehabilitation Facility-Patient Assessment Instrument (IRF-PAI), Medicare Provider Analysis and Review (MedPAR), and Beneficiary Summary files from 2012 to 2013. Inclusion criteria were applied to the IRF-PAI file for sample selection, and then the MedPAR and Beneficiary Summary files were linked and integrated with the IRF-PAI data. The study was approved by the University Institutional Review Board. A Data Use Agreement was completed following Centers for Medicare & Medicaid Services (CMS) requirements.

Study Sample

All Medicare fee-for-service enrollees discharged from inpatient rehabilitation between 15 September 2012 and 30 October 2013 were eligible. This time frame was selected to allow a 6-month look back before the acute care admission and a 32-day window following inpatient rehabilitation, while accounting for maximum acute (30 days) and inpatient rehabilitation (45 days) lengths of stays. Community-dwelling adults admitted from acute care with an inpatient rehabilitation stay of 3–

45 days and who survived 32 days following discharge were reviewed for unplanned rehospitalizations.

Variables

Outcome Variable. The primary outcome was 30-day unplanned rehospitalization. Patients were classified as “Rehospitalized” if an unplanned rehospitalization occurred during days 2 to 32 following post-acute discharge. “Unplanned” rehospitalizations were identified using the Hospital-Wide All-Cause Unplanned Readmission Algorithm, version 3.0.¹⁶ The algorithm and 30-day observation window (days 2 to 32) are endorsed by the National Quality Forum and used by the Centers for Medicare and Medicaid Services (CMS) to identify unplanned, urgent readmissions.¹⁷ Time between inpatient rehabilitation discharge and rehospitalization (days) was also calculated from the claims data.

Predictor Variables. The primary predictor variables were the functional domains included in the IMPACT Act, patient self-care, mobility, and cognition, at discharge. These functional domains are represented using items from the *Functional Independence Measure (FIM)*,¹⁸ which are components of the IRF-PAI. The FIM includes 18 items rated on a 7-point scale based on the level of independence demonstrated during performance of each item (1 = total assistance, 7 = complete independence).

The functional items were categorized into the following domains: “self-care” contained eating, grooming, bathing, dressing – upper body, dressing – lower body, toileting, bladder management, and bowel management items (range 8–56); “mobility” contained transfers – bed/chair/wheelchair, transfers – toilet, transfers – tub/shower, walk/wheelchair, and stairs items (range 5–35); and “cognition” contained comprehension, expression, social interaction, problem solving, and memory items (range 5–35). The ratings obtained at discharge were used to determine functional levels at the start of the 30-day rehospitalization window.¹⁴

Clinically relevant categorical variables were created for the functional domains included in the IMPACT Act⁵ (mobility, self-care and cognition) by classifying patients as “dependent”, “modified dependent”, or “independent” on each sub-scale. Approaches for categorizing scores on these three domains have not been established. Our goal was to create categories that minimized the variability in the functional profiles of patients classified at that level. Preliminary analyses were performed to inform our approach for categorizing scores on the domains (eTable 1). The number of items within the sub-scale scored as dependent (score of 1 or 2), modified dependent (score of 3 to 5), or independent (score of 6 or 7) was used for classification. Participants were classified as “dependent” or “independent” if they were dependent or independent on more than half the items within the sub-scale, respectively. Those who did not meet the criteria for “dependent” or “independent” were classified as “modified dependent.” Multiple permutations of item scores can sum to a sub-scale score above or below a designated cut

score; therefore, setting a “rule” rather than establishing a cut score decreases the variability in functional performance profiles within the category.

Covariates. The following sociodemographic variables were extracted from the IRF-PAI file: patient age (continuous, years), sex (female/male), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic/Latino, or Other), disability entitlement (disability as the original reason for Medicare enrollment, yes/no), and prior living situation (alone, living with family/friend, or paid attendant).

Data from the IRF-PAI file were used to determine the rehabilitation impairment category (RIC) and comorbidity tier. Medicare classifies patients admitted to inpatient rehabilitation into one of 21 impairment categories based on their primary condition. Using previous research, we clustered the impairment categories into six clinically relevant diagnostic categories: central nervous system (CNS) dysfunction, spinal cord dysfunction, other neurologic conditions (e.g., Parkinson’s), musculoskeletal conditions, endurance conditions, and other (eTable 2).^{19,20}

Patients admitted to inpatient rehabilitation are assigned to one of four comorbidity tiers (none, low, medium, or high) developed by CMS for inpatient rehabilitation prospective payment.²⁰ The CMS tiers are based on the presence of secondary conditions, and reimbursement rates are adjusted accordingly. Comorbidity tiers were used as a proxy for patient health beyond their rehabilitation diagnosis. Experiencing a rehabilitation program interruption (yes/no) was also included as a covariate. A program interruption occurred if a patient was discharged and returned to the same rehabilitation facility within 3 days.²⁰ Two clinical variables were extracted from the MedPAR file: number of hospital admissions over the 6 months prior to the index acute care admission (count) and the index acute care length of stay (days).

Data Analysis

Descriptive statistics were calculated to characterize the overall sample, as well as those with and without 30-day unplanned rehospitalizations.

A model predicting rehospitalization (yes/no) was constructed using a generalized estimating equation with the following sociodemographic and clinical covariates: age, sex, race/ethnicity, disability entitlement, living situation, number of hospital admits in prior 6 months, hospital length of stay, diagnostic category, comorbidity tier, admission functional status, and program interruption. The covariates were selected based on a review of the literature and clinical judgement.

Adjusted rehospitalization rates by functional classification were calculated from the model. Comparison of the

adjusted rates provided insight into how rehospitalization risk differed between patients classified as dependent, modified dependent, and independent at discharge on the three functional domains. Adjusted rates were also calculated for all combinations of functional status across the self-care and mobility domains.

RESULTS

Sample Characteristics

449,869 inpatient rehabilitation discharges occurred over the study period. Exclusion criteria were applied to this eligible sample, resulting in a final sample of 252,406 discharges (56.1 % of original sample). See Fig. 1 for information on sample selection.

Sociodemographic and clinical variables for the sample as a whole and for those with and without rehospitalizations are presented in Table 1. Mean sample age was 76.1 (SD, 10.6) years. A majority of the patients were female (59.6 %) and non-Hispanic white (81.7 %). Mobility, self-care, and cognition scores at post-acute rehabilitation discharge were lower for patients who were rehospitalized compared to those who were not rehospitalized. Correspondingly, the percentages of patients who were dependent for mobility, self-care, or cognition were higher among those who were rehospitalized compared to those who were not rehospitalized (mobility: 15.2 vs. 9.6 %, self-care: 6.4 vs. 3.6 %, cognition: 3.5 vs. 2.3 %) (Table 2).

30-day Unplanned Rehospitalization

The unadjusted 30-day unplanned rehospitalization rate for the overall sample was 12.0 % ($n = 30,179$). We show the parameter estimates for the model in Table 3 and use it as the basis for all subsequent analyses.

The sociodemographic covariates associated with 30-day unplanned rehospitalization were older age, non-Hispanic Black race/ethnicity, and disability entitlement (Table 3). The clinical covariates associated with rehospitalization were hospital admission(s) over the prior 6 months, longer index hospital length of stay, experiencing a rehabilitation program interruption, tier comorbidity, and cognitive impairment at admission. Individuals in the central nervous system (CNS) dysfunction, spinal cord dysfunction, other neurologic conditions, endurance conditions, and other diagnostic categories had greater odds of rehospitalization compared to those in the musculoskeletal category.

Functional Domains

Self-care, mobility, and cognition at discharge were significant predictors of rehospitalization (Table 3). Mobility [odds ratio (OR) = 1.50, 95 % confidence interval (CI): 1.42–1.59 for dependent. vs independent] demonstrated a slightly stronger association with rehospitalization than self-care (OR = 1.36,

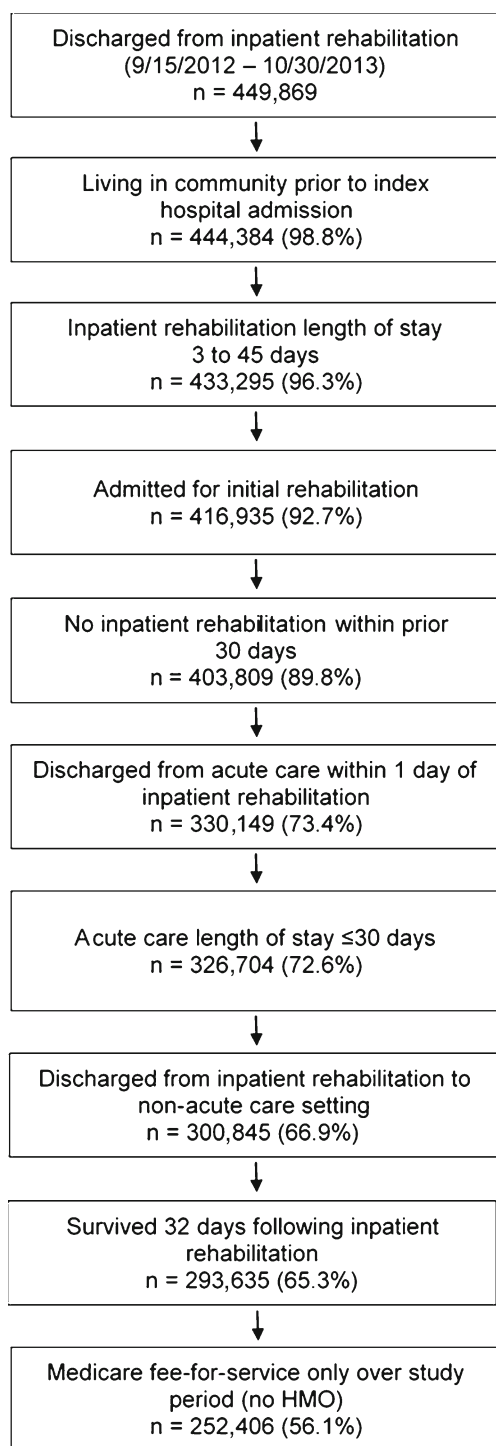


Figure 1. Flow chart presenting number and percent of eligible patients remaining at each step as exclusion criteria were applied.

95 % CI: 1.27–1.47) or cognition (OR = 1.19, 95 % CI: 1.09–1.29). Figure 2 shows that risk-adjusted rehospitalization rates were highest for individuals classified as “dependent” (dependent on mobility, 13.2 %; self-care 13.0 %; cognitive function 12.1 %) and lowest for those classified as “independent” (independent on mobility, 9.2 %; self-care 9.9 %; cognitive function 10.4 %) across the three domains.

Adjusted readmission rates for all combinations of self-care and mobility classifications are presented in Fig. 3. Individuals who were independent for self-care and mobility at discharge ($n = 74,641$; 29.6 %) had an 8.6 % (95 % CI: 8.4–8.8 %) risk-adjusted 30-day unplanned rehospitalization rate, while those dependent for self-care and mobility at discharge ($n = 8312$; 3.3 %) had a 16.1 % (95 % CI: 15.3–17.0 %) adjusted rate. The dependent for self-care and independent for mobility cell were censored due to inadequate size ($n = 14$; 0.0 %).

DISCUSSION

The IMPACT Act mandates the collection of self-care, mobility, and cognitive function data for quality-reporting in post-acute care settings.⁵ Previous studies examining rehospitalization and post-acute inpatient rehabilitation have focused on predictors other than the functional domains identified by the IMPACT Act and outcomes other than post-discharge 30-day unplanned rehospitalization.^{9,11,21–26} Unplanned rehospitalizations have the potential for improvement^{7,27} and are the focus of the current quality improvement policies being developed by CMS and the National Quality Forum.²⁸ In our national sample of community-dwelling adults who were discharged from post-acute rehabilitation, the overall unadjusted 30-day unplanned rehospitalization rate was 12.0 %. Self-care, mobility, and cognition at discharge remained significant predictors of rehospitalization after controlling for sociodemographic and other clinical variables (Table 2).

Functional status at discharge is indicative of a patient’s remaining needs. Understanding the relationship between discharge functional status and risk of rehospitalization informs discharge planning and continuing care recommendations. Although all three domains were associated with risk of rehospitalization, the strength of the associations varied across the domains. Mobility at discharge demonstrated a slightly stronger association with rehospitalization than self-care; however, the risk-adjusted rates of readmission for those who were dependent for either domain were similar (13 %). The importance of independent mobility in an individual’s rehospitalization risk is an important finding, given that more patients were dependent with mobility at discharge (10.2 %) than with self-care (3.9 %) or cognition (2.4 %). Mobility and self-care dependency at discharge further increased the risk-adjusted readmission rate to 16 %. This rate is higher than previously reported 30-day readmission rates following inpatient rehabilitation (11.8–13.5 %),^{10,17} indicating dependence in both domains may be a red flag for providers attempting to identify patients at increased risk for rehospitalization.

Our findings also support previous work demonstrating an association between higher cognitive scale scores and decreased risk of rehospitalization.^{10,23,29} However, in our sample, cognition at discharge exhibited a weaker association with rehospitalization than mobility or self-care. The low prevalence of cognitive dysfunction as measured by the cognitive

Table 1. Patient Characteristics of the Overall Sample and Those With and Without 30-day Unplanned Rehospitalization Following Inpatient Rehabilitation

Patient Characteristics	Overall	Rehospitalized	Not Rehospitalized
	<i>n</i> = 252,406	<i>n</i> = 30,179	<i>n</i> = 222,227
Sample size			
Age in years, mean ± SD	76.1 ± 10.6	75.9 ± 11.1	76.1 ± 10.5
Female, <i>n</i> (%)	150,473 (59.6)	17,144 (56.8)	133,329 (60.0)
Race/Ethnicity, <i>n</i> (%)			
Non-Hispanic White	206,307 (81.7)	23,968 (79.4)	182,339 (82.1)
Non-Hispanic Black	25,309 (10.0)	3680 (12.2)	21,629 (9.7)
Hispanic/Latino	13,598 (5.4)	1774 (5.9)	11,824 (5.3)
Other	6613 (2.6)	693 (2.3)	5920 (2.7)
Unknown	579 (0.2)	64 (0.2)	515 (0.2)
Disability entitlement*, <i>n</i> (%)	54,303 (21.5)	7642 (25.3)	46,661 (21.0)
Prior Living Situation, <i>n</i> (%)			
Family/Friends	164,191 (65.1)	20,275 (67.2)	143,916 (64.8)
Paid Attendant	2636 (1.0)	354 (1.2)	2282 (1.0)
Alone	85,417 (33.8)	9533 (31.6)	75,884 (34.1)
Unknown	162 (0.1)	17 (0.1)	145 (0.1)
Prior hospital admissions†, <i>n</i> (%)			
0	183,210 (72.6)	17,238 (57.1)	165,972 (74.7)
1	46,151 (18.3)	7303 (24.2)	38,848 (17.5)
2	14,513 (5.7)	3081 (10.2)	11,432 (5.1)
3+	8532 (3.4)	2557 (8.5)	5975 (2.7)
Acute care LOS in days, mean ± SD	6.1 ± 4.5	7.5 ± 5.3	5.9 ± 4.4
Diagnostic category, <i>n</i> (%)			
CNS dysfunction	69,850 (27.7)	8506 (28.2)	61,344 (27.6)
Spinal cord dysfunction	11,130 (4.4)	1151 (3.8)	9979 (4.5)
Other neurologic conditions	24,452 (9.7)	3798 (12.6)	20,654 (9.3)
Musculoskeletal conditions	93,178 (36.9)	7667 (25.4)	85,511 (38.5)
Endurance conditions	20,360 (8.1)	3779 (12.5)	16,581 (7.5)
Other	33,436 (13.2)	5278 (17.5)	28,158 (12.7)
Comorbidity Tier, <i>n</i> (%)			
None	151,098 (59.9)	14,299 (47.4)	136,799 (61.6)
Low	73,404 (29.1)	10,589 (35.1)	62,815 (28.3)
Medium	18,937 (7.5)	3143 (10.4)	15,794 (7.1)
High	8967 (3.6)	2148 (7.1)	6819 (3.1)
IR Program Interruption, <i>n</i> (%)	2608 (1.0)	434 (1.4)	2174 (1.0)
Admission FIM, mean ± SD			
Mobility	10.6 ± 4.1	10.3 ± 4.0	10.7 ± 4.1
Self-care	27.0 ± 8.4	25.8 ± 8.6	27.2 ± 8.4
Cognition	23.3 ± 7.0	22.3 ± 7.0	23.4 ± 6.9
Total	61.0 ± 16.1	58.3 ± 16.2	61.3 ± 16.0
Discharge FIM, mean ± SD			
Mobility	21.8 ± 6.3	20.2 ± 6.6	22.0 ± 6.2
Self-care	41.5 ± 9.1	39.2 ± 9.9	41.8 ± 8.9
Cognition	28.2 ± 5.9	27.2 ± 6.2	28.3 ± 5.8
Total	91.4 ± 18.5	86.6 ± 19.7	92.1 ± 18.2
Days to Rehospitalization, median (IQR)	–	14 (7–22)	–

Abbreviations: SD standard deviation, LOS length of stay, IR inpatient rehabilitation, IQR interquartile range

* "Disability" original reason for receiving Medicare

† Number of acute care admissions during 6 months prior to index admission

Table 2. Distributions of Participants Within the Mobility, Self-Care, and Cognition Domains at Discharge from Inpatient Rehabilitation

	Overall	Rehospitalized	Not Rehospitalized
	<i>n</i> = 252,406	<i>n</i> = 30,179	<i>n</i> = 222,227
Mobility			
Independent	81,852 (32.4)	7233 (24.0)	74,619 (33.6)
Modified Dependent	144,723 (57.3)	18,352 (60.8)	126,371 (56.9)
Dependent	25,831 (10.2)	4594 (15.2)	21,237 (9.6)
Self-care			
Independent	111,401 (44.1)	10,578 (35.1)	100,823 (45.4)
Modified Dependent	131,123 (51.9)	17,660 (58.5)	113,463 (51.1)
Dependent	9882 (3.9)	1941 (6.4)	7941 (3.6)
Cognition			
Independent	165,979 (65.8)	17,897 (59.3)	148,082 (66.6)
Modified Dependent	80,269 (31.8)	11,213 (37.2)	69,056 (31.1)
Dependent	6158 (2.4)	1069 (3.5)	5089 (2.3)

Table 3. Odds Ratios for the Fully Adjusted Model Predicting 30-day Unplanned Rehospitalization

Patient Variables	OR (95 % CI)
Age*	1.03 (1.03, 1.04)
Male	0.98 (0.96, 1.01)
Race/Ethnicity	
Non-Hispanic White	ref
Non-Hispanic Black	1.07 (1.02, 1.11)
Hispanic/Latino	1.00 (0.95, 1.06)
Other	0.85 (0.78, 0.92)
Disability entitlement (yes) [†]	1.20 (1.16, 1.24)
Prior Living Situation	
Family/Friends	ref
Paid Attendant	1.00 (0.89, 1.12)
Alone	0.99 (0.96, 1.02)
Prior Hospital Admissions [‡]	
0	ref
1	1.58 (1.53, 1.63)
2	2.06 (1.97, 2.15)
3+	3.07 (2.91, 3.23)
Hospital Length of Stay [§]	1.03 (1.03, 1.04)
Diagnostic Category	
Musculoskeletal Conditions	ref
CNS Dysfunction	1.29 (1.24, 1.33)
Spinal Cord Dysfunction	1.17 (1.09, 1.25)
Neurologic Conditions	1.55 (1.48, 1.62)
Endurance Conditions	1.93 (1.84, 2.02)
Other	1.54 (1.48, 1.60)
Comorbidity Tier	
None	ref
Low	1.32 (1.29, 1.36)
Medium	1.29 (1.24, 1.35)
High	1.76 (1.66, 1.86)
IRF Program Interruption	1.23 (1.10, 1.37)
Mobility at Admission	
Independent	ref
Modified Dependent	2.06 (0.84, 5.01)
Dependent	2.06 (0.84, 5.01)
Self-care at Admission	
Independent	ref
Modified Dependent	1.04 (0.79, 1.36)
Dependent	1.03 (0.79, 1.36)
Cognition at Admission	
Independent	ref
Modified Dependent	1.08 (1.04, 1.11)
Dependent	1.07 (1.01, 1.13)
Mobility at Discharge	
Independent	ref
Modified Dependent	1.22 (1.18, 1.27)
Dependent	1.50 (1.42, 1.59)
Self-care at Discharge	
Independent	ref
Modified Dependent	1.13 (1.10, 1.18)
Dependent	1.36 (1.27, 1.47)
Cognition at Discharge	
Independent	ref
Modified Dependent	1.08 (1.04, 1.11)
Dependent	1.19 (1.09, 1.29)

Abbreviations: OR odds ratio, CI confidence interval, ref reference category

* OR for Age in 5-year increments

† "Disability" original reason for receiving Medicare

‡ Number of acute care admissions during 6 months prior to index admission

§ OR for Hospital length of stay in 1-day increments

function items in the IRF-PAI is one possible explanation for this finding. Inpatient rehabilitation facilities provide intensive and expensive rehabilitative care compared to other post-acute settings.⁷ Patients must meet specific criteria to be eligible,⁷ potentially leading to the selection and admission of more cognitively intact patients. Patients are typically referred to

inpatient rehabilitation for physical therapy to address mobility impairments and/or occupational therapy to address self-care limitations. This is evidenced by the fact that almost 50 % of our sample was receiving rehabilitation for spinal cord dysfunction, musculoskeletal conditions, or endurance conditions. These diagnostic categories may be less likely to include individuals with cognitive impairments. A majority of patients (65.8 %) in our sample were classified as independent in cognition at discharge, whereas the percentages classified as independent in self-care or mobility at discharge were 44.1 and 32.4 %, respectively. This trend suggests the possibility of selection bias in which patients with lower cognitive function are purposely admitted to less rehabilitation-intensive post-acute settings, e.g., skilled nursing facilities.

Our study is the first we are aware of that examines the individual contributions of self-care, mobility and cognitive function at discharge to risk of 30-day unplanned readmission as endorsed by the National Quality Forum and used by CMS. Previous research on the relationship of functional status to rehospitalization in acute and post-acute care has not focused primarily on the IMPACT Act defined domains.¹¹ Our results highlight the need for the development of standardized measures of self-care, mobility and cognitive function that can be used across multiple post-acute settings as required in the IMPACT Act (inpatient rehabilitation facilities, skilled nursing facilities, home health agencies and long-term care hospitals). This represents a significant challenge for investigators, providers, administrators and policy makers in post-acute care.

This challenge must be addressed in the context of a changing service delivery and payment environment in post-acute care.^{3,11} The emergence of bundled payment models where providers are responsible for episodes of care extending from 30 to 90 days^{3,30} means that post-acute outcomes, including function and readmission will be increasingly important to acute care providers.⁹⁻¹² Bundling of payments may encourage "upstream" providers to opt for lower cost post-acute care alternatives. Consequently, the inpatient rehabilitation case-mix may shift towards patients with greater functional impairments and/or greater medical complexity. Understanding the role of discharge functional status and subsequent rehospitalization risk will be important for providers and payers as models of bundled payment continue to evolve and the IMPACT Act is implemented. Our findings are an important beginning step in addressing this challenge.

Limitations

Our analyses were limited by the constraints of administrative data sets including the lack of information about the consistency and accuracy of data entry.³¹ Additionally, the variables considered for inclusion in the models were restricted to those submitted to CMS

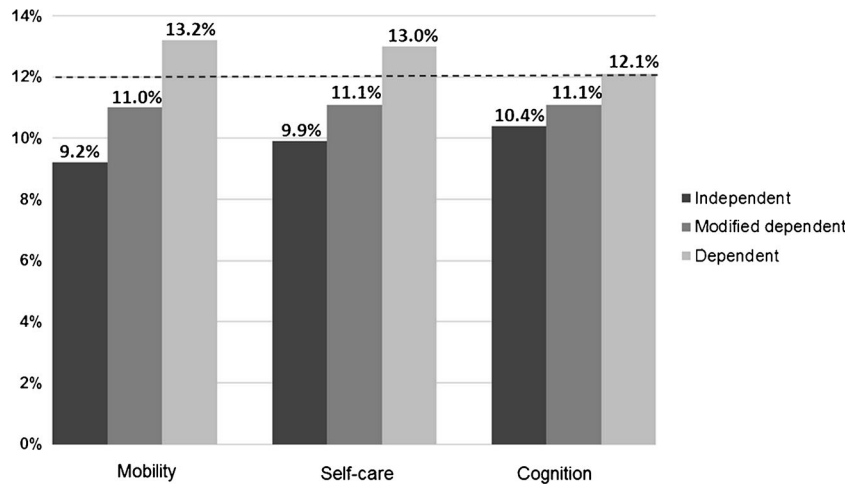


Figure 2. Adjusted 30-day unplanned rehospitalization rates by functional classification within each domain. The dashed line represents the unadjusted 30-day unplanned rehospitalization rate for the sample (12.0 %).

by the participating institutions. The lack of variables assessing education, socioeconomic status and social support in the Medicare data is a weakness in our analyses.³²

The generalizability of our results is limited to individuals residing in the community prior to their injury/illness and who survived for 32 days following post-acute rehabilitation. The role of functional status in rehospitalization risk may differ for

individuals who are not community-dwelling prior to their hospital admission. Results may also differ for patients who are members of Medicare Advantage or private fee-for-service plans.

CONCLUSIONS

Our results indicate that discharge functional status as defined in the IMPACT Act (mobility, self-care and

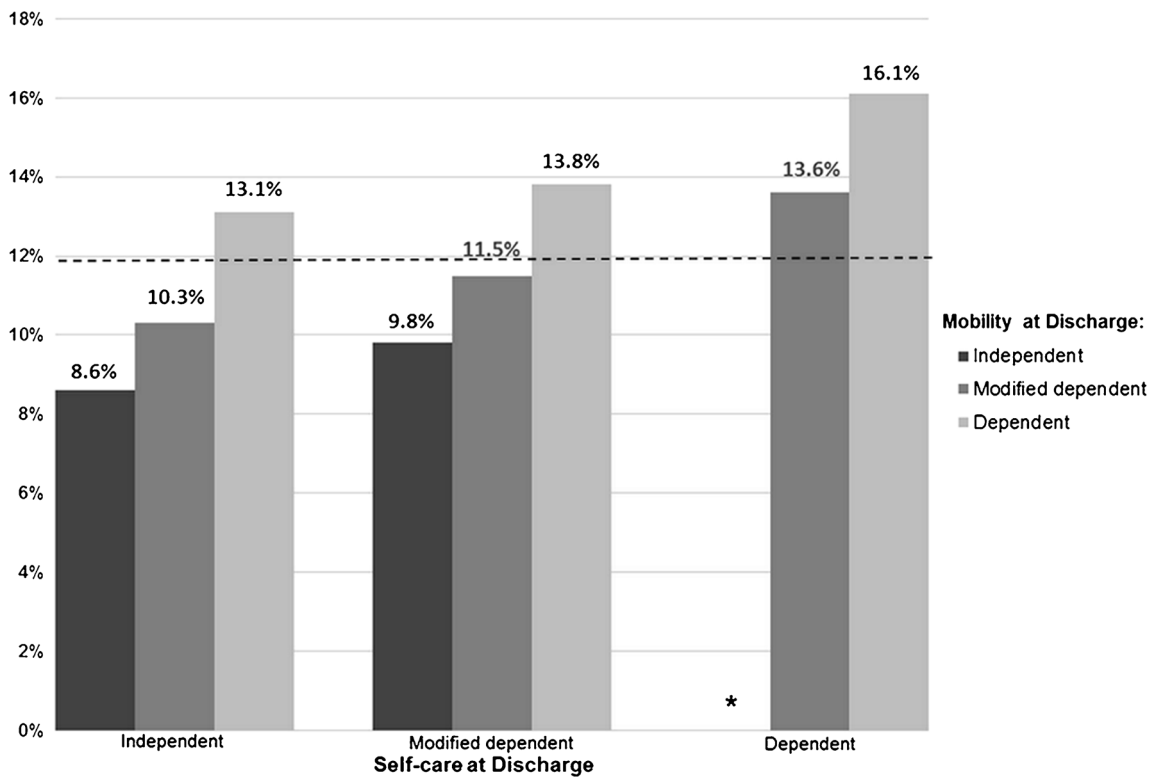


Figure 3. Adjusted 30-day unplanned rehospitalization rates for all combinations of discharge self-care and mobility functional categories. The dashed line represents the unadjusted 30-day unplanned rehospitalization rate for the sample (12.0 %).* The dependent for self-care and independent for mobility cell was censored due to inadequate size (n = 14; 0.0 %).

cognitive function) is a potentially useful predictor of rehospitalization in Medicare fee-for-service beneficiaries receiving post-acute rehabilitation. Additional research is needed to understand and improve the functional measures and to determine if their association with rehospitalizations varies across post-acute settings, patient populations, or episodes of care. Future studies are also needed to investigate how information about patient functional status can be used to develop intervention programs to reduce rehospitalization across the continuum of acute and post-acute care.

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