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Is Profit Status of Inpatient Rehabilitation Facilities Independently Associated with 30-day Unplanned Hospital Readmission for Medicare Beneficiaries?

Chih-Ying Li, PhD,

Postdoctoral Fellow, Division of Rehabilitation Sciences, School of Health Professions, University of Texas Medical Branch. 301 University Blvd. Galveston, TX 77555-0177. Phone: (617) 834-2611. Fax: 409-747-1638

Amol Karmarkar, PhD,

Assistant Professor, Division of Rehabilitation Sciences, School of Health Professions, University of Texas Medical Branch. 301 University Blvd. Galveston, TX 77555-0177. Phone: (412)728-0507. Fax: 409-747-1638

Yu-Li Lin, MS,

Biostatistician II, Office of Biostatistics, Department of Preventive Medicine & Community Health, University of Texas Medical Branch. 301 University Blvd. Galveston, TX 77555-0177. Phone: (409)772-5276. Fax: 409-772-9127

Yong-Fang Kuo, PhD,

Professor, Don W. and Frances Powell Professor in Aging Research; Director, Office of Biostatistics, Department of Preventive Medicine & Community Health, University of Texas Medical Branch. 301 University Blvd. Galveston, TX 77555-0177. Phone: (409)772-5276. Fax: 409-772-9127

Kenneth J. Ottenbacher, PhD, and

Professor & Director, Division of Rehabilitation Sciences, School of Health Professions; Russell Shearn Moody Distinguished Chair in Neurological Rehabilitation; University of Texas Medical Branch. 301 University Blvd. Galveston, TX 77555-0177. Phone: (409)747-1637. Fax: 409-747-1638

James E. Graham, PhD

Associate Professor, Division of Rehabilitation Sciences, School of Health Professions, University of Texas Medical Branch. 301 University Blvd. Galveston, TX 77555-0177. Phone: (409)747-1637. Fax: 409-747-1638

Abstract

Objective—To investigate the effects of facility-level factors on 30-day unplanned risk-adjusted hospital readmission after Inpatient Rehabilitation Facilities (IRFs) discharge.

Correspondence to: Chih-Ying Li.

Conflict of Interest Disclaimer

All authors declare that they have no potential conflicts of interest with respect to publish this paper.

Design—We used the 100% Medicare claims data, covering 269,306 discharges from 1,094 IRFs between October 2010 and September 2011. We examined the association between hospital readmission and ten facility-level factors (number of discharges, disproportionate share percentage, profit status, teaching status, freestanding status, accreditation status, census region, stroke belt, location and median household income).

Setting—Discharge from IRFs.

Participants—Facilities (IRFs) serving Medicare fee-for-service beneficiaries.

Intervention—NA

Main Outcome Measure(s)—Risk Standardized Readmission Rate (RSRR) for 30-day hospital readmission.

Results—Profit status was the only IRF provider-level characteristic significantly associated with unplanned readmissions. For-profit IRFs had significantly higher RSRR (13.26 ± 0.51) as compared to non-profit IRFs (13.15 ± 0.47) ($p < 0.001$). After controlling for all other facility characteristics (except for accreditation status due to collinearity), for-profit IRFs remained 0.1% point higher RSRR than non-profit IRFs, and census region was the only significant region-level characteristic, with the South showing the highest RSRR of all regions ($p = 0.005$ for both, type III test).

Conclusions—Our findings support the inclusion of profit status on the IRF Compare website (a platform includes IRF comparators to indicate quality of services). For-profit IRFs had higher RSRR than non-profit IRFs for Medicare beneficiaries. The South had higher RSRR than other regions. The RSRR difference between for-profit and non-profit IRFs could be due to the combined effects of organizational and regional factors.

Keywords

postacute care; readmissions; rehabilitation

Improving Medicare Post-Acute Care Transformation Act (IMPACT Act) of 2014, has laid out the dates and rules for the implementation of Quality Reporting Program to emphasize uniform and value-based payment systems for postacute settings, including inpatient rehabilitation facilities (IRFs), skilled nursing facilities (SNFs), home health agencies (HHAs), and long-term acute care hospitals (LTCHs).¹ By 2018, the Department of Health and Human Services aims to tie 50% of Medicare fee-for-service payments to quality- or value-based care models.² Risk Standardized Readmission Rate (RSRR) for 30-day hospital readmission has been used as one of the quality indicators to reflect quality of care among acute and postacute settings.^{3–5}

For postacute care, IRFs provide the most intensive rehabilitation services and have the second highest Medicare spending per beneficiary stay, after LTCHs.¹ The Centers for Medicare and Medicaid Services (CMS) launched Inpatient Rehabilitation Facility Compare on December 14, 2016 to compare IRF quality of services. However, consumers and providers can only access limited information from the IRF Compare, as profit status (for-profit versus non-profit) was the only reported facility-level IRF comparator. Evaluating

which types of facility exhibit higher RSRR could increase transparency of IRFs services and the quality of care for policymakers and clinicians.

While many potential variables could be considered, prior studies have shown the impact of individual-level characteristics (e.g., socio-demographics, surgical status or comorbidities) on IRF RSRR.⁴ In this study, we examined ten IRF facility-level characteristics (six provider-level and four region-level) and their independent associations with RSRR. These ten characteristics were specifically chosen for their relevance to value-based payment, quality of care and hospital readmission as indicated in the Medicare Payment Advisory Commission (MedPAC) reports.^{1,6–9}

Methods

This study used the 100% Medicare claims data, covering 269,306 discharges from 1,094 IRFs between October 2010 and September 2011. Appendix Table 1 illustrates the cohort selection process. We included only IRFs with at least 30 discharges during the study period to obtain reliable RSRR estimates.

We followed the methodology for all-cause unplanned readmission measure for the 30 days post-discharge from IRFs, published by the National Quality Forum (#2502).³ The 30-day readmission window starts at day 2 post IRF discharge and ends at day 32 or a planned readmission, whichever comes first. First, we calculated the predicted and expected number of unplanned hospital readmissions, using hierarchical generalized linear mixed models after adjusting for patients' age, gender, disability, comorbidities (in 51 hierarchical condition category groups identified from the prior acute-care stay or from all the acute-care stays in the prior year), case-mix groups (CMGs), number of acute-care stays in the prior year and covariates associated with the prior acute-care stay (including the principle diagnosis, surgical procedures, dialysis, length of stay and days in an intensive care or coronary care unit).³ Second, we calculated the IRF-wide standardized risk ratio (SRR) by dividing the predicted number of readmissions by the expected number. Lastly, RSRR was computed by multiplying SRR by the overall mean readmission rate, which was 13.19% for all the IRF stays.

We obtained five variables from the CMS IRF Rate Setting File (number of Medicare discharges, disproportionate share percentage, profit status, teaching status and facility type), one from the CMS IRF Facility Characteristic File (specialty designation by the Commission on Accreditation of Rehabilitation Facilities [CARF]), one from the US Census Bureau (census region), one from Centers for Disease Control and Prevention (CDC) (stroke belt), one from US Department of Agriculture (metropolitan/ nonmetropolitan) and finally one from 2007–2011 American Community Survey 5-Year Estimate (median household income at zip code). Detailed definitions of ten selected IRF characteristics are provided in Appendix Table 2. CARF accreditation information was missing for most IRFs (66%). While ownership status included for-profit, non-profit, and government-owned, the government-funded IRFs (n=61, 5.6%) were categorized as non-profit IRFs in this study based on their tax-filing status. In addition, sensitivity analysis (excluding or including government-owned as non-profit IRFs) did not demonstrate different results. We first

performed bivariate analyses to examine differences in observed readmission rates and RSRRs across categories for each IRF characteristic using Analysis of Variance or t-test. We then examined the independent effect of each IRF characteristic on the RSRR adjusting for other factors using multivariable linear regression. Model assumptions of normality, homoscedasticity, and linearity were assessed by residual plots and Spearman rank correlation between residuals and predicted values. No violations were found (Spearman Rank $r=0.44$, $p>0.05$). The parameter estimator and its standard error for the significant IRF characteristics were examined between the full and parsimonious models (with only significant variables). If the values were not different between the two, we would keep the full model to provide crucial information for the readers to understand which factors have significant impact on the RSRR after adjusting for all other IRF characteristics in the model. Interaction terms and the overall contributions of each characteristic to RSRR were examined with Type III tests. Significant level was set at 0.05.

Results

Table 1 shows that profit status was the only significant provider-level facility characteristic associated with RSRR: for-profit IRFs had significantly higher RSRR (13.26 ± 0.51) than non-profit IRFs (13.15 ± 0.47) ($p<0.001$) (Table 1). Three region-level IRF characteristics were also significantly associated with RSRR: census region, stroke belt and median household income ($p<0.05$). IRFs located in the South, those in the stroke belt and those in zip codes with lower median household income had higher RSRRs compared to their corresponding counterparts (Table 1).

Table 2 shows the adjusted effect of each IRF characteristic on RSRR after controlling for all provider-level and region-level IRF characteristics listed in Table 1, except for accreditation status (due to its collinearity with facility type). Profit status and census region remained significant ($p=0.005$ for both, type III test). For-profit IRFs had a 0.1% point higher RSRR than non-profit IRFs after controlling all other IRF characteristics (except accreditation status). IRFs located in the Northeast and West had 0.1% point and 0.2% point lower RSRR, respectively, compared to those located in the South, after adjusting for all other IRF characteristics (except accreditation status) in the model (both $p<0.05$). Note that the “%” refers to the RSRR units rather than percent change in RSRRs between for-profit and non-profit IRFs.

In order to understand whether the provider-level characteristics have different effects on RSRR between for-profit and non-profit IRFs, we tested the interactions between profit status with other provider-level characteristics (number of Medicare discharges, disproportionate share percentage, teaching status and facility type). No interaction was found based on Type III test (Appendix Table 3).

Discussion

This study aimed to find IRF characteristics significantly associated with RSRR for Medicare beneficiaries. As an independent study, our findings are comparable with the IRF Compare, indicating that profit status is a significant IRF provider-level characteristic

associated with RSRR. Also, our study demonstrated that for-profit IRFs had higher RSRR compared with non-profit IRFs, after controlling for provider- and region-level variables included in our study (except accreditation status). In addition, our study found the census region was significantly associated with IRF RSRR. IRFs in the Northeast and West census regions had significant lower RSRR compared to those in the South. The result implied the combined effects of organizational and regional factors contributed to the varied RSRR of IRFs. Even though IRF RSRR showed only 0.1%–0.2% estimated point difference, readmission with such small magnitude can result in 381~762 cases of readmission.

For postacute settings, several studies examined the associations between profit status and outcomes in SNFs. Using comprehensive systematic review and meta-analysis of observational studies and randomized controlled trials, Comondore and colleagues (2009) found that non-profit SNFs delivered higher quality of care than for-profit SNFs, the outcomes were measured with better quality of the staffing and lower prevalence of pressure ulcers.¹⁰ Rahman and colleagues (2013) also found that stronger linkages between the hospital and the SNF results in lower rehospitalization rates, regardless of hospital ownership status.¹¹ While those factors were found in SNFs, we suggest future studies of IRFs examine the association of RSRR with similar factors such as staff quality and care coordination.

Horwitz and colleague (2017)¹² found that region (e.g., local practice patterns) of the hospital strongly influences hospital readmission. Our study found that IRFs located in the Northeast and West census regions had lower RSRR compared to those in the South, indicating that regional factors may significantly affect care delivery and care quality in IRFs. However, the underlying mechanism and relative impact of regional factors of IRFs on RSRR remains unclear.

Choosing an efficient postacute care setting is crucial to maximizing patients' recovery. For providers, the ongoing and proposed changes in the reimbursement system makes this choice highly relevant. However, maintaining a high quality setting requires all stakeholders have access to uniform information on quality measures. We concluded that the difference in RSRR between for-profit and non-profit IRFs could be the result of combined organization- and region-level factors, and suggest multilevel-factor model should be used in the future studies to determine the underlying driving force of RSRR variability. This study is the first to explore IRF comparators with an intent to improve quality of care in IRFs for Medicare beneficiaries.

Study Limitations

This study only included one-year data, ten characteristics, and the missing accreditation status for many IRFs, which may limit the study generalizability. However, the ten characteristics were selected based on relevant importance to care quality reported by MedPAC. We suggest future study of this kind include additional years of data and extensive provider- and region-level IRF characteristics to improve study generalizability.

Conclusion

Interest in the quality and outcomes of care across postacute settings is increasing. This study is the first to examine the relationship between IRF facility-level characteristics and unplanned readmission rates among Medicare beneficiaries. Profit status was the only significant IRF provider-level characteristic independently associated with unplanned readmission. Identifying modifiable and unmodifiable factors related to care process at organization- and region-levels could potentially improve care quality.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Center for Large Data Research and Data Sharing in Rehabilitation (Renewal of R24)

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Readmission and Disability Outcomes related to Post-Acute Care

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Comparing Access and Effectiveness of Post-Acute Care Settings among Medicare Beneficiaries

Goal: Conducting comparative effectiveness studies of care utilization and transition patterns across post-acute care settings for Medicare beneficiaries

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Table 1
Observed and Risk-Standardized Unplanned Readmission Rate (RSRR) by IRF Characteristics (N=1,094)

IRF characteristic	Observed Readmission Rate			RSRR	
	N	Mean ± STD	P value	Mean ± STD	P value
Number of discharges ^{\$}					
< 149	265	11.87 ± 4.85		13.18 ± 0.33	
149–245	261	12.40 ± 3.85		13.20 ± 0.39	0.940 [#]
246–435	263	12.84 ± 3.36	< 0.001 [#]	13.19 ± 0.51	
> 435	261	13.77 ± 3.02		13.18 ± 0.66	
Disproportionate share ^{\$}					
0–16.49%	788	12.62 ± 3.76		13.20 ± 0.50	0.112 [‡]
16.50–78.60%	262	13.01 ± 4.26	0.190 [‡]	13.15 ± 0.45	
Profit status [‡]					
Non Profit	735	12.43 ± 3.83		13.15 ± 0.47	< 0.001
For Profit	359	13.28 ± 3.86	< 0.001	13.26 ± 0.51	
Teaching status ^{\$}					
No	937	12.66 ± 3.93		13.20 ± 0.50	0.063
Yes	113	13.21 ± 3.55	0.151	13.11 ± 0.44	
Facility type					
Hospital unit	863	12.47 ± 3.97		13.18 ± 0.45	0.536 [‡]
Freestanding	231	13.60 ± 3.28	< 0.001 [‡]	13.21 ± 0.61	
Accreditation ^{&}					
No	42	12.57 ± 4.30		13.15 ± 0.43	
Yes	332	13.34 ± 3.67	0.209	13.21 ± 0.56	0.463 [‡]
Unknown	720	12.43 ± 3.89		13.18 ± 0.45	
Census region [‡]					
Midwest	297	12.66 ± 4.15		13.19 ± 0.45	
Northeast	185	12.61 ± 3.61		13.10 ± 0.47	< 0.001 [#]
South	436	13.31 ± 3.74	< 0.001 [#]	13.27 ± 0.52	
West	173	11.42 ± 3.63		13.07 ± 0.45	

IRF characteristic	N	Observed Readmission Rate		RSRR	
		Mean ± STD	P value	Mean ± STD	P value
In stroke belt					
No	815	12.45 ± 3.79		13.17 ± 0.46	0.015 [‡]
Yes	279	13.48 ± 3.97	< 0.001	13.26 ± 0.56	
Location					
Metropolitan	932	12.81 ± 3.64		13.18 ± 0.49	0.431
Nonmetropolitan	162	12.13 ± 4.93	0.096 [‡]	13.21 ± 0.44	
Median household income at zip code [¶]					
< \$35740	270	13.49 ± 3.95		13.26 ± 0.47	
\$35740–\$44635	270	12.35 ± 3.97		13.20 ± 0.47	0.026 [#]
\$44636–\$57184	270	12.45 ± 3.99	0.002 [#]	13.16 ± 0.50	
\$57185–\$154779	270	12.53 ± 3.39		13.14 ± 0.51	

^{\$} 44 IRFs had missing information of number of discharges so these variables and were not included in this table. Number of discharges was presented in quartiles. Disproportionate share was presented in 2 groups: the first 3 quartiles and the last quartile.

[‡] 61 government-owned were included as non-profit IRFs.

[#] Analysis of variance (ANOVA).

[‡] T-test with unequal variances (Satterthwaite method). For others, the pooled method was used.

[¶] IRFs with unknown accreditation were included in the hypothesis testing.

[‡] 3 IRFs from Puerto Rico were not included in this table.

[¶] Median household income at zip code was presented in quartiles. 14 IRFs had missing information were not included in this table.

Table 2The effect of IRF Characteristics on the RSRR, Examined by Linear Regression (N=1,035[#])

IRF characteristic	Estimate	Standard Error	P value	P value, Type III test [*]
Number of discharges				
< 149		Reference		
149–245	0.008	0.043	0.856	
246–435	–0.018	0.044	0.676	0.704
> 435	–0.049	0.052	0.347	
Disproportionate share				
0–16.49%		Reference		
16.50–78.60%	–0.038	0.038	0.314	0.314
Profit status				
Non Profit		Reference		
For Profit	0.099	0.035	0.005	0.005
Teaching status				
No		Reference		
Yes	–0.069	0.054	0.199	0.199
Facility type				
Hospital unit		Reference		
Freestanding	0.011	0.048	0.819	0.819
Census region				
South		Reference		
Midwest	–0.048	0.043	0.268	
Northeast	–0.118	0.052	0.023	0.005
West	–0.177	0.053	0.001	
In stroke belt				
No		Reference		
Yes	–0.005	0.042	0.900	0.900
Location				
Nonmetropolitan		Reference		
Metropolitan	0.035	0.046	0.448	0.448
Median household income at zip code				
< \$35740		Reference		
\$35740–\$44635	–0.059	0.043	0.173	
\$44636–\$57184	–0.102	0.044	0.021	0.088
\$57185–\$154779	–0.096	0.045	0.033	

[#]59 (5.4%) IRFs missing number of discharges, disproportionate share, teaching status, median household income at zip code, or in Puerto Rico were not included in the analysis. Accreditation was not included in the model due to the collinearity with facility type.

^{*}Type III test was used to examine the overall significance for each IRF characteristic.