

Readmission Rates and Their Impact on Hospital Financial Performance: A Study of Washington Hospitals

INQUIRY: The Journal of Health Care Organization, Provision, and Financing
Volume 56: 1–10
© The Author(s) 2019
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/0046958019860386
journals.sagepub.com/home/inq



Soumya Upadhyay, PhD¹ , Amber L. Stephenson, PhD², and Dean G. Smith, PhD³

Abstract

This longitudinal study examines whether readmission rates, made transparent through Hospital Compare, affect hospital financial performance by examining 98 hospitals in the State of Washington from 2012 to 2014. Readmission rates for acute myocardial infarction (AMI), pneumonia (PN), and heart failure (HF) were examined against operating revenues per patient, operating expenses per patient, and operating margin. Using hospital-level fixed effects regression on 276 hospital year observations, the analysis indicated that a reduction in AMI readmission rates is related with increased operating revenues as expenses associated with costly treatments related with unnecessary readmissions are avoided. Additionally, reducing readmission rates is related with an increase in operating expenses. As a net effect, increased PN readmission rates may show marginal increase in operating margin because of the higher operating revenues due to readmissions. However, as readmissions continue to happen, a gradual increase in expenses due to greater use of resources may lead to decreased profitability.

Keywords

transparency, readmission rates, financial performance, hospital

What do we already know about this topic?

Answer—Under the Affordable Care Act, readmission rates have become transparent and hospitals are under financial stress for having excess readmission rates.

How does your research contribute to the field?

Answer—In the stream of research articles that examine the quality and finance relationship within the healthcare field, this is one of the first studies that examines readmission rates and financial performance measures as defined by operating revenues per patient, operating expenses per patient, and operating margin as outcomes.

What are your research's implications toward theory, practice, or policy?

Answer—Our findings would guide managers in strategizing ways to change health management practices to seek a balance between reducing readmission rates and maintaining profitability.

Introduction

Transparency pertaining to quality of care data as captured through measurement and reporting is a growing issue for hospitals and health services organizations.^{1–3} The avalanche created by the 1999 Institute of Medicine (IOM) report “*To Err Is Human*” and the Patient Safety and Quality Improvement Act of 2005, which became a law under the Bush administration, together laid the foundation for mandatory reporting requirements by Centers for Medicare and Medicaid Services (CMS).^{4,5} Then, in 2009, under the Obama administration and as part of the Patient Protection and Affordable Care Act (ACA), CMS began reporting 30-day readmission rates for acute myocardial infarction (AMI), pneumonia (PN), and heart failure (HF) on its website.^{6,7} The Hospital Readmission

Reduction Program (HRRP) was designed as a Medicare value-based purchasing program that decreases payments to

¹University of Nevada, Las Vegas, USA

²Clarkson University, Schenectady, NY, USA

³Louisiana State University Health Sciences Center, New Orleans, USA

Received 22 August 2018; revised 30 April 2019; revised manuscript accepted 5 June 2019

Corresponding Author:

Soumya Upadhyay, Assistant Professor, Department of Healthcare Administration and Policy, School of Public Health, University of Nevada, Las Vegas, 4505 South Maryland Pkwy, Las Vegas, NV 89119, USA.

Email: Soumya.upadhyay@unlv.edu



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons

Attribution-NonCommercial 4.0 License (<http://www.creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

hospitals that have disproportionately high readmissions.⁶ Beginning in 2012, the HRRP assessed penalties based on a hospitals' performance on six conditions or procedures including AMI, chronic obstructive pulmonary disease (COPD), heart failure (HF), PN, coronary artery bypass graft surgery, and elective primary total hip arthroplasty and/or total knee arthroplasty.⁶ In the duration of the program, the penalties have increased from 1% to 3% (or a factor of .97) for hospitals with excessive readmissions.⁶ Policymakers envisioned that publicly reporting quality measures including readmission rates would increase transparency of the quality of care delivered by hospitals. Transparency of quality indicators would encourage the patient to choose a hospital that offers comparatively better care as well as provide benchmarks for hospitals as they engage in quality improvement efforts to reduce readmission rates.

In addition, hospitals have at least two incentives to reduce readmission rates.⁸ Specifically, transparency through public reporting provides an incentive to reduce readmission rates, to avoid "shaming."¹¹ Hospitals that have high readmission rates might deter future patients from choosing them. Reputation for quality has been discussed as a driver for profits through its effect on increased market share and hospitals may have the incentive to decrease their readmission rates to avoid developing a bad reputation.⁹ Furthermore, hospitals get penalized under the CMS Readmission Reduction Program for having excess readmission rates.⁶ For instance, as noted by Byrnes,² readmission penalties in 2017 exceeded a half billion dollars. Avoiding these sizable financial penalties is a second incentive for hospitals to reduce their readmission rates.

Nevertheless, transparency stimulates accountability, while informing patients about the wide variation in quality of healthcare across hospitals.¹⁰ While being held accountable may create pressure among hospital administrators to reduce readmission rates, reducing readmissions by discharging patients too early may not really be a cost saving or profitable strategy if those patients must return to the hospital.¹¹ On the other hand, however, high readmissions rates may be generating an inpatient revenue stream, a problem that policymakers are trying to address.

Therefore, the purpose of this study is to further contribute to the literature by examining the association between published readmission rates and hospital financial performance. It is important for practitioners and policy makers to understand the financial implications of readmission reduction as they go through the stressful process of being increasingly transparent. Understanding the financial implications of readmission rate transparency can assist hospital leaders to employ a variety of strategies like expedited discharge or designing innovative quality improvement initiatives,⁷ which would influence revenues, expenses, and profit margins in divergent ways.

New Contributions

This article makes a new contribution in the stream of research articles that examine the quality and finance relationship

within the healthcare field. This is one of the first studies that examines readmission rates and financial performance measures as defined by operating revenues per patient, operating expenses per patient, and operating margin as outcomes. We located one study, for instance, that examined the relationship between average profitability of patient admissions and readmission rates, which found no evidence of an association between them.¹² To the best of our knowledge, there is still a gap in the literature on research that evaluates the longitudinal impact of transparently reported quality of care metrics on average hospital financial performance. Finally, this study contributes through the use of a fixed-effects regression methodology. By using a fixed-effects methodology, we control for any unobserved factors that don't change over time such as policy effects regarding readmission reduction.

In addition, whereas much has been written about how transparency in quality measures influences consumer's choice behaviors¹⁰ or influences payment for services,³ our paper, instead, seeks to evaluate the association between transparently reported readmission rates and hospital financial performance. Findings from this study offer guidance to healthcare managers on ways to position their organizations adequately to achieve reduction in readmission rates while maintaining decent profitability. Through this research, policymakers gain an insight on the effects of having transparent readmission rates including financial penalties and lower reimbursements on hospital financial performance.

Transparency in Quality Reporting: An Overview

Several legislative efforts and endeavors from independent organizations sparked the evolution that created the current transparency of quality metrics that includes both process and outcome indicators.

Department of Health and Human Services

One of the first legislative movements toward quality transparency included the Congressional hearings that were held in 1999 as a reaction to the IOM "To Err Is Human" report.¹³ The IOM report instilled the importance of reducing adverse medical events and complications by estimating the number of deaths each year due to medical errors.¹³ Consequently, the Department of Human and Health Services (DHHS) formed a subcommittee with the key purpose of evaluating the pros and cons of data transparency through voluntary and mandatory reporting systems.¹⁴ The subcommittee recommended more aggressive drug surveillance, increased availability of federal demonstration waiver projects in an effort to assert comparative effectiveness, and the proposal of bills that covered the differences in mandatory (eg, for serious errors) and voluntary reporting systems (eg, for minor errors and "close calls").¹⁴

National Aeronautics and Space Administration

Around the same time of the DHHS debates, the National Aeronautics and Space Administration (NASA) created the confidential and voluntary Patient Safety Reporting System.¹⁵ Modeled after a previously created aviation safety reporting system, the PSRS is meant as a complement to a medical entity's existing reporting systems and designed to report safety-related concerns such as unexpected injuries or occurrences, safety ideas, "close calls," or even lessons learned.¹⁵

Joint Commission

In 1998, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), launched one of the first national programs on measurement of hospital quality that required reporting of performance measures to increase transparency.¹⁶ As a result, in 2002, all accredited hospitals were required to collect and report data on performance for core measures, which were made available to public in 2004.³ As of 2010, hospitals reported data on 57 quality measures; a list that JCAHO intends to expand with the inclusion of other measures such as deaths and readmissions.^{3,17}

Centers for Medicare and Medicaid Services

In 2004, CMS began imposing financial penalties on hospitals that did not report to CMS the same performance data that they made transparent to JCAHO. Then in 2005, CMS began its own public reporting of quality measures to make these data available and transparent to public.¹⁸ Consistent with this trend, the ACA¹⁹ provided the greatest impetus for collection and reporting of quality of care data. Through this act, public reporting for hospitals and physicians has increased and improved over the past few years.¹⁹ And currently, CMS uses its *Hospital Compare* website²⁰ to provide transparency on both process and outcome quality indicators.

Readmission Rates as a Measure of Quality and Hospital Financial Performance

Hospital readmission is defined as "a hospital admission that occurs within a specified time frame after discharge from the first admission."²¹ Readmission rates have been considered a hospital quality measure^{22,23} and have been shown to reflect dimensions of quality of patient care.^{24,25} Prior studies have discussed the relationship between readmissions, length of stay, cost of care, and mortality.²⁶ For instance, in-hospital mortality has been found to be higher for patients who are readmitted versus those who are not.^{26,27} Other researchers argue that readmissions lead to an increased length of stay and expenditure of more hospital resources.^{28,29} But a recent study argues that low cost hospitals that spend fewer resources had readmission rates that were only slightly

higher or similar to the hospitals that are high cost or spend more resources.¹¹ Consequently, the present study adds to this literature by examining readmissions as associated with hospital financial performance.

One way to measure hospital financial performance is through hospital profitability. Studies on profitability commonly use margins, which reveal the percentage of revenue that is left after expenses have been paid.³⁰⁻³² Other studies, however, measured profitability by examining net income from direct care services³³ patient revenues, or the ratio of cash flow to total revenues.³⁴ Given that readmissions are a part of direct patient care expenses and revenues, our study, instead, examines the financial indicators of operating revenues per patient, operating expenses per patient, and operating margin as outcomes.

While some researchers have examined the impact of profitability on quality,^{35,36} others have assessed the relationship of quality on profitability. For example, a study that tested the impact of profitability on quality indicated that operating cash flow is inversely related to mortality rates of heart attack, HF, and PN.³⁷ However, hospital profitability has been well-documented in the literature as an outcome of various determinants including but not limited to patient mix, managerial policies, and quality outcomes.³⁸⁻⁴⁰ As such, studies that have assessed the impact of quality on profitability have argued that poor-quality hospitals may lead to poor profits and have demonstrated that low-quality hospitals experienced below average profits.³⁵ Other scholars have found that generally better quality led to better profits.⁴¹ However, increase in treatments such as higher readmission rates and higher use of technology contributes to increase in profits, even though it means that the care may not be effective.³⁹ This study sheds further light on hospital quality and financial performance relationship by specifically focusing on readmission rates as the quality indicator.

Theoretical Perspective and Hypotheses

Resource Dependence Theory (RDT) posits that an organization's survival relies on its ability to acquire resources from the external environment.⁴² This interdependence between the organization and environment can create a power imbalance due to asymmetric resource distribution.⁴²

Relevant to the present study, RDT has been presented using "munificence" as one of its various perspectives.⁴³ Munificence relates to the abundance and availability of resources in an organization's external environment.⁴³ When resources become scarce and less abundant, organizations adopt strategies to survive. Hospitals rely on reimbursement from outside agencies such as CMS and private insurers for payments regarding readmissions. In the current payment scenario, it has become increasingly difficult for hospitals to obtain funding from external resources. In addition, hospitals

have to pay financial penalties for having excess readmission rates. While the environment has become less munificent, hospitals have adopted readmission reduction strategies to reduce potential readmissions and financial penalties associated with them. This suggests that hospitals may not get fully reimbursed for having readmissions and would also have to pay additional penalties. Stated differently, a decline in unnecessary penalties pertaining to avoidable readmissions, instead being reimbursed at higher rates, are likely to increase operating revenues per patient. In addition, lower readmissions would improve hospital quality indicators that drives patients and an in-stream of revenues. Thus, we hypothesize that

Hypothesis 1 (H1): Reduction in readmission rates is associated with an increase in operating revenues per patient.

To reduce environmental interdependence and uncertainty, organizations adopt various strategies to obtain and stances to preserve resources.⁴² One of these postures, may be, to focus on internal operations.⁴⁴ Changes in internal operations that are oriented toward quality improvement may include improving readmission rates by investing in readmission reduction strategies such as implementing robust home healthcare programs, ensuring smooth transitional care and joining a readmission prevention-focused collaborative.^{45,46} In other cases, reducing length of patient's stay in hospitals may reduce readmission rate.⁴⁷ However, the choice of internal strategy used in reducing readmission would influence financial outcomes, for instance, investment in activities to reduce readmissions may increase operating expenses per patient. For example, the amount spent in assuring good discharges or communicating patients about their follow-up plan is likely be an additional financial burden to the hospital. Stated differently, additional expenses may be incurred through engaging in a variety of readmission reduction and proper discharge programs. Therefore, we hypothesize the following:

Hypothesis 2 (H2): Reduction in readmission rates is associated with increased operating expenses per patient.

To reduce the effects of lack of abundant resources and environmental uncertainty, hospitals may engage in readmission reduction strategies that may be expensive but effective. While hospitals may achieve a reduction in expenses by avoiding future readmissions, they may also observe an increase in their expenses due to investment in readmission reduction strategies. Based on the above two hypotheses, we also examine if as a net effect, readmissions are associated with changes in operating margins. Operating margin is an indicator of hospital's profitability and involves revenues and expenses related with direct patient care only. It is a function of both operating revenues and expenses. Higher

expenses due to additional expenditures associated with investment in readmission reduction programs, may reduce the operating margins because expenses would exceed revenues. As such, we hypothesize the following:

Hypothesis 3 (H3): Reduction in readmission rates is associated with operating margin.

To summarize, readmissions are costly expenses for hospitals. Instead of spending resources on complicated procedures and patients with high severity, hospitals could streamline their resources into having more initial admissions for patients who have less severity, or invest resources into proper discharge and readmission reduction programs. With a focus on detailed discharge planning and efforts toward reducing readmissions, the average length of stay may slightly increase, which might be associated with higher operating expenses. However, ensuring that those patients do not return with complications, would permit the allocation of more time and resources to be used toward those patients with initial admissions. This would be associated with an increase in operating revenues. Finally, we expect to see that a reduction in readmission rates would be associated with operating margin. It is possible that expenses incurred as a result of proper readmission reduction programming and discharge planning, may be related with a decrease in the overall operating margin.

Methods

Data and Sample

Data for readmission rates were obtained from Centers of Medicare and Medicaid Services' Hospital Compare. Financial data on inpatient visits was obtained from information provided by Department of Health, State of Washington and the Medicare Cost Reports.⁴⁸ Information on total number of outpatient visits was obtained from the American Hospital Association's (AHA) annual survey each for 2012, 2013, and 2014. All datasets were merged using Medicare provider numbers as the primary identifier. The total number of hospitals in the dataset was 98, which included all the hospitals in Washington between the time period 2012-2014, and data were organized in a panel format at the hospital level. Since data were missing at random, missing values were neither removed nor filled in, which left a total of 276 hospital year observations. All analysis was performed in Stata version 15.⁴⁹

Measures

Independent variables. We examine the relationship between 30-day unadjusted AMI, PN, and HF readmission rates with operating revenues per patient, operating expenses per patient and overall operating margin. Thirty-day unadjusted

readmission rates for AMI, PN, and HF are defined as admission to a hospital within 30 days of a discharge from the same or another diagnosis.⁶

Dependent variables. Operating revenue per patient is the total operating revenue divided by total adjusted discharges. Operating expenses per patient is the total operating expenses divided by total adjusted discharges. Total adjusted discharges take into account both outpatient visits and discharges. It was computed by adding the total discharges to the product of outpatient equivalent discharges and total outpatient visits. Outpatient equivalent discharges were computed by dividing inpatient revenue per discharge by outpatient revenue per outpatient visit.

Operating margin is calculated as the difference between hospital operating revenues and operating expenses, also known as operating income, divided by operating revenues.⁵⁰ CMS publishes rolling readmission rates on Hospital Compare. This means that the year 2012 includes readmission rates from 2008 to 2011, 2013 includes readmission rates from 2009 to 2012, and 2014 includes readmission rates from 2010 to 2013. We have considered average hospital operating margin for state of Washington hospitals for each of these years.

Control variables. Control variables used in this analysis include 30-day unadjusted mortality rates for AMI, PN, and HF. Thirty-day unadjusted mortality rates for AMI, PN, and HF estimate the death within 30 days of a hospital admission for patients hospitalized with AMI, PN, and HF, respectively.⁶ Mortality rates have been used as a control variable because patients who die within 30 days will not be readmitted, which suggests that hospitals that have poor quality and high number of mortalities during this period may have low readmission rates.¹² Additionally, by including mortality rates as control variables, we expect to increase the explanatory power of our models.

Data Analysis

This study employs a fixed-effects regression model, a methodology not previously used in this line of research. The rationale behind using hospital level fixed effects is that it will control for any baseline time constant unobserved factors that may lead a hospital to select particular readmission reduction strategies, which may affect readmission rates, our explanatory variable. Policies regarding how to reduce readmission rates may vary across hospitals and a fixed effects methodology can help control for that variation. This method would also minimize selection bias issues (hospital characteristics that would lead a hospital into selecting certain readmission strategies) to properly show the association between reducing readmission rates and profitability of hospitals.⁵¹ A distribution of hospitals by characteristics was also determined. Following is the empirical model for the fixed-effects regression for the explanatory variable, readmission rates

Table 1. Distribution of Hospitals by Characteristics (n = 276).

	Hospital characteristics	
	Mean	SD
	Frequency	%
Hospital size	225 beds	147.92 beds
Ownership		
Not-for profit	190	68.84
For-profit	23	8.33
Government	63	22.82
Location		
Metro	233	84.4
Non-metro	43	15.5
Teaching		
No	143	51.81
Yes	133	48.18

Operating Revenue

$$\begin{aligned} \text{per patient}_{it} = & b_0 + b_1 \text{readm_ami}_{it} + \\ & b_2 \text{readm_pn}_{it} + b_3 \text{readm_hf}_{it} + \\ & b_4 \text{mort_ami}_{it} + b_5 \text{mort_pn}_{it} + \\ & b_6 \text{mort_hf}_{it} + v_i + u_{it} \end{aligned}$$

Operating Expense

$$\begin{aligned} \text{per patient}_{it} = & b_0 + b_1 \text{readm_ami}_{it} + \\ & b_2 \text{readm_pn}_{it} + b_3 \text{readm_hf}_{it} + \\ & b_4 \text{mort_ami}_{it} + b_5 \text{mort_pn}_{it} + \\ & b_6 \text{mort_hf}_{it} + v_i + u_{it} \end{aligned}$$

$$\begin{aligned} \text{Operating margin}_{it} = & b_0 + b_1 \text{readm_ami}_{it} + \\ & b_2 \text{readm_pn}_{it} + b_3 \text{readm_hf}_{it} + \\ & b_4 \text{mort_ami}_{it} + b_5 \text{mort_pn}_{it} + \\ & b_6 \text{mort_hf}_{it} + v_i + u_{it} \end{aligned}$$

Subscripts i and t represent the i th hospital in the t th year and v_i is the hospital fixed effect. Robust standard errors are reported to account for variability of our dependent variable, profit margins, across values of independent variable, the readmission rates (also known as heteroskedasticity).

Results

Descriptive Statistics

Table 1 presents the results of distribution of hospital characteristics. The average hospital size, represented by the number of beds is 225, with a SD of 148. Most of the hospitals in the sample were not-for-profit (68.9%), followed by government (23%), and for-profit (8%). Majority of the hospitals in this sample were located in metro areas (84%), followed by non-metro areas (16%). More than half of the hospitals were non-teaching (52%), and the remaining were teaching (48%).

Table 2. Descriptive Statistics, State of Washington Hospitals (n = 276).

Descriptive statistics	Mean	SD
Dependent variables		
Operating revenues/pt (in \$)		
2012	20357.37	4334.2
2013	21266.82	6130.9
2014	30869.01	15101.05
Operating expenses/pt (in \$)		
2012	20437.38	4388.78
2013	20365.61	5551.14
2014	29873.54	14579.17
Operating margin (in %)		
2012	-0.89	2.14
2013	0.5	2.25
2014	3.06	0.96
Independent variables		
AMI 30-day readmission rate		
2012	15.98	0.98
2013	15.68	0.84
2014	19.48	2.85
Pneumonia 30-day readmission rate		
2012	15.89	0.43
2013	15.08	0.52
2014	18.58	1.97
Heart failure 30-day readmission rate		
2012	22.21	0.58
2013	20.78	0.54
2014	22.32	2.86
Control variables		
AMI 30-day mortality rate		
2012	16.15	0.26
2013	15.84	0.21
2014	15.53	0.2
Pneumonia 30-day mortality rate		
2012	12.3	0.18
2013	12.37	0.18
2014	12.58	0.2
Heart Failure 30-day mortality rate		
2012	12.63	0.2
2013	12.71	0.18
2014	12.92	0.15

Note. AMI = acute myocardial infarction.

Descriptive statistics on the sample of hospitals (N = 276) are given in Table 2. The average operating revenues per patient is higher in 2014 than in 2013 by \$9602 and in 2012 by \$10,511. Similarly, the mean operating expenses per patient is higher in 2014 than in 2013 by \$9508 and in 2012 by \$9436. The average operating margin in 2014 is higher by 2.56 percent points in 2013 and by 3.95 percentage points in 2012. The average readmission rates for both AMI and PN showed an increase in 2014 by approximately 3-4 percentage points, but for HF, the readmission rate increased by

approximately 1 percent point in 2014 as compared to the prior 2 years. However, average overall HF readmission rates were higher than the average overall AMI and average overall PN readmission rates by approximately 5 percent points. The average mortality rate for AMI, HF, and PN shows consistency (approximately 12%-16%) across the years and across diagnoses. The descriptive statistics reveal a trend, whereby, operating expenses per patient becomes higher when readmission rates increase. In addition, we see a trend of increasing operating revenues per patient and increasing overall operating margin in those years that show higher readmission rates across all diagnoses.

Regression Analyses

Results from the fixed-effects regression models are provided in Table 3. It should be noted that in examining fixed effects model as compared to an ordinary least squares regression model (not shown), the adjusted R^2 was higher for fixed effects model with 75%-78% explained variance. Eta squared (effect size) and F statistics for each model have also been reported in Table 3.

Our first hypothesis posited that a reduction in readmission rates would associate with an increase in operating revenues per patient. Based on the model for AMI 30-day readmission rates, we can infer that a 1 percent point decrease in AMI readmission rate is associated with a \$50 increase in operating revenues per patient. PN readmission rate and HF 30-day readmission rate had no association with operating revenues per patient. Thus, our first hypothesis was partially supported.

Our second hypothesis suggested that a reduction in readmission rates would associate with increased operating expenses per patient. Our first model for AMI readmission rates shows that, a 1 percent point decrease in AMI readmission rate is related with a \$51 increase in operating expenses per patient. PN readmission rates and HF readmission rates were not related with operating expenses per patient. Therefore, our second hypothesis was partially supported.

Finally, our hypothesis about net effect posited that a reduction in readmission rates would be associated with operating margins was partially satisfied. Of the three models, higher PN readmission rates showed a positive relationship with overall operating margin. Specifically, on an average, a 10 percent point increase in PN readmission rate is associated with approximately one percent point increase in operating margin. Therefore, our third hypothesis was partially supported.

Discussion and Conclusion

A key finding of this study is that readmission rates have a variable association with different indicators of financial performance. Given that readmission rates have become

Table 3. Fixed effects regression results.

	Model 1: acute myocardial infarction			Model 2: pneumonia			Model 3: heart failure		
	Coefficient	SD	T stat	Coefficient	SD	T stat	Coefficient	SD	T stat
Operating revenues/patient (H1)									
30-day readmission rate	-49.63	27.45	-1.81 ^a	30.09	27.21	1.4	-102.52	88.43	-1.16
30-day mortality rate	790.75	483.73	1.03	-447.06	294.8	-1.52	-19.6	261.58	-0.07
2013	528.69	485.52	1.09	269.68	468.42	0.58	95.43	488.49	0.2
2014	1848.98	1359.84	1.36	1369.42	991.64	1.38	-120.52	796.57	-0.15
Constant	1266.3	7738.98	0.16	17885.21	3810.89	4.69	15440.6	2877.3	5.37
Adjusted R ²	0.86			0.860			0.858		
F statistic	2.06			28.25			3.94		
Eta squared	0.02			0.28			0.05		
Operating expenses/patient (H2)									
30-day readmission rate	-51.02	24.12	-2.11 ^b	13.83	23.24	0.6	-84.79	84.21	-1.01
30-day mortality rate	516.82	442.51	1.17	-353.14	287.4	-1.23	-121.43	199.76	-0.61
2013	178.21	468.36	0.38	-0.269	423.83	0	-104.45	470.24	-0.22
2014	1500.83	1300.12	1.15	1031.36	932.86	1.11	21.45	716.04	0.03
Constant	5330.8	7051.4	0.76	16817.81	3619.74	4.65	15952.04		
Adjusted R ²	0.86			0.93			0.86		
F statistic	6.36			9.54			8.70		
Eta squared	0.08			0.11			0.10		
Operating margin (H3)									
30-day Readmission rate	0.011	0.091	0.12	0.089	0.052	1.72 ^a	-0.082	0.150	-0.54
30-day Mortality rate	1.487	0.923	1.61	-0.942	0.810	-1.16	0.507	0.618	0.82
2013	1.484	1.245	1.19	1.174	1.196	0.98	0.841	1.140	0.74
2014	1.332	1.741	0.77	1.000	1.591	0.63	-1.031	2.839	-0.36
Constant	-21.144	15.485	-1.37	13.187	10.397	1.27	-1.628	7.735	-0.21
Adj R ²	0.587			0.574			0.534		
F statistic	1.55			0.32			4.86		
Eta squared	0.02			0.004			0.06		

Note. CI = confidence interval.

^aIndicates significance at the 90% CI.

^bIndicates significance at the 95% CI.

transparent and hospitals are being financially penalized for having high readmission rates, organizations have become more aggressive in managing clinical practices related with conditions that usually end up in readmissions, for instance, AMI. Overall, our results show that operating revenue per patient was significantly associated with AMI (H1) that operating expenses per patient was significantly associated with AMI (H2), and operating margins associated with PN (H3).

More specifically, in the case of AMI, results showed that a reduction in readmission rate is related with higher operating revenues as well as higher operating expenses. This finding is consistent with other studies that found varying relationships between AMI and financial performance.⁵² AMI is a costly condition that is expensive for a hospital to treat initially as well as during readmissions. Improvement in the quality of discharge planning for these patients as a strategy of avoiding readmissions can increase up-front operating expenses in the hopes of avoiding regulatory penalties and

the costs of readmission stays later. For example, a high-quality discharge planning may include individualized discharge plans in addition to post discharge support, medication management, and follow ups with pharmacist that may add to operating expenses.⁵³

Furthermore, in the case of AMI, reducing the readmission rates may yield cost savings for the hospital due to treatments not rendered because unnecessary readmission were avoided, which may be reflected in the form of higher operating revenues. Due to the complexity of the condition and the reimbursement structure, AMI also has the potential to yield higher operating revenue in the payment for related services such as percutaneous coronary intervention (formerly called angioplasty with stent).⁵⁴

Across all models, on the other hand, HF was not statistically significant. This finding is not altogether surprising given the chronic nature of HF and the resources required to treat it. For instance, though the hospital system was designed under the acute model, chronic illnesses require an entirely

different approach to care.^{55,56} While “the majority of chronic illness care is performed within the primary care setting,”⁵⁵ it is a phenomenon that requires linkages and resources at the level of community, the healthcare system, and the provider organization. Consequently, the lack of a statistically significant relationship across all financial measures with HF readmissions may be due to treatment being regularly obtained in alternate locations like primary care facilities or other outpatient clinics. Additionally, when considering a condition like HF, illness severity may play a significant role.⁵⁶ As such, future studies may consider stratifying by risk as a way to obtain a more nuanced understanding of the impact of reducing HF readmission rates on financial performance.

In the case of PN, a higher readmission rate was associated with a higher operating margin. An explanation for this finding would be that, possibly hospitals discharge patients too soon to save on costs of service, but only to incur expenses from readmissions or having to pay penalties. Patients who come back to hospitals with readmissions may have a higher severity of illness as compared to when they presented first. For instance, a patient who acquired a Central Line Infection at the hospital when they were being treated for PN, would return with a complication, thus requiring more resources on the part of the hospital. Subsequently, hospitals incur a greater use of hospital resources. This is a penny-wise pound-foolish type of situation in which the pursuit of lower cost by hospitals may eventually lead to slight increase in operating margin in the short term.¹¹ In the long run, as expenses keep getting higher, continued readmissions may result in decreased profitability. As an alternate explanation, it may be such that the HRRP program with a capped 3% penalty may not be effective if hospitals are making a profit with higher reimbursements despite the penalty. However, that is likely to happen in very few cases because the rates of those reimbursements would be lower while the severity of readmitted patients would be higher.

Findings from our study are consistent with earlier studies that have provided evidence of either no association or inconsistent association between readmission rates and profitability.^{11,12} Studies have shown that hospitals may not have the incentive to improve quality outcomes if the added cost of improving quality scores is high.⁵⁷ Other studies have found that increase in treatments through a greater number of diagnostic tests, treatments, and use of technology may contribute to increase in profits, even though it means that the care may not be effective.³⁹ This could be a possible rationale behind those occurrences where operating revenues and margin increase even with higher readmissions. Quality enhancements need expenditure and usage of resources. In other situations, hospitals that do invest the time and efforts in reducing readmission rates also see increasing profit margins because they may be able to reduce wasteful expenditure on readmissions.

It is important to acknowledge the limitations of our study. Findings from this study may be limited in generalizability because our dataset is small and consists of hospitals

only in the state of Washington. Even though a small dataset provides a snapshot of the possible relationship between readmission rates and profitability, a bigger dataset may allow us to see stronger associations. Another limitation includes potential endogeneity in case of AMI, in which hospitals that have higher operating revenue may be able to invest more resources in reducing readmission rates. Additionally, the inpatient and outpatient revenues and expenses were combined in this study. Future scholars should consider separating the inpatient and outpatient data as an alternative approach to analysis. There is also a chance that those hospitals with higher operational efficiency are more likely to invest in readmission reduction programs. Future research should examine the role that operational efficiency may play in the adoption and execution of such programming. Alternately, one of the strengths of this study, which also explains the difference in findings between our study and previous studies in this line of research, is the use of fixed effects regression as our methodology. This methods account for the variation in policies regarding readmission reduction across hospitals and time periods. While some hospitals may discharge patients sooner to achieve short term cost savings by conserving on beneficial therapeutic services, others may have efficient quality improvement strategies to properly manage high readmissions. Future studies should expand on our study by using a larger dataset that includes data from more states and include more time periods to gain a better understanding of the association between readmission rates and financial performance. Additionally, prospective studies can demonstrate the lag effects of readmission rates on operating margin.

This research has implications both for administrators as well as policy makers. Findings from this study inform health-care managers that policies regarding proper discharge should be made carefully so as to avoid unnecessary readmissions and wasteful expenditure. Our findings would guide managers in strategizing how to change health management practices to achieve a balance between reducing readmission rates and maintaining profitability. Additionally, our research assists policymakers in gaining a broader understanding of ways in which transparency in readmission rates including financial penalties and lower reimbursements associate with hospitals' financial performance across revenues, expenses, and margins. In conclusion, hospitals need to ensure that they deliver high-quality performance including low readmission rates while being financially viable in the long term.


Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Soumya Upadhyay  <https://orcid.org/0000-0002-4651-0925>

References

1. Axon RN, Williams MV. Hospital readmission as an accountability measure. *JAMA*. 2011;305(5):504-505. doi:10.1001/jama.2011.72.
2. Byrnes J. Winning at quality and safety: do you need a chief quality officer. *J Healthc Manag*. 2016;61(6):391-395. [https://www.ache.org/pubs/jhm/61_6/03_JHM61\(6\)-FINAL_Byrnes-column.pdf](https://www.ache.org/pubs/jhm/61_6/03_JHM61(6)-FINAL_Byrnes-column.pdf). Accessed June 14, 2019.
3. Chassin MR, Loeb JM, Schmaltz SP, Wachter RM. Accountability measures—using measurement to promote quality improvement. *N Engl J Med*. 2010;363(7):683-688. doi:10.1056/NEJMs01002320.
4. Patient Safety and Quality Improvement Act of 2005, 109 U.S.C. §§ 41; 2005.
5. Congressional Record. S 2038, S 2378, S 2738 House Hearing, 106th Congress. (2000). *Medical Errors* (Government Printing Office, Serial 106-101). <https://www.gpo.gov/fdsys/pkg/CHRG-106hhrg69818/html/CHRG-106hhrg69818.htm>. Published June 29, 2000. Accessed March 16, 2016.
6. Readmission Reduction Program. *Centers for Medicare and Medicaid Services*. CMS.gov. <https://www.cms.gov/medicare/medicare-fee-for-service-payment/acuteinpatientpps/readmissions-reduction-program.html>. Published April 27, 2018. Accessed December 5, 2015.
7. Jweinat JJ. Hospital readmissions under the spotlight. *J Healthc Manag*. 2010;55(4):252-264.
8. Brown EG, Burgess D, Li CS, Canter RJ, Bold RJ. Hospital readmissions: necessary evil or preventable target for quality improvement. *Ann Surg*. 2014;260(4):583-591. doi:10.1097/SLA.0000000000000923.
9. Harkey J, Vraciu R. Quality of health care and financial performance: is there a link. *Health Care Manage Rev*. 1992;17(4):55-63. <https://www.ncbi.nlm.nih.gov/pubmed/1428860>. Accessed June 14, 2019.
10. Faber M, Bosch M, Wollersheim H, Leatherman S, Grol R. Public reporting in health care: how do consumers use quality-of-care information? a systematic review. *Med Care*. 2009;47(1):1-8. doi:10.1097/MLR.0b013e3181808bb5.
11. Chen LM, Jha AK, Guterman S, Ridgway AB, Orav EJ, Epstein AM. Hospital cost of care, quality of care, and readmission rates: penny wise and pound foolish. *Arch Intern Med*. 2010;170(4):340-346. doi:10.1001/archinternmed.2009.511.
12. Navathe AS, Volpp KG, Konetzka RT, et al. A longitudinal analysis of the impact of hospital service line profitability on the likelihood of readmission. *Med Care Res Rev*. 2012;69(4):414-431. doi:10.1177/1077558712441085.
13. Institute of Medicine. *To Err Is Human: Building a Safer Health System*. Washington, DC: The National Academies Press; 2000.
14. Parsons DW. Federal legislation efforts to improve patient safety. *Eff Clin Pract*. 2000;3(6):309. <http://ecp.acponline.org/novdec00/parsons.htm>. Accessed June 14, 2019.
15. Patient Safety Reporting Systems. *National Aeronautics and Space Administration [NASA]*. psrs.arc.nasa.gov. Date unknown. <https://psrs.arc.nasa.gov/faq.html>. Accessed February 8, 2018.
16. Lee KY, Loeb JM, Nadzam DM, Hanold LS. Special report: an overview of the Joint Commission's ORYX initiative and proposed statistical methods. *Health Serv Outcomes Res Methodol*. 2000;1(1):63-73. <https://link.springer.com/article/10.1023/A:1010010221434>. Accessed June 14, 2019.
17. Williams SC, Schmaltz SP, Morton DJ, Koss RG, Loeb JM. Quality of care in U.S. hospitals as reflected by standardized measures, 2002-2004. *N Engl J Med*. 2005;353(3):255-264. doi:10.1056/NEJMs043778.
18. Lindenauer PK, Remus D, Roman S, et al. Public reporting and pay for performance in hospital quality improvement. *N Engl J Med*. 2007;356(5):486-496. doi:10.1056/NEJMs064964.
19. Patient Protection & Affordable Care Act of 2010, 111 U.S.C. §§ 111-148; 2010.
20. Hospital Compare. Medicare.gov. <https://www.medicare.gov/hospitalcompare/search.html>. Published July 25, 2018. Accessed December 3, 2015.
21. Lin Guo, Chung ES, Casey DE Jr, Snow R. Redefining hospital readmissions to better reflect clinical course of care for heart failure patients. *Am J Med Qual*. 2007;22(2):98-102. doi:10.1177/1062860606298245.
22. Benbassat J, Taragin M. Hospital readmissions as a measure of quality of health care: advantages and limitations. *Arch Intern Med*. 2000;160(8):1074-1081. doi:10.1001/archinte.160.8.1074.
23. Nakamura MM, Toomey SL, Zaslavsky AM, et al. Measuring pediatric hospital readmission rates to drive quality improvement. *Acad Pediatr*. 2014;14(5 suppl):S39-S46. doi:10.1016/j.acap.2014.06.012.
24. Krumholz HM, Lin Z, Drye EE, et al. An administrative claims measure suitable for profiling hospital performance based on 30-day all-cause readmission rates among patients with acute myocardial infarction. *Circ Cardiovasc Qual Outcomes*. 2011;4(2):243-252. doi:10.1161/CIRCOUTCOMES.110.957498.
25. Press MJ, Scanlon DP, Ryan AM, et al. Limits of readmission rates in measuring hospital quality suggest the need for added metrics. *Health Aff (Millwood)*. 2013;32(6):1083-1091. doi:10.1377/hlthaff.2012.0518.
26. Cooper GS, Sirio CA, Rotondi AJ, Shepardson LB, Rosenthal GE. Are readmissions to the intensive care unit a useful measure of hospital performance. *Med Care*. 1999;37(4):399-408 <https://www.ncbi.nlm.nih.gov/pubmed/10213020>. Accessed June 14, 2019.
27. Bottle A, Goudie R, Cowie MR, Bell D, Aylin P. Relation between process measures and diagnosis-specific readmission rates in patients with heart failure. *Heart*. 2015;101(21):1704-1710. doi:10.1136/heartjnl-2014-307328.
28. Durbin CG, Kopel RF. A case-control study of patients readmitted to the intensive care unit. *Crit Care Med*. 1993;21(10):1547-1553. <https://www.ncbi.nlm.nih.gov/pubmed/8403966>. Accessed June 14, 2019.
29. Cotter PE, Bhalla VK, Wallis SJ, Biram RW. Predicting readmissions: poor performance of the LACE index in an older UK population. *Age Ageing*. 2012;41(6):784-789. doi:10.1093/ageing/afs073.
30. Chang CF, Tuckman HP. The profits of not-for-profit hospitals. *J Health Polit Policy Law*. 1988;13(3):547-564. <https://>

- www.ncbi.nlm.nih.gov/pubmed/3171114. Accessed June 14, 2019.
31. Reiter KL, Harless DW, Pink GH, Mark BA. Minimum nurse staffing legislation and the financial performance of California hospitals. *Health Serv Res.* 2012;47(3, pt 1). doi:10.1111/j.1475-6773.2011.01356.x.
 32. Upadhyay S, Sen B, Smith D. The cash conversion cycle and profitability: a study of hospitals in the state of Washington. *J Health Care Finance.* 2015;41(4). <http://healthfinancejournal.com/index.php/johcf/article/view/29>. Accessed June 14, 2019.
 33. Bai G, Anderson GF. A more detailed understanding of factors associated with hospital profitability. *Health Aff (Millwood).* 2016;35 doi.org/10.1377/hlthaff.2015.1193(5):889-897. doi:10.1377/hlthaff.2015.1193.
 34. Bazzoli GJ, Clement JP, Lindrooth RC, et al. Hospital financial condition and operational decisions related to the quality of hospital care. *Med Care Res Rev.* 2007;64(2):148-168. doi:10.1177/1077558706298289.
 35. Cleverley WO, Harvey RK. Is there a link between hospital profit and quality? *Healthc Financ Manage.* 1992;46(9), 40-42. <https://www.ncbi.nlm.nih.gov/pubmed/10145680>. Accessed June 14, 2019.
 36. Lindrooth RC, Konetzka RT, Navathe AS, Zhu J, Chen W, Volpp K. The impact of profitability of hospital admissions on mortality. *Health Serv Res.* 2013;48(2, pt 2):792-809. doi:10.1111/1475-6773.12026.
 37. Pratt WR, Belloit JD. Hospital costs and profitability related to the Patient Protection and Affordable Care Act. *J Hosp Adm.* 2014;3(3):100. <https://doi.org/10.5430/jha.v3n3p100>. Accessed June 14, 2019.
 38. Gapenski LC, Vogel WB, Langland-Orban B. The determinants of hospital profitability. *Hosp Health Serv Adm.* 1993;38(1):63. <https://www.ncbi.nlm.nih.gov/pubmed/10127295>. Accessed June 14, 2019.
 39. Kwon J. Hospital Profitability: Intrinsic | Extrinsic Factors [Unpublished dissertation]. 2014. <http://business.tcnj.edu/wp-content/uploads/sites/219/2014/05/Kwon-2014-Thesis-Final-Revised.5.14.pdf>.
 40. Mark TL, Evans WN, Schur CL, Guterman S. Hospital-physician arrangements and hospital financial performance. *Med Care.* 1998;36(1):67-78.
 41. Self DR, Hegji CE, Self RM. Alternative quality measures and profitability of hospital inpatient services offered. *J Hosp Mark Public Relations.* 2010;20(1):2-13. doi:10.1080/15390940903450917.
 42. Pfeffer J, Salancik GR. *The External Control of Organizations: A Resource Dependence Approach.* New York, NY: Harper & Row; 1978.
 43. Banaszak-Holl J, Zinn JS, Mor V. The impact of market and organizational characteristics on nursing care facility service innovation: a resource dependency perspective. *Health Serv Res.* 1996;31(1):97-117. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1070105/>. Accessed June 14, 2019.
 44. Ginn GO, Young GJ, Beekun RI. Business strategy and financial structure: an empirical analysis of acute care hospitals. *Hosp Health Serv Adm.* 1995;40(2):191-209. <https://www.ncbi.nlm.nih.gov/pubmed/10143031>. Accessed June 14, 2019.
 45. Bisognano M, Boutwell A. Improving transitions to reduce readmissions. *Front Health Serv Manage.* 2009;25(3):3-10. <https://www.ncbi.nlm.nih.gov/pubmed/19382513>. Accessed June 14, 2019.
 46. Kangovi S, Grande D. Hospital readmissions—not just a measure of quality. *JAMA.* 2011;306(16):1796-1797. doi:10.1001/jama.2011.1562.
 47. Heeren O, Dixon L, Gavirneni S, Regenold WT. The association between decreasing length of stay and readmission rate on a psychogeriatric unit. *Psychiatr Serv.* 2002;53(1):76-79. doi:10.1176/appi.ps.53.1.76.
 48. Financial and Utilization Summary Files. *Washington State Department of Health.* Date unknown. <http://www.doh.wa.gov/DataandStatisticalReports/HealthcareinWashington/HospitalandPatientData/HospitalFinancialData/SummaryFinancialData>. Accessed August 10, 2015.
 49. Stata: Data Analysis and Statistical Software. *Bootstrap Sampling and Estimation | Stata.* Date unknown. <http://www.stata.com/company/>. Accessed August 3, 2018.
 50. Gapenski LC. *Healthcare Finance.* Ann Arbor: Health Administration Press; 2007.
 51. Wooldridge J. *Introductory Econometrics: A Modern Approach.* 10th ed. Boston, MA: Cengage Learning; 2012.
 52. Nguyen OK, Halm EA, Makam AN. Relationship between hospital financial performance and publicly reported outcomes. *J Hosp Med.* 2016;11(7):481-488. doi:10.1002/jhm.2570.
 53. Henke RM, Karaca Z, Jackson P, Marder WD, Wong HS. Discharge planning and hospital readmissions. *Med Care Res Rev.* 2017;74(3):345-368. doi:10.1177/1077558716647652.
 54. Amin AP, Patterson M, House JA, et al. Costs associated with access site and same-day discharge among Medicare beneficiaries undergoing percutaneous coronary intervention. *JACC Cardiovasc Interv.* 2017;10(4):342-351. doi:10.1016/j.jcin.2016.11.049.
 55. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA.* 2002;288(14):1775-1779. doi:10.1001/jama.288.14.1775.
 56. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, Part 2. *JAMA.* 2002;288(15):1909-1914. doi:10.1001/jama.288.15.1909.
 57. Cleverley WO, Cleverley JO. Is there a cost associated with higher quality? *Healthc Financ Manage.* 2011;65(1):96-103. <https://europepmc.org/abstract/med/21351716>. Accessed June 14, 2019.