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National Trends in Readmission Following Inpatient Surgery in the Hospital Readmissions Reduction Program Era

An Original Study Submitted by

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Running Head
Trends in Surgical Readmission in the HRRP Era

Mini-Abstract:

In this study, we sought to examine whether surgical readmission rates have declined over the past decade, and whether the Hospital Readmissions Reduction Program (HRRP) has had an influence. Surgical readmission rates have fallen over the past decade, and these declines have increased during the HRRP era.

Objective: To investigate whether the Hospital Readmissions Reduction Program, a national program that introduced financial penalties for high readmission rates for certain medical conditions, had a "spillover" effect on surgical conditions.

Summary Background Data: Over the past decade, there have been multiple national efforts to improve surgical care. Readmission rates are a key metric for assessing surgical quality. Whether surgical readmission rates have declined, and whether the Hospital Readmissions Reduction Program has had an influence is unclear.

Methods: Using national Medicare data, we identified patients undergoing a range of procedures over the past decade. We examined whether certain procedures that would be targeted by the HRRP had a differential change in readmissions compared to other procedures. We used an interrupted time-series model to examine readmission trends in three time periods: pre-ACA, HRRP implementation, and HRRP penalty.

Results: Between 2005-2014, 17,423,106 patients underwent the procedures of interest; risk-adjusted rates of readmission across the eight procedures declined from 12.2% to 8.6%. Pre-ACA rates of readmission were decreasing (-0.060% per quarter [-0.072%, -0.048%], P<0.001). During the HRRP implementation period, the rate of decline of readmissions increased (-0.129% [-0.142%, -0.116%], P<0.001) and continued declining at a similar rate during the penalty period (-0.118% [-0.131%, -0.105%], P<0.001). Largest declines in surgical readmissions were seen among the non-targeted procedures. The hospitals with the greatest reductions in medical readmissions also had the greatest drop in surgical readmissions.

Conclusions: Surgical readmission rates have fallen over the past decade and rates of decline have increased during the HRRP period.

Introduction:

Readmission following inpatient hospitalization is common, costly, and increasingly used as a measure of quality for surgical care. Nearly 1 in 7 patients are readmitted within 30-days following inpatient surgery.[1] Many clinical leaders and policy makers view high readmission rates as evidence of suboptimal care during the initial hospitalization or during follow-up. The evidence supporting this view is particularly compelling for surgical conditions, where patients returning during 30 days usually do so because of complications from the initial procedure.[2,3]

There have been a series of national efforts to reduce complications and improve surgical care over the past decade, including the National Surgical Quality Improvement Program (NSQIP), the Society for Thoracic Surgeons clinical registry, and procedure specific public reporting.[4,5] With the passage of the Affordable Care Act (ACA) in March 2010, hospital readmission rates became a key performance metric for payment through the Hospital Readmission Reduction Program (HRRP), which penalizes hospitals with higher-than-expected readmission rates.[6] Although the initial efforts in HRRP focused on a small number of medical conditions, policymakers forecasted that certain surgical conditions would eventually be included.

Given these efforts to improve surgical care, we know little about whether surgical readmission rates have changed over the past decade. Further, while early evidence suggests that the passage of the HRRP was associated with reductions in medical readmissions[7], whether there have been similar reductions in surgical readmissions is largely unknown. It is plausible that in response to the HRRP, hospital leaders implemented broad, system-wide approaches to reducing readmissions, such as investing in care coordination and close follow up protocols across all departments, which could theoretically reduce surgical readmissions as well. Alternatively, it might be that surgical conditions (and the factors that cause surgical readmissions) are different enough (i.e. driven more by complications) that efforts required to reduce medical readmissions (i.e. care coordination) wouldn't lower surgical readmissions. If indeed targeting three medical conditions led to drops in surgical readmissions, it has important implications for future policy efforts and would suggest that even a narrowly tailored program can have a broad effect. Empirical data here would immensely useful.

Therefore, using national Medicare data, we sought to answer three questions. Given the various important national efforts to improve surgical care, have surgical readmission rates changed over the past decade and is the passage of the HRRP associated with accelerations in readmission reductions? Second, if readmissions have fallen in the post-ACA era, were reductions more pronounced among surgical conditions that were announced to be targeted in the future versus those surgical conditions that were not? And finally, given the evidence of reductions in medical readmissions as a result of the HRRP, are the hospitals with substantial reductions in medical readmissions the same as those with largest reductions in surgical readmissions?

Methods

The Hospital Readmissions Reduction Program – Timeline of Announcement, Implementation, Performance Window, and Penalty Period

The HRRP, first mandated in Section 3025 of the Affordable Care Act, penalizes hospitals with higher- than-expected 30-day readmission rates for selected clinical conditions.[6] The final rule, released in August 2012, outlined penalties for acute myocardial infarction, heart failure, and pneumonia with hospitals first incurring penalties for these conditions in October 2012 (FY 2013). Readmission rates above the national average are determined on the basis of readmission performance over the previous three years. Expansion to include surgical procedures, such as coronary artery bypass (CABG), was forecasted in the original mandate under Section 3025, with final ruling in the Inpatient Prospective Payment Systems Rule FY 2014. Penalties for total hip and knee replacement began in FY 2015 and for CABG in FY 2017, again with performance periods from the three years prior.[8]

Data

We linked several data sources for this study. The Medicare Provider Analysis and Review (MedPAR) and Inpatient Claims dataset was linked to the Beneficiary Denominator and Enrollment database, which provided key patient-level variables including basic demographics, primary cause and dates of hospitalizations, comorbidities, mortality, and procedures. Additionally, we used the American Hospital Association (AHA) annual survey, which provided data on hospital size, location, and teaching status. The study was approved by the institutional review board at the Harvard T. H. Chan School of Public Health.

Study Cohort

Using the 100% Medicare inpatient file claims from January 1, 2005 through November 30, 2014, we identified beneficiaries enrolled in Medicare Part A, who underwent one of eight selected procedures, three targeted and five non-targeted procedures. We considered CABG, hip replacement, and knee replacement to be targeted procedures because of their future inclusion in the HRRP penalty targets. Non-targeted procedures included abdominal aortic aneurysm repair

(AAA), pulmonary lobectomy, colectomy, appendectomy, and cholecystectomy. These were chosen because they are common, represent a broad range of inpatient surgical procedures, involve a variety of surgical specialists, and are associated with a spectrum of morbidity and mortality. The specific International Classification of Diseases, Ninth Revision (ICD-9) procedure codes used to identify these procedures are available in Supplemental Digital Content 1.

We excluded patients who were younger than 65 years or not continuously enrolled in Medicare Part A for 12 months, patients undergoing surgical procedures outside the 50 states and the District of Columbia, and those receiving care in a federal hospital. To enhance the homogeneity of our procedural cohorts, we applied the following restrictions as done in previous studies: patients undergoing concurrent valve repair were excluded from the CABG sample, only non-ruptured aneurysms without a thoracic component of their repair were included, and for cancer resections, we excluded patients without an accompanying cancer diagnosis.[1,9,10]

Variables

Our primary outcome of interest was all-cause 30-day readmission, defined as readmission to the hospital within 30 days of discharge following an index inpatient procedure. Our main exposure was time in quarters, analyzed as a continuous variable. We examined changes in time trends between three periods, based on those previously defined by Zuckerman et al.[7]: the pre-ACA period (January 2005 through March 2010), the HRRP implementation period (April 2010 through September 2012), and the penalty period, when penalties were initiated for medical conditions (October 2012 through November 2014). Our pre-ACA time period started earlier than Zuckerman's to investigate national trends that were in place prior to the policy. Surgeries that occurred in December 2014 were excluded from our study, as we did not have 30-day follow-up data for those patients.

Examining Trends in Readmission Rates for Surgical Procedures

For targeted procedures and non-targeted procedures, we first compared index admission, patient, and hospital characteristics in the baseline and final year of the study using X^2 analyses for categorical variables and t-tests for continuous variables.

We used multivariable, patient-level, linear spline regression models to examine the quarterly trends in readmission rates over time. Although the outcome was binary, we chose a linear model to preserve the interpretability of linear trends in readmission rates. Generalized estimating equations, including an independent working correlation matrix and robust empirical standard errors, were used to account for within-hospital correlation over time. Changes in readmission rates over time were estimated using a linear term for time as well as linear splines at each change in time period (April 2010 and October 2012). To ensure that apparent changes in readmission rates were not simply due to changes in patient severity, all models controlled for age, race, gender, admission urgency, Elixhauser comorbidities,[11,12] discharge location on index admission, and **DRG weight. DRG weight helps account for patient severity by incorporating the resource utilization of the patient during their inpatient stay.**

We modeled the differences in time trends between readmissions across all surgical procedures in aggregate using the model described above. We then expanded the model to include a binary indicator for targeted versus non-targeted procedures, as well as interaction terms between each time trend and the binary indicator. This model allowed us to assess whether the slope changes were different for targeted versus non-targeted procedures. In secondary analyses, we ran regression models for each procedure separately, adjusting for the same covariates. This enabled us to calculate aggregate, targeted, non-targeted, and procedure-specific risk-adjusted estimates for readmission rate trends across the study period.

Examining Hospital-level Variation in Readmission Trends Rates

To examine whether reductions in readmission rates led to more homogeneity between hospitals, we calculated the variability between hospital readmission rates in 2005 (prior to the HRRP) and again in 2014 (after the implementation of the HRRP).

Examining Readmission Trends by Baseline Readmission Rate

In order to see the degree to which changes in readmission rates were driven by differences in baseline readmission rates, we divided hospitals into four quartiles based on their readmission rate in the baseline year (2005). We then ran the models described above to assess the slope changes for targeted and non-targeted procedures at each change in time period (April 2010 and October 2012) within each of the four quartiles.

Examining the Correlation between the Reductions in Surgical and Medical Readmissions

We evaluated whether hospitals that had reductions in medical readmissions also had reductions in surgical readmissions. If these changes in readmissions were all linked to the HRRP, we would expect to see positive correlations between the trends. For each hospital we calculated the slopes in readmission rates across the entire study period for targeted medical conditions, surgical procedures in aggregate, and separately for targeted and non-targeted surgical procedures. We then divided hospitals into quartiles of readmission reductions for medical conditions and determined the mean rate of surgical readmission reduction across each quartile. The average surgical readmission slopes were compared across the four levels of medical readmission reductions using analysis of variance with a test for trend, as well as a pairwise comparison between the average surgical readmission slopes in the highest and lowest medical readmission categories.

Results:

Patient, Index Admission, and Hospital Characteristics

Between 2005-2014, 17,423,106 patients underwent the procedures of interest. The number of cases decreased annually from 783, 646 in 2005 to 641,277 in 2014. Cases in 2014 were more likely to be elective and had slightly shorter median lengths of stay compared to 2005 (Table 1). We observed no clinically meaningful differences in the age, gender, or race of patients undergoing inpatient surgery in 2014 versus 2005. Overall, patients undergoing surgery in 2014 had a higher prevalence of comorbid conditions. There was very little difference in the types of hospitals where these inpatient procedures were occurring in 2014 vs. 2005. Examining targeted and non-targeted procedures specifically, we observed similar trends for non-targeted procedures (Supplemental Digital Content 2).

Trends in Surgical Readmissions between 2005 and 2014

Between 2005-2014, risk-adjusted rates of readmission across the eight procedures declined from 12.2% to 8.6% (Figure 1). Prior to the passage of the ACA, rates for readmission were decreasing (-0.060% per quarter [-0.072%, -0.048%], P<0.001). During the HRRP implementation period (after the passage of the HRRP but before financial penalties kicked in), the rate of decline of surgical readmission rates increased more rapidly (-0.129% per quarter [-0.142%, -0.116%], P<0.001) and continued declining at a similar rate during the HRRP penalty period (-0.118% per quarter [-0.131%, -0.105%], P<0.001) (Table 2). The change in slope between the pre-ACA and the implementation period was -0.069% per quarter ([-0.089%, -0.048%], P<0.001). The change in slope between the implementation period and the penalty period, however, was not statistically significant (+0.11% per quarter [-0.011%, 0.034%], P=0.31) (Table 2). **Annual changes in readmission rates are shown visually in Supplemental Digital Content 3 for each time period.**

Between 2005 and 2014, risk-adjusted rates of readmission for surgical conditions that were going to be targeted by HRRP declined from 11.3% to 7.1% (Figure 2). Prior to the passage of the ACA, quarterly rates for readmission were already decreasing (-0.10% per quarter [-0.12%, -0.09%]). These rates declined at a faster rate during the HRRP implementation period (-0.13% per quarter, [-0.15%, -0.12%]), and continued declining at a similar rate during the HRRP penalty period (-0.11% per quarter [-0.12%, -0.09%]) (Table 2). The difference in the slope between the pre-ACA and the implementation period was small (0.03%) and statistically significant (P=0.049). There was no difference in the change in slope between the implementation and the penalty periods (Table 2). **Annual changes in readmission rates for targeted conditions are shown visually in Supplemental Digital Content 3**. The drop in readmissions in the HRRP implementation period was pronounced for CABG but not for hip or knee replacement (Supplemental Digital Content 4).

Among non-targeted procedures, risk-adjusted rates of readmission declined from 13.7% to 12.2% during the study period (Figure 2). Quarterly rates for readmission were increasing prior to the passage of the ACA, (0.025% per quarter [0.015%, 0.034%], P<0.001), fell during the HRRP implementation period (-0.104% per quarter [-0.124%, -0.084%], P<0.001), and then declined at a similar rate during the HRRP penalty period (-0.104% per quarter [-0.129%, -0.078%], P<0.001). The change in slope between the pre-ACA and the implementation period was significant; however the change in slope between the implementation period and the penalty period was not. (Table 2) **Annual changes in readmission rates for non-targeted conditions are shown visually in Supplemental Digital Content 3.** For each of the non-targeted procedures, we observed a change in slope during the implementation phase but no further gains during the HRRP penalty phase (Supplemental Digital Content 4).

Hospital-level Variation in Readmission Trends

In 2005, we found that readmission rates varied across hospitals with a standard deviation of 8.33% and an inter-quartile range of 6.6% (with quartiles of [8.1%, 14.7%]). In the final year of our study, 2014, after the implementation and penalty periods of the HRRP, reductions in readmission rates led to more homogeneity between hospitals. Both the standard deviation (7.28%) and the inter-quartile range (5.6%, based on quartiles of [5.9%, 11.5%]) were reduced by approximately 14%.

Readmission Trends by Baseline Readmission Rate

For targeted procedures, the hospitals with the highest baseline readmission rates had the steepest slopes in the pre-ACA period (-0.23%, P<0.001), but the slope did not decrease as fast during the

implementation period (-0.07%, P<0.001), with an increase in slope between the pre-ACA and implementation period (0.15%, P<0.001) (Supplemental Digital Content 5). In contrast, those hospitals with the lowest readmission rates in the pre-ACA period, had no significant slope (0.005%, P=0.50) during the pre-ACA period, were reduced by -0.10% (P<0.001) in the implementation period, and had the greatest decrease in slope of all 4 quartiles. The same pattern was seen for non-targeted procedures, the hospitals with the lowest baseline readmission rates saw the greatest decreases between the implementation and pre-ACA period (Supplemental Digital Content 5).”

The Relationship between Change in Medical and Surgical Readmission Rates

The quartile of hospitals with the greatest average reductions in medical readmissions had more substantial drops in surgical readmissions compared to hospitals with the smallest gains in medical readmissions (-0.57% per quarter versus -0.03% per quarter, p-value for trend across quartiles <0.001). We found similar patterns when we examined targeted and non-targeted procedures separately (Table 3).

Discussion

In a national study of Medicare beneficiaries who underwent one of 8 surgical procedures over the past decade, we found that the likelihood of being readmitted has decreased steadily. The drop in readmission rates seem to have accelerated after the passage of the Hospital Readmissions Reduction Program, at a time when the program was focused on a few medical conditions. To our surprise, the biggest declines in surgical readmissions occurred not among the “future” targeted surgical procedures but among those not targeted. Finally, we found that the hospitals with the greatest reductions in medical readmissions also had the greatest drop in surgical readmissions, suggesting some degree of spillover. Taken together, these findings suggest that while readmission rates have been falling for some time, the HRRP appears to have sped up that improvement, possibly by inspiring hospitals to focus more broadly on readmissions.

We also found, counter-intuitively, that the largest reductions in surgical readmissions among non-targeted surgical procedures and a smaller impact among the targeted conditions. While we can't be sure why this difference exists, one likely explanation is that hospitals mobilized efforts to reduce readmissions for targeted surgical conditions long before the ACA. CABG, hip, and knee replacement had already been at the center of several local and national quality improvement initiatives for years prior to the ACA.[13,14] The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database has been at the forefront of quality improvement efforts over the last decade, with CABG outcome reporting a key component of their quality programs.[15-17] It is plausible that the HRRP brought attention to readmissions more broadly, including for non-targeted surgical procedures, which had increasing rates of readmission prior to the passage of the ACA, presumably because they had been subject to fewer early quality improvement efforts**. We cannot, however, exclude the possibility that the reductions in surgical readmissions that we have seen could be associated with other factors such as, but not limited to, other CMS efforts to reduce readmissions during the implementation period.[18] Possible confounding factors also include culture changes within hospitals, related to an increased focus on quality independent of the HRRP, which may translate to broader changes in readmissions.**

The association that we observed between reductions in surgical and medical readmissions is important and supports the notion that a narrowly defined policy for readmission reductions can potentially have broad effects. It may be surprising that reductions in medical and surgical readmission are associated, as a growing body of work suggests that surgical and medical readmissions have different underlying mechanisms.[1-3,19-21] However, it is possible that HRRP motivated hospital leaders to prioritize readmission reductions, and that this could have resulted in the implementation of department specific approaches which had an effect on reducing both non-targeted and targeted surgical procedures. In fact, a prior study found that two-thirds of hospital leaders in the U.S. believed that the HRRP had a "major impact" on the implementation of system wide strategies to reduce readmission rates.[22] Successful strategies for medical conditions may look different than successful strategies for surgical ones; however hospitals successfully reducing their medical readmissions do appear to be the ones reducing their surgical readmissions, suggesting some unified hospital impetus.

There have been several important studies focused on readmissions in the post-ACA era, although most have focused on medical conditions. The sentinel study by Zuckerman and colleagues found that readmission rates for both targeted and non-targeted medical conditions declined significantly after HRRP implementation, although there were larger reductions for targeted conditions.[7] Wasfy et al. also found that readmission rates for myocardial infarction, heart failure, and pneumonia decreased more rapidly after HRRP's passage, and that improvement was most for hospitals with the lowest baseline performance.[23] Our analysis extends this work by examining the impact of the HRRP on a surgical population, where it appears mechanisms and strategies of readmission reductions may be different.

Our analysis should be interpreted in the context of important limitations. First, because this was an analysis of claims data, our results are subject to imperfect risk adjustment. Yet, changes in coding of claims data is unlikely to have varied dramatically before and after passage of the HRRP in a way that would explain our findings. Second, we cannot be certain that decreases in readmission rates were due to real improvements in quality and not driven by other factors such as increasing observation stays, greater use of emergency departments, or the choice to not readmit patients who otherwise would have benefitted from re-hospitalization. However, prior work has found that drops in medical readmission are not due to increases in use of observation stays[7] and it would be unlikely that this would systematically occur in surgical conditions only. **Third, unmeasured confounders such as local quality efforts, or other CMS programs independent of the HRRP could be contributing to readmission reductions.**

Conclusions

In conclusion, we found that surgical readmissions rates have decreased across US hospitals over the past decade and those declines have accelerated after the passage of the Hospital Readmissions Reduction Program. It appears that the narrowly targeted program that focused on three medical conditions appears to be having broad effects across a range of conditions, including major surgical procedures.

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Legends for Illustrations

Table 1: Characteristics of Medicare Patients Undergoing Inpatient Surgery in 2005 and 2014

All procedures included CABG, hip replacement, knee replacement, colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. All comparisons are significant at $p<0.001$ except those denoted with $^{+}$, which where $p>0.05$.

Figure 1: National Trends in Readmissions among Medicare Beneficiaries Undergoing Inpatient Surgery

All procedures included CABG, hip replacement, knee replacement, colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. January 2005 through March 2010 was the period before enactment of the Affordable Care Act (ACA); April 2010 through September 2012 was the period of implementation of the Hospital Readmissions Reduction Program, and October 2012 through November 2014 was the HRRP penalty period.

Figure 2: National Trends in Readmission among Medicare Beneficiaries Undergoing Targeted and Non-Targeted Surgical Procedures

Targeted procedures included CABG, hip replacement, and knee replacement. Non-targeted procedures include colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. January 2005 through March 2010 was the period before enactment of the Affordable Care Act (ACA); April 2010 through September 2012 was the period of implementation of the Hospital Readmissions Reduction Program, and October 2012 through November 2014 was the HRRP penalty period.

Table 2: National Trends in Surgical Readmissions among Medicare Beneficiaries in Pre-ACA, HRRP Implementation, and HRRP Penalty Era

Targeted procedures include CABG, hip replacement, and knee replacement. Non-targeted procedures include colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. All comparisons are significant at $p<0.001$ except those denoted with $^{+}$, which where $p>0.05$.

Table 3: Relationship between Change in Targeted Medical Readmissions, Targeted Surgical Readmissions, and Non-Targeted Surgical Readmissions

Targeted medical conditions include acute myocardial infarction, congestive heart failure, and pneumonia. Targeted surgical procedures include CABG, hip replacement, and knee replacement. Non-targeted surgical procedures include colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. Slopes are the mean quarterly rates across quartiles change in medical readmissions across the study period. *Significant ($P<0.001$) pairwise difference between highest and lowest categories of medical readmissions slope.

List of Supplemental Digital Content

Supplemental Digital Content 1.docx

Supplemental Digital Content 2.docx

Supplemental Digital Content 3.docx

Supplemental Digital Content 4.docx

Supplemental Digital Content 5.docx

Table 1: Characteristics of Medicare Patients Undergoing Inpatient Surgery in 2005 and 2014

			2005 (N=783,646)	2014 (N=641,277)
Index Admission Characteristics	Elective Admission (%)		62.3	69.7
	Length of Stay (days, median)		6.0	5.0
	Discharge Location	Home (%)	34.5	32.2
		Home with VNA (%)	22.5	29.2
		Skilled nursing facility (%)	25	27.6
		Rehabilitation facility (%)	14.8	8.1
Patient Characteristics	Age (year, median)+		75.2	75.2
	Male (%)+		43.1	42.9
	Non-white race (%)+		9.7	9.3
	Hypertension (%)		61.6	64.7
	Diabetes (%)		18.8	21.1
	Renal Failure (%)		3.1	8
	Liver Disease (%)		0.9	1.2
	Obesity (%)		5.1	12.6
Hospital Characteristics	Hospital Size+	Small (%)	29	28.3
		Medium (%)	58.4	58.6
		Large (%)	12.6	13.1
	Teaching Status+	Major Teaching (%)	8.5	8.8
		Minor (%)	12.4	12.6
		Non-Teaching (%)	79.1	78.6

All procedures included CABG, hip replacement, knee replacement, colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. **All comparisons are significant at $p<0.001$ except those denoted with +, which where $p>0.05$**

Table 2: National Trends in Surgical Readmissions among Medicare Beneficiaries in Pre-ACA, HRRP Implementation, and HRRP Penalty Era

	Pre-ACA Period (Q1 2005 – Q1 2010)	HRRP Implementation Period (Q2 2010 – Q2 2012)			HRRP Penalty Period (Q3 2012 – Q4 2014)		
	Quarterly Slope [95% CI]	**Quarterly Slope [95% CI]**	**Change in slope from pre-ACA [95% CI]**	**P-Value**	**Quarterly Slope [95% CI]**	**Change in slope from implementation of ACA [95% CI]**	**P-Value**
All Procedures	-0.060%	-0.129%	-0.069%	<0.001	-0.118%	0.011%[+]	0.31
	[-0.072, -0.048]	[-0.142, -0.116]	[-0.089, -0.049]		[-0.131, -0.105]	[-0.011, 0.034]	
Targeted Procedures	-0.103%	-0.129%	-0.026%[*]	0.049	-0.111%	0.02%[+]	0.18
	[-0.12, -0.087]	[-0.144, -0.113]	[-0.051, 0.000]		[-0.126, -0.097]	[-0.008, 0.043]	
Non - Targeted Procedures	0.023%	-0.121%	-0.144%	<0.001	-0.09%	0.030%[+]	0.15
	[0.014, 0.033]	[-0.141, -0.101]	[-0.170, -0.118]		[-0.117, -0.065]	[-0.011, 0.071]	
Difference, Targeted – Non-targeted	-0.126%	-0.008%[+]	0.119%	<0.001	-0.021%[+]	-0.013%[+]	0.60
	[-0.144, -0.109]	[-0.032, 0.016]	[0.084, 0.154]		[-0.050, 0.009]	[-0.060, 0.035]	

Targeted procedures include CABG, hip replacement, and knee replacement. Non-targeted procedures include colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. **All comparisons are significant at p<0.001 except those denoted with [*], which where 0.001< p <0.05, and [+], which where p>0.05 .**

Table 3: Relationship between Change in Targeted Medical Readmissions, Targeted Surgical Readmissions, and Non-Targeted Surgical Readmissions

Quartile of Performance for Medical Readmissions Reduction (Average Quarterly Slope)	**All Surgical Procedures Quarterly Slope**	**Targeted Surgical Procedures Quarterly Slope**	**Non-Targeted Surgical Procedures Quarterly Slope**
First Quartile (Largest reduction in medical readmission) (-1.05%)	-0.57%*	-0.70%*	-0.34%*
2nd Quartile (-0.46%)	-0.37%	-0.43%	-0.25%
3rd Quartile (-0.19%)	-0.24%	-0.28%	-0.16%
Fourth Quartile (Smallest reductions in medical readmissions) (0.50%)	-0.03%*	-0.07%*	-0.02%*
P-Value for Trend Across Categories of Medical Readmission Reductions	P<0.001	P<0.001	P<0.001

Targeted medical conditions include acute myocardial infarction, congestive heart failure, and pneumonia. Targeted surgical procedures include CABG, hip replacement, and knee replacement. Non-targeted surgical procedures include colectomy, pulmonary lobectomy, AAA repair, cholecystectomy, and appendectomy. Slopes are the mean quarterly rates across quartiles change in medical readmissions across the study period.

*Significant (P<0.001) pairwise difference between highest and lowest categories of medical readmissions slope.