

Comprehensive Program Reduces Hospital Readmission Rates After Total Joint Arthroplasty

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Abstract

Hospital readmissions are quality indicators of health-care delivery. Our purpose is to examine the effect of a program designed to reduce readmissions after total joint replacement.

We initiated a comprehensive program with 4 goals: (1) outpatient workup of venous thromboembolism; (2) decrease surgical site infection; (3) early follow-up with primary care physicians; and (4) increase physician awareness of the financial and quality-related ramifications of unplanned readmissions. We then compared readmission rates before our initiative was instituted (2005-2006) to 3 years after implementation (2007-2009).

Readmission rates preintervention were 3.70 and 3.29 for total hip replacement (THR) and knee replacement (TKR), respectively. Postintervention rates fell to 1.78 and 1.98, respectively, representing a 47.2% reduction of readmission for THR and 39.8% for TKR ($P < .05$).

These results demonstrate the success of our program in reducing readmissions. This may result in reductions in healthcare costs and improvement in quality of care.

Hospital readmissions following elective surgical procedures are the focus of efforts to control the rising cost of healthcare and to improve the quality of care delivered in this country. Unplanned readmissions account for a significant amount of health-care spending. Several studies have estimated that in 2004, the cost to Medicare of unplanned readmissions to the hospital exceeded \$17 billion.^{1,2} The government and other payers are actively examining this issue and have identified the reduction of unplanned, and possibly avoidable, readmissions as a way to potentially save significant healthcare dollars. As a result, the concept of “episodes

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of care,” where a set of services are required to manage a specific patient medical condition over a defined period of time, is one that has received recent attention in the healthcare policy field. The Centers for Medicare and Medicaid Services (CMS) has proposed a bundle-type reimbursement to hospitals for a single episode of care, which includes the 72 hours prior to surgery, the surgery itself, and immediate perioperative period, as well as all care delivered within 30 days of hospital discharge.^{3,4} Hospital readmissions would no longer be reimbursed separately if they occur within 30 days of discharge.

In addition, rates of unplanned readmissions are being used as an indicator of the quality of healthcare delivered and considered as a potential barometer with which to reimburse institutions in a performance-based system.^{5,6} Ashton and colleagues⁷ reported that the risk of readmission is increased by 55% when care is deemed to be substandard. CMS has shown an interest in instituting a value-based hospital payment system. In 2008, the Medicare Payment Advisory Commission (MedPAC) recommended that hospitals with high risk-adjusted readmissions rates receive correspondingly lower average reimbursements.⁸ Performance-based reimbursement is a concept that has already been instituted to some degree in other countries, and could be present in some capacity in this country in the near future.⁸

We examined our readmissions and identified the most common causes to be: concern for venous thromboembolic events (VTE), infection, and medical complications. We initiated a comprehensive program to address these 3 complications and to educate surgeons on this issue. VTE are a potentially avoidable cause of morbidity and readmission after total joint replacement surgery and is the most common cause of readmission after a total hip replacement (THR) or total knee replacement (TKR). The incidence of VTE has been reported to be as high as 15% in some series.⁹⁻¹³ Another commonly seen complication after joint replacement surgery is surgical site infections (SSI).¹⁴ The incidence of deep infection is approximately 1%, while superficial infections are reported to occur in as many as 10% of cases in the revision setting.¹⁵ Moreover, medical complications are estimated by some, to be the most common complications seen in postoperative patients.²

Jenks and colleagues¹⁶ estimated that 70% of readmissions to the hospital after a surgical procedure are due to a medical complication. Early follow-up with the primary care physician can reduce the rates of rehospitalization for patients with medical problems.

We hypothesized that a comprehensive program designed specifically to reduce the incidence of these complications will decrease our 30-day readmission rate. We also instituted a physician education program to further lower the incidence of unplanned readmissions. The purpose of this study was to examine the effect of this program on the 30-day hospital readmission rates after total joint replacement in a large, academic medical center.

MATERIALS AND METHODS

On January 1, 2007, a program to reduce readmissions after total joint replacement was initiated. This program focused on 4 main components: (1) institution of infrastructure to enable outpatient workup of VTE; (2) system wide efforts to decrease SSI rate; (3) early follow up with primary care physicians after discharge; and (4) education efforts to increase physician awareness of the financial and quality-related ramifications of readmissions following hip and knee replacement.

Using the billing records of our institution, data was retrospectively collected for all orthopedic readmissions within 30 days of discharge from January 1, 2005 through December 31, 2009. To be eligible for inclusion patients had to be 18 years or older, with a primary THR or TKR, and patients must have undergone an unplanned readmission within 30 days of discharge from the hospital after hip or knee replacement. The total number of patients who underwent primary THR and primary TKR at our institution was calculated for the years 2005-2009 and patients with unplanned readmission, tallied. Readmission rates were calculated for each calendar year and used to calculate an average readmission rate for 2 groups: (1) patients readmitted

before implementation of the program in 2007, and (2) patients readmitted after the implementation of the program. The means were calculated and difference between these rates was analyzed using a chi-squared test.

RESULTS

Between 2005 and 2009, 7462 primary THRs and TKRs were performed at our institution. Of these, 185 patients met the inclusion criteria (ie, patients had undergone primary total joint replacement and were readmitted within 30 days of surgery).

In 2005, 1420 THRs and TKRs performed, with 46 patients readmitted within 30 days. The readmissions rate was 3.24 per 100 cases. In 2006, the readmission rate was 3.77 per 100 cases. In 2007, 2008, and 2009, however, the readmissions rates were 1.66, 2.14, and 1.85 per 100 cases, respectively. In 2007-2009 the rate of readmission was significantly lower (1.66, 2.14, 1.85, respectively), compared with 2005-2006, before the program was implemented. As such, the average rate of readmissions for the period between 2005 and 2006 was 3.5, whereas the rate for the period 2007 and later was 1.89 (Table). The overall difference in readmissions rates for the period before the initiation of the program, compared with the period after implementation was statistically significantly lower for all total joint replacements, as well as for total hip arthroplasty (THA) and total knee arthroplasty (TKA) individually (Figure).

DISCUSSION

Our results show that the initiation of our program was associated with a statistically significant reduction in 30-day readmissions after primary total joint replacements. Our data supports the concept that a comprehensive program designed to reduce the incidence of common preventable causes for readmission can have a significant positive effect on the reduction of readmission rates.

There are other factors that have been shown to

Table. Readmission Rate Data (per 100 cases)

Procedure		2005-2006	2007-2009	P-Value
Total Joint Replacement	Total Cases	2744	4717	
	Readmissions	96	89	
	Readmission Rate (per 100 cases)	3.5	1.89	<i>P</i> < .001
Total Knee Replacement	Total Cases	1339	2520	
	Readmissions	44	50	
	Readmissions Rate (per 100 cases)	3.29	1.98	<i>P</i> = .01
Total Hip Replacement	Total Cases	1405	2197	
	Miller	52	39	
	Spechtel al ⁵	3.7	1.78	<i>P</i> < .001

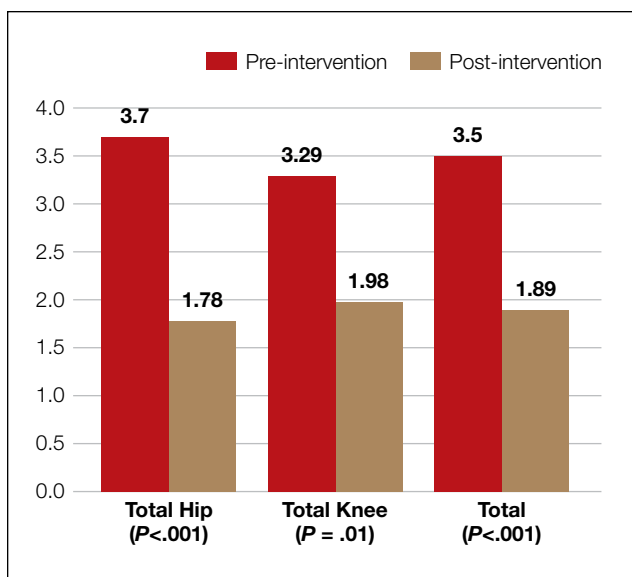


Figure. A comparison of readmission rates before and after intervention for total hip replacements, total knee replacements, and all total joints performed. All reported differences in readmission rates were statistically significant.

decrease rates of readmissions after orthopaedic procedures.¹⁷ Several other studies have reported favorable results after instituting programs designed to improve outcomes after total joint replacements both in the United States and abroad.¹⁸ Dowsey and colleagues¹⁹ reported shorter lengths of stay, earlier ambulation, and a lower readmission rate in patients who were placed in a clinical pathway after total hip or knee arthroplasty, although the difference in readmission rates was not statistically significant. Studies have also shown that such programs can also favorably affect healthcare costs. Mabrey and colleagues²⁰ reported decreased length of stay and lower total costs without adversely affecting perioperative outcome scores in patients who received TKA who were placed in a clinical pathway. Moreover, Batsis and colleagues²¹ demonstrated that proper resource utilization, including interventions such as the placement of patients in a specialty-based patient care unit after TKA, reduced length of stay and overall hospital costs without compromising outcomes. This study supports that institutionally based programs can be a safe and effective way to improve outcomes when the interventions focus on appropriate goals.

In our intervention program, we focused on improving outcomes that commonly affect hospital readmission rates, a strategy, which to our knowledge, has not been reported in the orthopedic literature.

A primary cause for readmission in our population was concern for VTE. VTE are a major source of morbidity after orthopaedic surgery.^{11,22} In the past, patients in our institution who were suspected of having a post-operative VTE often required readmission in order to diagnose the problem, treat it, or both. Generally, the performance of a venous duplex ultrasound is only

available during weekday business hours. Also, both a computed tomographic (CT) angiogram and ventilation/perfusion scan have not always been available in a timely fashion without admitting the patient. Our intervention program included the implementation of the support infrastructure for the outpatient diagnosis and treatment of these thromboembolic events. Duplex ultrasonography was made available 24-hours a day in our emergency departments and through the outpatient radiology department for physicians evaluating patients in the office setting. In the last year of our study (2009), we evaluated 35 patients in the emergency room for venous thromboembolic disease. Of these patients, 30 were not admitted and 5 were. This data underscores the positive effect of the outpatient workup for venous thromboembolic disease on a readmission rate, although the precise quantitative analysis of this is not possible since we are unsure how many of these patients before the inception of the study would have been admitted to our institution. Additionally, a protocol was initiated to make CT scanning available to ambulatory patients within 24 hours of discharge on an outpatient basis. A standard protocol was also developed to ensure that patients are given perioperative deep vein thrombosis chemoprophylaxis in accordance with the guidelines of the American Academy of Orthopaedic Surgeons.^{23,24}

A second major cause for readmission was infection, or the concern for infection. In our institution we developed several interventions to reduce the rates of surgical site infections. A hospital-wide hand washing and universal precaution protocol was undertaken, as well as a brushless hand-scrubbing protocol. A protocol was also developed for preoperative methicillin-sensitive *Staphylococcus aureus* and methicillin-resistant *S. aureus* screening and decolonization prior to hip and knee replacement.^{25,26} Patients were also instructed to use chlorhexidine gluconate cloth wipes preoperatively to decrease the bacterial colonization on their skin prior to surgery. Moreover, since chlorhexidine surgical prep has been shown to be more effective as a surgical disinfectant than the traditional povidone-iodine preparations, we standardized the use of a chlorhexidine surgical disinfectant on all patients unless contraindicated.^{27,28} The use of perioperative antibiotic prophylaxis was also standardized in all of our hospitals. We have decreased our overall deep surgical site infection rate by 13% since the inception of the study protocol. Without a doubt, this positively affected our readmission rate.²⁹

Medical complications are, according to some reports, the most common sources of readmission in surgical patients. Although in orthopedics a high proportion of surgery performed is elective, and patients are less likely to have significant medical comorbidities than in other surgical fields, a significant amount of readmissions are still likely to be due to nonsurgical complications.² It is imperative that potential medical complications are detected and addressed early before they require

readmission and/or cause significant morbidity for the patient. In addition, medication changes may be made during the inpatient or rehabilitation stay, that require readjustment in the outpatient setting after early recovery. Studies have shown that a visit with the primary care physician within 2 weeks of discharge to address these issues can decrease postoperative complications.³⁰ To that end, the process of discharge planning was modified at our institution to include an appointment with the patient's primary care provider (PCP) to be seen within 2 weeks of discharge. If the patient did not have a PCP, they would receive a referral to see an internist at our institution, and this was added as part of the discharge plan. We have no data on what type of conditions were diagnosed and/or treated by our patients' PCPs during the postoperative visit. However, in a study by Jencks and colleagues,² it was shown that close follow-up within 3 weeks of discharge prevented patients' readmissions, although the conditions for which the patients were treated were not quantified by their PCPs.

Finally, in an effort to raise awareness among the faculty and housestaff and to encourage participation, several education initiatives were performed, including email announcements (every 2 weeks) of changes and progress made, presentations at appropriate faculty grand rounds, and nursing and social work meetings in an effort to ensure that the elements of this intervention become part of routine practice. We cannot quantitate the effect of physician education and awareness on our rate of readmissions.

A potential limitation of this study was that we did not capture our patients' readmissions to other institutions. Although we do not believe there were no readmissions, we feel strongly that omitting readmissions to other institutions does not affect the purpose of our study. The aim of this study was to describe the efficacy of a protocol designed to reduce readmissions. If we assume that readmissions to other institutions remained stable over the study, then the effect of these missed readmissions on the change in observed readmissions to our institution will be insignificant. If the purpose of our study had been to describe our overall readmission rate (which it was not), then not accounting for readmissions to outside hospitals would impact the accuracy of our findings.

This study demonstrates that a comprehensive program designed to reduce complications after TKA and THA can have a significant effect on the reduction of postoperative readmissions. In the current healthcare environment, it is increasingly important that we find ways to reduce costs. Unplanned hospital readmissions result in billions of dollars of cost to our healthcare system. Reduction of these readmissions may result in not only significant reductions in healthcare spending, but also improvement in quality of care delivered to patients. This study also shows that focused, institu-

tionally-based programs can have a very positive effect on healthcare delivery and improve overall outcomes to both our patients and the public as a whole.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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