

Arthroplasty

Michael M. Decker, MD

Department of Orthopaedics & Rehabilitation, The University of New Mexico Health Sciences Center, Albuquerque, New Mexico

Abstract

The United States continues to spend an unprecedented amount of annual money on healthcare. However, the costs of providing care may not appropriately reflect the quality of care patients are receiving. This is particularly concerning when examining the projected increase in total joint arthroplasty (TJA) procedures over the next few decades, which are expected to increase to nearly 4 million procedures annually. The Center for Medicare and Medicaid Services (CMS) has responded by increasingly shifting reimbursements from the less efficient fee-for-service repayment model to value-based repayment. The Comprehensive Care for Joint Replacement (CJR) bundle payment model has recently been implemented as part of this shift towards value-based care delivery. The CJR repayment model, developed based on the success of the elective Bundled Payments for Care Improvement (BPCI) initiative, is an episodic bundled payment for TJA procedures, putting more financial responsibility on hospitals with the aim of improving quality of care, reducing costs, and decreasing local and regional cost and quality variability amongst providers and hospitals. I reviewed current studies on the BPCI and CJR model, including benefits associated with reducing patient readmissions to the hospital; limited costs and postoperative complications associated with post-acute care facilities and patient length of stay; and instituting evidence-based protocols for preoperative, perioperative, and postoperative care. Promising data exists that suggests these programs may help incentivize reducing costs and improving the quality of care provided to patients undergoing TJA procedures.

Introduction

Healthcare spending in the United States (US) has risen to unprecedented levels. The US designates roughly \$3.2 trillion annually to healthcare, which accounts for 17.8% of the gross domestic product and equates to approximately \$9990 per person.¹ Furthermore, costs of Medicare and

Medicaid constitute about \$1.2 trillion (37%) of total healthcare spending in the US.¹ Although we spend a notable amount of money, the quality of care delivered has not kept pace. According to Davis et al,² the US ranks last amongst 11 industrialized countries in overall healthcare quality, efficiency, and equity in 2014. The soaring costs yet middling quality of the US healthcare system suggest a pressing value issue. Subsequently, there has been an appeal to transition away from the traditional fee-for-service repayment model to help improve efficiency in healthcare services through a more value and quality-based repayment model

In particular, hip and knee arthroplasty make up a large portion of the Center for Medicare & Medicaid Services (CMS) spending. In 2014, Medicare spending on total joint arthroplasty (TJA) hospitalizations alone was \$7 billion for 400,000 procedures,³ which accounted for 5.7% of all yearly Medicare expenditures.⁴ By 2030, the number of total knee arthroplasty (TKA) and total hip arthroplasty (THA) procedures, respectively, in the US annually are projected to increase to approximately 3,500,000 (673% increase) and more than 500,000 (174% increase).⁵ As a payer for many of these procedures, CMS will experience a considerable cost burden. Additionally, costs associated with TJA vary substantially between geographical and local markets.^{3,6} These increasing volumes and varying prices have resulted in the development and implementation of an alternative value-based repayment model from CMS, called the Comprehensive Care for Joint Replacement (CJR) model, which took effect in April 2016.^{7,8}

The CJR model aims to hold hospitals accountable for the quality and cost of care while incentivizing improved coordination among providers involved in hip and knee replacement surgery.³ The CJR is modeled on the success of the voluntary Bundled Payments for Care Improvement (BPCI). The general payment model is best described as an episodic bundled payment for a TJA procedure³ where payers reimburse a contracted price for various services within a specific episode of care.⁷ In the CJR model, this episode is defined as the index admission and 90-day postoperative period. In the CJR, each involved

care provider bills Medicare for appropriately provided services during the episode of care. CMS then reconciles all qualifying payments and compares the total costs to the target (or contracted) price. Should the hospital spend less than the target price, the difference is provided to the hospital as a payment. Hospitals and providers can share in that payment. As the model becomes more established, any excessive costs by hospitals above the target price will be penalized the difference. Nearly all medical and rehabilitation care in that 90-day period are included in the total costs, with few exceptions.⁸ The target price in the first year is based on historical costs for the hospital; however, during the initial 5-year period, this transitions to a regional-based target price (Figure 1).

As a whole, using the CJR model may push hospitals and providers to identify and eliminate inefficiencies in caring for TJA patients, which can reduce affiliated costs and improve care quality. Because of the rapid transition in target pricing, hospitals will need to act swiftly to remain financially solvent. Experience with the BPCI has allowed the orthopaedic community to objectively identify cost-saving and quality-improving opportunities for TJA procedures in preparation for CJR.



Figure 1. Comprehensive Care for Joint Replacement (known as CJR) target price calculation. Multiple price modifiers such as Medicare savings discounts and capped losses are not represented here. Further information on targeting pricing can be found at <https://innovation.cms.gov/initiatives/cjr>.

Reducing Readmissions

Readmission during an episode of care can be extremely costly to a hospital system in a bundled payment model. Although not all readmissions can be eliminated, reducing the complications that lead to readmissions can decrease costs and improve patient-care quality. Clair et al⁹ found that overall 90-day readmission rates for primary TJA procedures were 10%. Surgical complications added costs

of \$36,038 for THA readmissions and \$38,953 for TKA readmissions, whereas medical complications added costs of \$22,775 for THA readmissions and \$24,183 for TKA readmissions. Bosco et al¹⁰ quantified the cost burden of unplanned readmissions during the first 30 days after TJA and TKA in the Medicare population. Cost burden represents the necessary profit margin of each procedure in order to account for readmissions and remain financially solvent. Unplanned readmissions during this time for THA and TKA were both 2.4%, with a cost burden of 4.3% and 2.8%, respectively. Unplanned readmissions after revision THA and revision TKA were significantly more common and costly, with readmission rates of 9.5% and 11.9% and cost burdens of 8.3% and 11.9%, respectively.

In an effort to identify patients at risk for readmission, Kurtz et al^{11,12} reviewed Medicare claims data on more than 950,000 TKA and 440,000 THA procedures. These studies found that readmission rates for THA and TKA during the 90-day postoperative period were 10.5% and 8.6%, respectively. Patients requiring a perioperative blood transfusion were at increased risk of readmission, whereas patients discharged to home or had hospital stays less than 5 days had significantly decreased risk of readmission. As surgeon procedural volume increased, patient risk for readmission was decreased.

Boraiah et al¹³ developed a readmission risk assessment tool (RRAT) and analyzed the relationship between cumulative RRAT scores and readmission risk. This tool assessed numerous modifiable and non-modifiable risk factors including tobacco use, Staphylococcus Aureus colonization, obesity, cardiovascular disease, history or risk factors for venous thromboembolism, neurocognitive or psychological problems, physical conditioning, and diabetes. Of the modifiable risk factors assessed with this tool, diabetes, history of venous thromboembolic disease, and smoking were significantly associated with readmission regardless of patient age. Using this tool, patients with a cumulative RRAT score of 3 or greater were significantly associated with higher odds of readmission. Importantly, infection continues to be a leading cause for readmission.^{9,11-13} This tool may help guide surgeons towards modifying certain risk factors to reduce the patient's odds of sustaining a complication or readmission before they undergo elective TJA.

Hospital readmissions are costly for hospitals and can be morbid for patients. Identifying high-risk patients, managing modifiable risk factors preoperatively, and focusing on high-quality perioperative care may significantly reduce the risk of readmission, improving overall patient health and quality of care while reducing hospital costs.

Post-Acute Care Facility Discharges and Length of Stay

The 90-day period after discharge can be a considerable source of cost in a bundle-payment model, starting with the early post-discharge period. Patient discharge to a post-acute care (PAC) facility, such as a skilled nursing facility or inpatient rehabilitation facility, can lead to a significant increase in cost in a bundle-payment model. Patients discharged to PAC facilities instead of home can incur 30% to 40% higher costs during an episode of care.^{14,15} In 2015, a total of \$10.8 billion was spent on discharges to PAC facilities after TJA.¹⁵ PAC spending is the single largest contributor to variation in Medicare spending in the US, accounting for 73% of regional-spending variations.¹⁶ Reducing patient discharges to PAC facilities is clearly an opportunity at cost reduction.

Multiple strategies have been proposed to reduce PAC discharges after TJA. Snow et al¹⁶ evaluated the impact of a “prehabilitation” program on use of PAC services after TJA. Patients who underwent preoperative physical therapy had an overall 29% reduced usage of PAC services at an average adjusted cost reduction of \$1215, predominantly through reduced skilled nursing facility and home health agency payments. The average cost of preoperative physical therapy was \$100, limited to one or two sessions. The author suggested that the value of this therapy was predominantly in the patient’s planning for recovery and training in assistive walking devices as opposed to intensive range of motion and strength regimens. In another study, Slover et al¹⁷ used decision analysis to assess the impact of extending inpatient hospital stays to avoid PAC facility discharge in a 90-day episode of care. Results showed that an inpatient stay can be extended to a total of 8.2 days after surgery if a patient is discharged to home and remain more cost-effective than discharge to a PAC facility. The authors suggested that savings that could be realized with such a strategy are primarily the result of relatively low costs of additional days in the acute care facility, compared to a more expensive stay at a PAC facility.

However, length of stay has been identified as a significant risk factor for readmission.^{11,12,18} Williams et al¹⁸ found that length of stay greater than 4 days after TJA is a significant risk factor for readmission within 90 days after surgery. Patients with higher American Society of Anesthesiologists (ASA) physical-status scores who had a length of stay greater than 4 days had higher readmission risk during the 31- to 90-day postoperative period than those with lower ASA scores. Longer hospital admissions increase the risk of complications such as hospital-acquired infections and venous thromboembolism.¹⁸ Interestingly, the study also identified discharge to a facility other than

home as an independent risk factor for readmission. The risk of readmission for patients who required prolonged hospital stays is significant and can remain so even through the later period of the episode of care.

Although discharging to home may be more cost-effective than a PAC-facility discharge, it does not come without risk. Yao et al¹⁵ assessed numerous risk factors for severe adverse events or readmission for patients discharged to home after TJA. Patients who experienced severe complications or readmission were older, smoked, obese, or functionally dependent, and the odds of a severe adverse event or readmission increased with each additional risk factor. About 70% of unplanned readmissions occurred within the first 2 weeks after discharge. The author concluded that patients discharged to home should be risk-stratified, and home healthcare surveillance should be more aggressively used in high-risk patients during the early post-discharge period to reduce complications and readmissions.

Ultimately, there is a balance between discharge location, length of stay, and patient risk factors that optimizes cost and improves the quality of care. The optimal post-discharge pathway for each patient will require accurate risk stratification and subsequent allocation of resources. Further investigation needs to be performed to identify these risk factors and determine effective ways to modify care accordingly.

Standardized Care Pathways

Developing an efficient, streamlined care pathway for TJA patients has been proposed as an opportunity to improve value in an episodic bundle payment model by using cost-reduction techniques and providing improved quality of perioperative care. As a method to reduce inefficiency or use of duplicative services, hospitals have adopted standardized care pathways for TJA practices. These pathways create customary, evidence-based protocols for patient care in the preoperative, perioperative, and postoperative periods.¹⁹

Froemke et al⁷ evaluated the impact of implementing a standardized care pathway, with a bundled payment and gainshare model, on patient care and costs. The study found several areas of improvement after implementation of this pilot initiative. Compared to the pre-pilot cohort, the pilot cohort had significantly reduced length of stay, greater discharge to home with self-care, decreased in discharge to skilled nursing facilities and home with healthcare, and a reduction of total-allowed claims by 6% per case. Concomitantly, quality measures including Surgical Care Improvement Project compliance, Press Ganey hospital scores, and 3-month postoperative Western

Ontario and McMaster Universities Arthritis Index scores were favorable compared to national benchmarks. Tessier et al¹⁹ assessed cost differences and readmission rates of more than 77,000 Medicare TJA patients from 68 different orthopaedic groups within the US with and without defined clinical-care pathways. The study noted that these cohorts had similar readmission rates; however, groups with a defined clinical-care pathway averaged \$3189 less costs for THA and \$2466 less cost per case compared to those without defined clinical-care pathways.

Standardized care pathways for TJA patients have the potential to reduce inefficiency by streamlining common services, create clearly defined roles for each care provider, and align the interests of all providers with the patient to assure an excellent, cost-effective outcome.

Conclusion

TJA is a major contributor to increasing costs seen by CMS, and this will only continue to grow. Procedural volume is increasing rapidly, and costs have been highly variable. With the implantation of the CJR model, there is increased incentive for providers to improve efficiency, decrease costs, and improve the quality of patient care. However, because of increasing influence of regional prices in the early stages of implementation and annually adjusted target prices, the available opportunities to reduce inefficiencies in care delivery and improve patient outcomes must be clearly delineated to help providers adjust to a rapidly changing landscape and remain solvent. Reducing hospital length of stay, decreasing use of PAC facilities and resources, reducing hospital readmissions, and implementing standardized care pathways have all been shown to have a positive impact on cost reduction and patient care quality.

Avenues need to be explored that help improve the overall patient-care experience by reducing complications and enhancing objective patient-outcome measures in order to continue to improve the overall value of total joint replacement surgery. It is essential that all the stakeholders in a patient's episode of care are incentivized to develop methods to improve patient outcomes within their scope of practice. Gainsharing is a financial relationship between a hospital and care providers involved in a TJA episode of care where costs savings realized as a payment to the hospital can be shared with these providers. The CJR model allows gainsharing opportunities, which may provide incentives for improved care coordination and quality. Strategies to reduce potentially unnecessary readmissions can decrease costs, but more importantly reduce unnecessary burden on TJA patients and their families. Some potential strategies that may reduce these readmission events include developing defined emergency

room care pathways for TJA patients, post-discharge patient monitoring by clinical staff, and preoperative planning sessions with individual patients where procedures are established for patients to navigate potential complications.

As spending decreases with downward pressure on payments and increasing risk being absorbed by hospitals, a possible consequence may be the withholding of a potentially beneficial TJA procedure from patients with increased risks. As the current CJR model does not account for preoperative medical care in their target price, there is significant opportunity to improve and even eliminate patient risk factors before surgery, such as poor glycemic control, smoking, or obesity, while keeping costs controlled. However, a major concern with this model will be the financial impact it will have on institutions currently providing TJA procedures to higher risk patients and whether or not this will lead to decrease in access to care for this population. We must critically assess the impact of this program and others like it to assure that patients are receiving the care they require.

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Conflict of Interest

The author reports no conflicts of interest.

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