



Navigating the New Frontier: Quality Improvement Strategies to Prepare for Bundled Payment Scheme for Lower Extremity Joint Replacements

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Title: Navigating the New Frontier: Quality Improvement Strategies to Prepare for Bundled Payment Scheme for Lower Extremity Joint Replacements

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Abstract

Background: A number of alternative payment schemes aiming to restructure the health system and realign financial incentives have emerged as potential strategies for achieving higher value within healthcare. Interest has grown particularly around bundled payments for episodes of care. The Centers for Medicare and Medicaid Services (CMS) has initiated testing scale-up of the bundled payment models nationally through the Comprehensive Care for Joint Replacement (CJR) Program. Concerns and questions regarding how and whether bundled payment models will be effective in raising value in lower extremity joint replacement (LEJR) care exist. We sought to evaluate the value-raising potential of bundled payments and determine the most effective strategies for implementing bundled payment schemes for LEJR.

Methods: A review of the literature was conducted to synthesize the empirical data available on effective strategies and known outcomes of applying bundled payments to LEJR. Relevant publications were identified using comprehensive search terms in Medline, reference mining, and ad hoc searches. To assess stakeholder readiness and plans for LEJR bundled payment reform, we sampled a small cohort of senior officials from hospitals in a large integrated health system in Boston, MA. A standardized semi-structured interview guide was used to assess stakeholder initial reaction to LEJR bundled payment models, planned strategies for lowering costs and improving quality, anticipated challenges to implementation, approach to care coordination with other stakeholders, strengths and challenges of CJR. Interviews were transcribed and analyzed for *a priori* and inductively-derived themes and subthemes.

Results: Our systematic search identified 16 publications describing LEJR bundled payment demonstrations. Demonstrations of bundled payments for LEJR conditions generally reported achieving lower utilization and costs outcomes. However, quality metrics reported in captured demonstrations were limited and variable. Demonstrations that reported successful outcomes utilized some common care redesign strategies, including creation of standard clinical pathways, eliminating unnecessary use of rehabilitation services, and development of a care coordination infrastructure. Barriers to successful bundled payment implementation included failure to align stakeholders, low case volume, and high administrative burden. Eleven healthcare stakeholders took part in in-depth semi-structured interviews between December 2015-January 2017. Though stakeholders generally praised CJR as a step toward creating a more efficient health care system, they anticipated a number of challenges to implementation, including apprehension toward taking on risk, managing competing demands and particularly complex patients in tertiary care hospitals, and bridging fragmented vertical reporting structures between different stakeholder groups (i.e. physicians, care coordinators, postacute facilities).

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Glossary

ACA: Affordable Care Act

ACE: Acute Care Episode Program, voluntary Medicare 3-year bundled payment program for inpatient cardiac and orthopedic procedures which began in 2009

AHRQ: Agency for Healthcare Research and Quality

BPCI: Bundled Payment for Care Improvement Program, a voluntary bundled payment pilot program initiated in 2013. Participating providers can select from 4 different bundling options (Model 2=bundles hospitalization, post-acute care and a warranty period) and different clinical conditions to bundle.

CMS: Centers for Medicare and Medicaid Services

CJR: Comprehensive Care for Joint Replacement Model, mandatory bundled payment model initiated in 2016. Bundles LEJR procedure and index hospitalization, postacute care, and 90-day warranty.

DME: Durable Medical Equipment

IRF: Inpatient rehabilitation facility

LEJR: Lower extremity joint replacement

LTAC: Long-term acute care facility

SNF: Skilled nursing facility

THA: Total hip arthroplasty

TKA: Total knee arthroplasty

Introduction

The shortcomings of the traditional US fee-for-service health payment system in reigning in exponential health care spending and providing better health outcomes have been widely recognized and articulated in recent years[1, 2]. In the wake of this recognition, strong consensus that the US health care system is in need of significant and expeditious health care reform has emerged among consumers, providers, and both private and public payers nationally[3, 4]. Concomitantly, a number of alternative payment schemes aiming to restructure the health system and realign financial incentives have emerged as potential strategies for achieving higher value within healthcare[4]. To catalyze the innovation and evaluation of these alternative models, the Centers for Medicare and Medicaid Services (CMS) has created and piloted an ever-growing number of novel care delivery pilot programs[5, 6].

Among the alternative payment models, interest is growing particularly around bundled payments for episodes of care[3, 7-9]. These types of bundled payments agglomerate all projected costs associated with a predefined health care episode, including inpatient admission, diagnostic tests, medical and surgical treatments, physician services, and outpatient care costs, into one target price[7]. Typically, providers entering bundled payment agreements are held accountable for patients' final outcomes by committing to certain quality standards while keeping costs low over the entire episode. CMS bundled payment models such as the Bundled Payment for Care Improvement Program (BPCI), have been applied to numerous different clinical conditions including stroke, urinary infection, COPD, and cardiac and orthopedic procedures[10-12].

In 2012, the Agency for Healthcare Research and Quality (AHRQ) released their "Revisiting the State of the Science" evidence report on the effects of bundled payments on healthcare spending and quality[13]. The report summarized findings from a comprehensive systematic review of bundled demonstrations conducted in the U.S. and internationally between the years 1985-2011 by both private and public payers. Bundled definitions of demonstrations were highly variable and applied to a variety of provider settings, including hospitals, skilled nursing facilities and home health agencies. Additionally, most bundled payment demonstrations included in this report were prospective (meaning payers provide payments in advance of service delivery) and bundled services of a single provider (i.e. services in just the post-acute care setting). Only three demonstrations examined broader bundle definitions that combined

services delivered across multiple sites of care (i.e. both inpatient hospitalization and post-acute rehabilitation services). Thus, findings from the AHRQ systematic review are more applicable to those considering implementing a bundled payment program that targets a single provider.

Today, most bundles payment programs, including most BPCI models, are retrospective (providers are paid after they have delivered care) and defined more widely, combining services across multiple healthcare settings. Since enactment of the ACA in 2010, bundled payment models have taken off with many new programs emerging in both the public and private sector nationally[14]. To test the scale-up of bundled payment nationally, CMS has turned to one of the highest volume, most expensive health services it provides: lower extremity joint replacement.

Lower Extremity Joint Replacement

Since the 1990s, the rates of total knee arthroplasty (TKA) and total hip arthroplasty (THA) have risen substantially, doubling and tripling respectively[15, 16]. Medicare is the primary payer for most LEJRs and has seen substantial increase in per-capita utilization[2]. The total demand for LEJR among beneficiaries is only projected to rise to unprecedented levels in the decades to come as the US population ages[2, 17, 18]. As the volume of LEJR procedures has increased, so have per procedure hospital charges[1]. The cost of these procedures can vary by as much as 313% across the nation, ranging from \$11K to greater than \$70K[19]. Even within the same metropolitan market similar magnitudes of variation in cost exist[19]. Whatsoever, these high costs have not equated with better outcomes. Hospitals have decreased patient length of stay; however, these declines have been met with increases in the rate of readmission[2]. Post-operative complications necessitating post-discharge care, such as infection, MI, and hemorrhage, have also increased[2].

Lower extremity joint replacements are among the most popular conditions for testing bundled payment schemes because they are thought to have relatively lower financial risk and allow for longer episode lengths that capture more costs and readmissions[20, 21]. In April 2016, CMS implemented the new Comprehensive Care for Joint Replacement (CJR) bundled payment program that would hold hospitals financially accountable for managing the costs of the joint replacement procedure and all other medical services 90 days post-discharge; including post-

acute charges such as potential readmissions, rehabilitation, and outpatient care[22]. CJR will affect hundreds of hospitals within 67 selected geographic areas across the country and occur over a 5-year period; it is estimated that 25% of all LEJR arthroplasty procedures will be covered by CJR over its 5 year implementation [22, 23]. CJR is distinctly different from other bundled payment models. Unlike other CMS payment models, participation in CJR is mandatory for those hospitals selected. Hospitals bear all of the financial risk and will either endure payment penalties or gain payment rewards based on the quality of care they provide and total costs[22].

As with any new pilot, many concerns and questions regarding how and whether the model will be effective in raising value have surfaced[24, 25]. As CMS moves in the direction of bundled payments, stakeholders are requesting more empirical evidence on bundle payments' efficacy in achieving cost reduction and quality improvement[10]. This study proposes to evaluate the more recent literature to determine what are predicted to be the most effective strategies for implementing bundled payment schemes for LEJR and query key healthcare stakeholders to determine the strategies they intend to employ to best implement the bundled payment model. The main aim of the study is to provide stakeholders with quality improvement strategies and policy recommendations.

Methods

Systematic Literature Review

A focused review of the literature was conducted to summarize current state of knowledge on three key questions: (1) What implementation strategies have proven to be effective for implementing bundled payment models for LEJR procedures? (2) How effective have LEJR bundled payment models been in lowering hospital costs and improving hospital quality outcomes. We utilized systematic literature search strategies very similar to the AHRQ systematic review; we used the same PubMed search term from the AHRQ systematic review[13]. A reference librarian was also consulted to advise on creation of a new search term specific to LEJR to ensure that no additional demonstrations were missed. The primary database used for the literature review was MEDLINE. Grey literature articles were accessed through government websites and additional think-tank agency websites. Reference mining and ad hoc searches were also conducted to identify relevant publications.

Inclusion criteria for studies examined were specified as: US-based, peer-reviewed academic studies and federal or state government reports, published between January 17th 2012 and January 23 2017 that focused on LEJR episodes only. We selected this search range to capture more recent demonstrations published after the AHRQ's systematic search. Database search results were manually previewed for relevance. Of the publications selected for review, descriptions of the demonstrations were extracted and summarized. We summarized findings from these published demonstrations to answer our key research questions: (1) How effective have LEJR bundled payment models been in lowering hospital costs and improving hospital quality outcomes? (2) What implementation strategies have proven to be effective for initiating bundled payment models for LEJR procedures?

Stakeholder Analysis: Qualitative Data Collection

A standardized semi-structured interview guide was developed. Topics addressed in the interview guide included: initial reaction to a mandatory bundled payment program for LEJR, planned strategies for lowering costs and improving quality, anticipated challenges in implementation, approach to care coordination with other stakeholders, strengths and challenges of LEJR bundled payment programs, and anticipated unintended consequences of LEJR bundled payment programs. The interview guide contained open-ended questions that could specifically be tailored to individual stakeholder groups.

Stakeholder interview participants were sampled from Partners Health Care, a large integrated health system located in Boston, MA. Though Massachusetts was not one of the randomly selected Metropolitan Statistical Areas (MSAs) we opted to recruit from this community to provide recommendations to our affiliated integrated health system sampled and other hospitals that are not required to participate currently but may face similar requirements in the future. Findings from our interview participants were intended to serve as a comparison for literature review findings and to inform quality improvement strategies within our integrated health system.

Using a convenience sampling strategy, the integrated health system's online directories were examined to identify and send email interview invitations to senior hospital administrators,

senior rehabilitation facility administrators, orthopedic surgeons with experience operating on and caring for LEJR patients, and physical therapy providers with experience in caring for LEJR patients. Snowball sampling was also used to enhance recruitment. A total of 64 email interview invitations were sent to potential participants. Eleven agreed to participate, including 3 orthopedic surgery providers, 5 hospital administrators, and 4 physical therapy providers. We requested interviews from local private payer organizations but did not succeed in recruiting any participants from this stakeholder group. Stakeholder interview procedures were deemed to be exempt from full review by the Harvard University Institutional Review Board.

Individuals interested in participating were scheduled for either an in-person or telephone interview. Interviews were digitally recorded and lasted 22-48 minutes in length (median length 33 minutes). Audiorecordings of interviews were transcribed. Transcripts were analyzed using The Framework Method for qualitative data analysis[26].

A priori codes were generated based on our systematic literature findings and interview guide. Open coding was conducted on the first three interviews to generate new codes to ensure that important aspects of data were not missed. *A priori* and inductively-derived codes were compared to generate a finalized list of codes. Codes were grouped into categories. All interview transcripts were then indexed using finalized codes and categories. Microsoft Excel was used to generate a matrix of codes. Coded transcript data was charted into the matrix. Matrixed data were analyzed to identify salient themes and subthemes, and key data points were selected to represent and summarize final themes.

RESULTS

A. Focused Literature Review Findings

We found 16 publications that described implementation and outcomes from LEJR bundled payment demonstrations. The majority of publications described implementation and results from Medicare's Bundled Payment for Care Improvement Model 2 Initiative [23, 27-32]; one also reported on findings from one hospital system's performance in the ACE Initiative in addition to BPCI performance ; and four described uniquely-designed bundle payment

demonstrations[33-36]. A summary of findings from each demonstration is described in Table I.

Effects on Lowering Costs and Improving Quality

Overall, all studies that described Medicare BPCI Model 2 initiatives reported achieving LEJR episode cost savings [23, 30, 31, 37-39]. Interestingly, the Baptist Health System demonstration, which reported findings from participation in both the ACE and BPCI programs, reported a statistically significant decrease in Medicare payments after the BPCI initiative but decreases in Medicare payments weren't statistically significant during the ACE pilot[38]. Most savings reported from Baptist Health System's BPCI Initiative came from limiting postacute care whereas savings from the ACE pilot largely came from standardizing implant costs[38]. Most of the LEJR demonstrations initiated by private payers also reported achieving cost savings [33, 34, 36]. The only demonstration that did not report cost savings after implementation of bundled payment initiatives, the California Integrated Healthcare Association, experienced significant hospital participant drop-out due to break-downs in stakeholder negotiations[35].

Though nearly all captured demonstrations of bundled payments for LEJR reported lower utilization and costs outcomes, it should be noted that demonstrations often did not describe what specific costs were considered in determining estimates. Moreover, it was not clear for most demonstrations whether implementation costs were accounted for in reported total savings. These overhead bundled payment implementation costs can be significant when considering the infrastructural changes that must be invested to initiate bundled payment strategies; for example the NYU Langone demonstration reported achieving cost savings per episode, but indicated these savings were balance by the cost of infrastructure investment[31].

Data on the effects of bundling on quality outcomes were limited and variable across demonstrations. When data on quality was available, metrics often differed across demonstrations. Some studies reported lowering readmission rates after implementation of bundled payment models [30, 32] while others reported achieving stable readmission rates [27, 33, 37, 40]. Only a few of the studies examined in our review included patient functional status or patient satisfaction metrics in their analyses[34, 36, 37].

Implementation Strategies and Barriers to Success

Demonstrations that reported successful outcomes utilized some common care redesign strategies (Table 2). The creation of clinical pathways to standardize patient care and limit unnecessary services was often cited as a key strategy for success by demonstrations that had positive outcomes (Figure 1). Episodes were often divided into the pre-operative phase, peri-operative phase, and post-operative phase within these clinical pathways. Specific protocols were introduced and followed during each phase of the episode. In the pre-operative phase, patient education sessions, early physical therapy, and comorbidity management were often implemented to lower risk of complications and optimize patients for early discharge. In the peri-operative phase, efforts were made to standardize implants used; optimize local pain control; avoid urinary and hemodynamic complications by limiting foley catheter use, unnecessary transfusions, and tailoring thromboembolic prophylaxis to patient needs; and encourage early mobilization. In the post-operative phase, focus was placed on reducing hospital length of stay and discharging patients home. In addition to developing standard pathways, successful demonstrations also cited the development of a care coordination infrastructure in the form of an electronic provider communication platform and a designated care navigator position.

A number of barriers to successful bundled payment implementation also emerged from our review. The most significant barriers to implementation were failure to align stakeholders, low case volume, and implementation cost burdens. It is clear from the Integrated Health Association demonstration in particular that low case volume provides very little incentive for providers to invest cost and effort into significant care redesign and practice reform[35]. Effective negotiation among stakeholders was another barrier to implementation, particularly during efforts to align surgical and postacute care providers with care redesign strategies (i.e. standardizing implant choices, limiting use of postacute services, etc.) [35, 36, 41]. Also among the reported challenges to implementation was the large administrative burden and cost of training staff on bundled payment initiative goals and new protocols, data analysis and patient tracking, and employment of additional staff. Administrative burden was the most frequently reported reason for withdrawing from BPCI initiative[40].

B. Stakeholder Interview Findings

Eleven healthcare stakeholders took part in in-depth semi-structured interviews between December 2015-January 2017. Stakeholders represented a range of institutions including senior-level hospital administrators (H1-H4); a physical therapy facility administrator (R5); and physician providers, including three orthopedic surgeons (P6-P8) and four Physical Medicine and Rehabilitation specialists (P9-P11). Results are presented based on key transcript themes.

Stakeholder Reactions to CCJR

The CJR model was generally praised by stakeholders as a positive move away from the traditional fee-for-service payment model. CJR was viewed as a step toward creating a more efficient health care system, and stakeholders believed that alternative payment models like CJR were an inevitable part of the future health care landscape. Many stakeholders expressed some relief that CMS chose joint arthroplasty as the condition with which to pilot bundled payments as LEJR has a more routine and predictable clinical course compared to other clinical conditions. One stakeholder, representing a community hospital, expressed enthusiasm for the new bundled payment model as an opportunity for community hospitals to excel.

P8: Overall, it's the right thing to do to get rid of the waste in the system... I think ultimately it is good that our health care system will go through this change. There's way too much waste in the system, so it's good to reduce this waste and reshape the landscape.

Though stakeholders generally expressed positive reactions toward CJR, they still had concerns about the model. Many stakeholders expressed concerns about their institution's preparedness for payment reform and the level of resource investment that would be required to successfully implement such bundled models. Regarding the model features, most hospital administrators expressed apprehension toward having to take on risk for post-acute care, which they traditionally have little control over. Similarly, they expressed concerned about taking on financial risk for medically complex patients and incomplete satisfaction with the model's risk-adjustment strategy. One stakeholder mentioned the concern that a 90-day warranty period would not encompass patients' full episode of recovery. Several stakeholders expressed

concern about the possibility of the new model leading to withholding of important services that would benefit patients.

HI: We are very anxious about how we are going to manage things that are beyond our direct influence like post-acute care. We worry a bit about controlling costs for those patients that leave you to go to subacute rehab.

R5: In the past, there was no financial disincentive to have patients bounce back and be readmitted. We need to make sure that we don't convert from a system that incentivizes overutilization to one that incentivizes withholding care that's needed by the patient—that's the dilemma.

Concerns also varied by stakeholder type: orthopedic surgeons mentioned lack of defined gain-sharing for providers and one provider expressed worry about the potential for legal consequences should the model result in less access for high-risk patients. Post-acute stakeholders expressed concern that the intensified focus on cutting postacute services would lead to underutilizing of those rehabilitation services and would result in worse quality outcomes for patients.

PIO: Some people don't do so well and they're in therapy for a year after they have a knee replacement and they're still not happy. And the major problem is if those people don't receive appropriate post-surgical rehabilitation follow-up, those are the people that I think 1. Don't have as great an outcome and 2. I do believe they are at greater risk for complication.

Care delivery and QI Strategies

The range of stakeholders interviewed were able to consistently describe a similar variety of preoperative, intraoperative, and postoperative care delivery changes for implementing bundled payment schemes.

A) Preoperative phase: cost consciousness, early coordination of care, and patient engagement

In the preoperative phase, several stakeholders emphasized the importance of understanding the anticipated bundle cost prior to taking patients to the operating room; one respondent indicated this would be important not just for determining ways to lower costs to target but also for competing against competitors' costs. Care teams would also need to coordinate a patient's care early by evaluating what the likely clinical course and discharge destination would be for

the patient and medically optimize patients prior to taking them into the operating room for the procedure; some stakeholders suggested that partnering with a geriatrician would be an effective strategy for managing the unique risks of the LEJR patient population. Many stakeholders also recommended developing initiatives that allowed for greater patient education and engagement like pre-operative classes aimed to inform, manage, and keep patient expectations in account.

PII: Have a good sense of what the patient's goals are. When I'm going to do something that has draw-backs, that's one of the first things I do is say "we can do this," but we can't do this without having a very clear sense what we want to accomplish. If I'm doing [a procedure], I say to them "what do you want to do that you can't do right now"?

B) Intraoperative: Implementing Standardization and Improving efficiency

In the intraoperative stage of care, most stakeholders emphasized that establishing efficient care pathways that promote standardization would be critical to lowering costs. These care pathways were described as highly-structured and inclusive of only necessary, evidence-based services. Examples of care pathway components described were more protocol-driven anesthesia use and OR turn-over. Standardization of orthopedic surgeon implant choices was a component that was particularly emphasized as a high-yield strategy for lowering costs.

C) Postoperative: Cost-lowering through more judicious use of post-acute care

The post-operative period was described as the phase with the most cost-lowering potential. Nearly all hospital stakeholders described intentions to decrease hospital length of stay for patients as a means to cut costs. Stakeholders described instituting changes like achieving better post-operative pain management and starting physical therapy early to allow for early ambulation and discharge. Another key post-operative strategy was more selective use of post-acute services. Stakeholders believed that patient discharge home should be made the rule rather than the exception with inpatient rehabilitation and SNF transfer reserved only for those patients who require higher-level care.

H2: We're really thinking about being judicious about who we send to SNF. We want to invest in home health but we also want recognize the point that the patient can actually go outpatient for an ambulatory visit which again is a more cost-effective way of continuing that therapy.

D) Approach to Negotiations with Stakeholders

Stakeholders generally recognized the importance of engaging with other stakeholder across the care continuum and described a sense of urgency toward developing a risk and reward-sharing structure to align all stakeholders. However, they expressed uncertainty with regard to how exactly stakeholder negotiations would look.

R5: Determining how you split the payment across all the different settings is going to be difficult. The upstream providers are going to want to have as much of the bundle payment as possible, but to overcome that, every provider has to be at risk in relation to the outcome of their portion of the care. If don't have everyone's skin in the game, then you're not really going to develop a well-coordinated bundle.

With regard to which stakeholders it would be important to negotiate with, hospital administration stakeholders consistently named providers as a key target for forming agreements. Some stakeholders suggested providers could be motivated by the inherent benefits that bundled payment schemes are projected to produce like greater efficiencies in the operating room and better patient health outcomes and satisfaction measures. Other stakeholders described creating formal external incentives such as bonuses for providers that are meeting cost and quality outcomes. One stakeholder described a potential solution would be for hospitals to employ physicians directly in the future.

H4: Hospitals will have to also begin negotiating with providers... Perhaps that may look like allocating bonuses to providers that are meeting cost and quality outcomes or the potential to earn a percent of the reward for their patients that do well under the model.

P6: There has been a shift in the way that orthopedic surgeons are employed; I think ultimately as we transition from an independent practitioner to an employed model, it will be easier to align physicians than when they are independent stakeholders that aren't necessarily aligned with the system for outcomes. So rather than create an additional stakeholder in the physician, if they are aligned with the system they will change their vision for what's optimal for the patient and what's optimal to the system.

Stakeholders also described a need to collaborate with post-acute providers. Some hospital administrative stakeholders believed that sharing risk with postacute providers would be necessary to ensure commitment to achieving greater efficiency in the postacute phase of the

bundle. Some believed that integrated health care systems held an advantage because they have already established relationships between hospitals and post-acute providers.

Barriers to Implementation

Stakeholders reported that the current fragmented, non-value-driven health care system would make it very difficult to implement care-delivery changes. As noted by one respondent, it may be difficult to implement bundled payment schemes when hospitals are still being paid in a fee-for-service manner. Some stakeholders described the competing demands and distractions that tertiary care hospitals face such as the high volume of clinically diverse and complex patients and frequent hospital bed shortages. The individualized, vertical reporting structure for each stakeholder type (i.e. physicians, nursing, postacute care facility, etc) was described as another barrier to implementation; stakeholders suggested that a new organizational structure where all members of a multidisciplinary team report through a common platform would be necessary.

H2: It's currently not easy for administrators nurses and orthopedic surgeons to come together with members across the continuum to have discussions about how we're doing as a system. That's not easy right now because of how individuals report up through their departments. We need to start looking at how we think about Centers of Excellence models where multidisciplinary staff and multispecialty physicians report through a common structure. This doesn't mean that they lose their individual identity which they need to have unique discipline perspectives. But this structure does mean that there would be more joint accountability collectively in moving ahead with these bundled payments

Stakeholders also anticipated that persuading other stakeholders to make the infrastructure investments necessary to implement bundled payments would be difficult given the uncertainty of rewards and gainsharing agreements. Aligning providers and changing the independent practice culture of providers in particular were emphasized as potentially difficult but critical to achieving success with bundles.

P6: I think there will be challenges with aligning various stakeholders with a value-driven agenda. There has been a shift in the way that orthopedic surgeons are employed; I think ultimately as we transition from an independent practitioner to an employed model, it will be easier to align physicians than when they are independent stakeholders that aren't necessarily aligned with the system for outcomes. So rather than create an additional stakeholder in the

physician, if they are aligned with the system they will change their vision for what's optimal for the patient and what's optimal to the system.

Projections for CCJR Outcomes

Stakeholders expressed tempered optimism toward the outcomes of the CCJR model. Some projected that the model will likely lead to lower costs, greater efficiency, decreased variation in LEJR care practices across the nation, more coordinated care and savings for hospitals. Stakeholders anticipated that patients would experience less fragmented care and would be happy to return to the community setting sooner. The community hospital administration stakeholder expressed optimism that the community hospitals would receive greater recognition as a well-equipped setting for successfully implementing bundled payment schemes. Some stakeholders questioned whether the model would lead to better quality outcomes for patients and expressed concern that more medically complex patients would have lower access to these procedures under bundled payment schemes.

H3: The best thing that can come out of this is improvements in care coordination.

P8: We're ultimately, probably going to do less on patients. We can't get rid of that much money in the system and ultimately maintain the same volume of services. Also, I think in some cases physicians are going to be disincentivized to take care of some patients.

Discussion

To promote good planning for CJR, it is important to both gain lessons from past bundled payment initiatives and current stakeholder recommendations. In this analysis we have synthesized the empirical data available on effective strategies and known outcomes of applying bundled payments to LEJR and interviewed stakeholders from a large health care system on their perceptions of and perceived approach to successfully implementing CJR bundled payment rule with a particular focus on quality improvement strategies. Using both literature and stakeholder interview findings, we sought to understand perceptions on the likelihood that bundled payments will raise value in LEJR healthcare and identify particular successful strategies for initiating bundled payments.

Will LEJR bundled payments be effective?

Consensus within the healthcare field is that bundled payments are the promising alternative payment models with the potential to help curb health care costs and incentivize quality gains within healthcare[3, 7, 8]. Bundled payments have been presumed to have the potential to reduce or eliminate unnecessary services, motivate care coordination across care providers and settings, produce more reliable care by incentivizing creation of evidenced-based clinical care pathways and protocols, and provide a “warranty” for services by holding providers responsible for patient outcomes well into the post-acute phase of treatment[42]. Early evidence came from the 1990s Heart Bypass Center Demonstration, wherein bundled payments were applied to the inpatient care of heart bypass patients. During this demonstration, hospital costs and Medicare spending declined while patient health outcomes and satisfaction improved[43]. However, overall evidence on the efficacy of bundled payment in reaching its presumed cost-lowering, quality-raising goals is sparse and mixed, and the final outcome of the model remain uncertain[35, 44].

The AHRQ review of bundled demonstrations conducted internationally between 1985-2011 found that the financial impacts of bundled payments were highly consistent across the demonstrations examined: transitioning from a fee-for-service to bundled payments was indeed found to be associated with declines in healthcare spending and utilization[13]. However, because the demonstrations included in the systematic review provided only limited quality measures, no conclusions on the effects of bundled payments on healthcare quality could be made[13]. Similar to the AHRQ report, our survey of bundled payment demonstrations carried out from 2012-2016 found that most demonstrations were able to achieve cost savings after instituting bundled payment models. However, demonstrations often described disparate or no quality outcomes, so it was not possible to generalize the potential impact of bundled payment models on quality. For example, some demonstrations reported patient satisfaction as a quality metric, but varied on the specific metric used (i.e. Press Ganey ‘Likelihood to Recommend’ hospital score[36] vs. Hospital Consumer Assessment of Healthcare Providers and Systems survey[34] vs. patient-reported functional assessments [37]). Some demonstrations examined readmission rates at 30 days after discharge[38] while others reported 90-day readmission figures.[36]

Interestingly, these findings echoed interviewed stakeholder beliefs regarding the eventual outcome of LEJR bundled payment models. Overall, stakeholders expressed optimism and confidence that CJR would be an incrementally positive change from the fee-for-service system. Many stakeholders also believed that bundled payment models would be successful in lowering costs. Moreover, stakeholders believed that CJR would instigate practice transformation that would lead to improvements in the care efficiency and coordination. For example, many stakeholders indicated that bundled payments would lead hospitals to develop a care coordination infrastructure (i.e. through creation of a care coordinator role and development of a common electronic medical record) that would allow for better communication across different care settings.

With regard to quality outcomes, some stakeholders expressed optimism while others expressed uncertainty that bundled payments would succeed in achieving substantial improvements. Stakeholders highlighted a few concerns with regard to CJR's potential impact on quality, mainly that CJR could result in limited access to procedures for higher-risk, more medically complex patients. Other unintended consequences associated with bundled episode payments include the presumed risk of incentivizing the shifting of care beyond the postacute period, upcoding of patients as having more severe conditions to receive higher reimbursement amounts when bundles provide the option to risk-stratify cases, and increasing the overall number of cases[42]. Many stakeholders, however, reported that improvements in care coordination would likely result in patients experiencing less disconnects in their care and eliminating inefficiencies in care would lead to patients having the opportunity to return home earlier.

Key Findings on Strategies for Implementing LEJR Bundled Payment Reform

Literature review findings and stakeholder interviews revealed a number of key overall strategies for successfully implementing bundled payments. Prior to initiating LEJR care redesign, hospitals will need to establish a thorough understanding of their costs, service utilization patterns, and patient outcomes. Once an understanding of hospital-specific baselines is achieved, planning should focus on developing highly-structured clinical pathways

to standardize patient care. One widely-mentioned strategy for cost-lowering encompassed within creating evidence-based pathways, was the standardization of orthopedic surgeon implant choices. As hospitals begin to standardize implant choices, they may begin forming contracts with durable medical equipment (DME) stakeholders, potentially leading to competition amongst DME companies.

The post-operative phase was believed to hold the most potential for cost-lowering in our literature and interview findings. Post-acute care is perhaps the most widely-mentioned target for cost-lowering in bundled payment models[45, 46]; it has been shown that providers who have defined postacute care plans are able to achieve greater decreases in cost and utilization relative to providers without defined postacute care pathways[47]. Hospital providers will likely target this phase of care heavily and early in transitioning to bundled payments, reducing hospital length of stay and limiting transfer of patients to high-cost inpatient rehabilitation and skilled nursing facilities.

Key Challenges to Implementation

One of the most commonly cited challenges to implementing LEJR bundled payments was achieving adequate risk adjustment. One demonstration examined in our literature review failed to gain adequate stakeholder participation due to provider reluctance to take on risk[35]. Under the current CJR model, no risk adjustment is made for patient-specific clinical severity beyond hip fracture status[22]. Many stakeholders expressed concern that lack of adequate patient-specific risk adjustment would create a strong disincentive for providers to care for higher-risk, more medically complex patients (i.e. patients with chronic diseases). This concern reflects wider concerns around the potential for bundled payment to lead to “cherry picking” of lower risk, less medically complex patients[48-50]. Moreover, lack of adequate risk adjustment may limit tertiary care hospitals’ ability to compete and succeed in meeting cost targets given that they serve a higher-risk patient population[51]. CMS chose not to implement risk adjustment based on patient age and comorbidities when drafting the final rule for the CJR model, citing absence of a gold-standard risk adjustment model[51].

Beyond risk adjustments, our literature review and stakeholder interviews both suggested that establishing negotiations amongst stakeholders may be another key challenge in implementing

LEJR bundled payments. In several of the demonstrations we examined, break-downs in negotiations with stakeholders, particularly orthopedic providers, were cited as significant obstacles to achieving cooperation with LEJR care reforms. Similarly, hospital stakeholders we interviewed emphasized that aligning other stakeholders with care redesign initiatives would be an important but potentially challenging step in implementing bundled payment reform. Interestingly, however, there was no consensus in either our literature or stakeholder findings on the best type of agreements to form with stakeholders. A number of models for achieving stakeholder alignment exist, including employment, pay for performance, gainsharing, and co-management[52].

Policy Recommendations

Our findings from the stakeholder analysis and literature review yielded some key insights including recommendations to both providers and policy makers on strategies for successful implementation of bundled payments and planning for challenges related to bundled payments models.

Recommendations for Achieving Better Preparedness for Bundled Payments

- Hospitals may currently feel unprepared for payment reform and hesitant about the significant resource investment that will likely be necessary for implementing payment reform. CMS should create a toolkit to help inexperienced or underprepared hospitals begin implementing bundled payment programs.
- Stakeholders are apprehensive to take on risk—national scale-up of bundled payment programs should be conscientious of stakeholders concern and warnings about taking on too much risk, particularly the fear that stakeholders have that medically complex patients may have less access to LEJR procedures due to provider risk-avoidance. CMS should monitor procedure utilization by older and/or medically complex patients to ensure fair access to LEJR services. CMS should consider adopting a risk adjustment tool or system of adjudication so that hospitals can negotiate on readmissions or complications that are not related to the index LEJR surgery. Lastly, hospitals should ensure adoption of a risk stratification tool to optimize medically complex patients for

surgery, plan adequately for services needed beyond the standard clinical pathways, and reduce readmissions.

- Stakeholders will need to make adjustments in the healthcare work force as they implement bundled payment strategies. Hospitals will need to create new roles (i.e. hiring care coordinators tasked with tracking patients throughout the 90-day episode). Hospitals may need to reduce their referral networks to a handful of high-performing facilities. Agreements with select post-acute facilities could be formed that establish postacute facilities' commitment to meeting cost and quality metrics.

Recommendations for Achieving Practice Reform

- Stakeholders will need to change the traditional “vertical’ reporting structure of different providers. Orthopedic surgeons should no longer just report to their individualized departments but should move to team-based reporting (including post-acute providers, nursing, clinical care manager, data analysts etc). The center of excellence or integrated practice unit (IPU) models may be a good paradigm for restructuring reporting structures[9].
- To limit variation in cost, stakeholders will need to adopt standardized care pathways. Orthopedic surgeons should work with other stakeholders to develop evidenced-based LEJR protocols.
- Implementing care coordination infrastructure will result in more streamlined care transitions. Some hospitals nationally have found it useful to adopt a formal structure for improving care coordination healthcare delivery such as the Perioperative Surgical Home[53, 54], which parallels the Patient Centered Medical Home (PCMH) Model. The care coordination efforts mentioned in our literature review and stakeholder interviews align well with the six standards of PCMH Model. Hospitals may find models like the PSH or PCMH useful and efficient frameworks for planning and evaluating care coordination strategies.

Recommendation for Aligning Stakeholders

- Effective negotiation with stakeholders is critical to success: hospitals must align stakeholders by establishing early communication and defining risk and reward-sharing structure. Notably, no clear strategy for pursuing this resonated from our interviews and literature review. Negotiations should provide sufficient incentive to motivate providers to improve efficiency and achieve better health outcomes.

Limitations and Next Steps

Our work is subject to a number of limitations. Our systematic literature search strategy may have failed to capture all published demonstrations of LEJR bundled payment programs. Demonstrations that were captured described voluntary bundled payment programs and may not be representative of hospitals that are tasked with initiating a mandatory bundled program. For example, hospitals that participated in CMS's BPCI were largely urban, non-profit, high-volume, and reported having experience in care redesign or payment incentive initiatives[41]. Similarly, findings from our small sample of stakeholders interviewed may not be generalizable to providers in other settings. Additionally, stakeholder interview participants who agreed to participate may have had a particular interest in this topic that is not shared by providers in other settings.

Future work will need to focus on evaluating the impact of bundled payment models on quality. Our examination of the literature was not able to come to a conclusion regarding the potential for achieving better quality metrics under bundled payment models due to the limited availability of data in our examined demonstrations. Our findings did not elucidate some of the other commonly reported limitations of bundled payments; including the upcoding of patients if risk is not addressed sufficiently and shifting care beyond the post-acute period.

Our examination of strategies for implementation of bundled payments focused on a single clinical condition, lower extremity joint replacement. CJR is a unique bundled payment program due to its compulsory nature. However, the future of bundled payment programs will likely not only be limited to joint replacement. Bundled payments have already been applied to other clinical conditions[55], particularly conditions that are high-cost, occur at a

high volume, and have a readily definable and predictable clinical course for most patients. Physicians of all specialties will need to begin thinking about how bundled payment programs will be applied to their clinical practice.

Summary

- Demonstrations of bundled payments for LEJR largely report success in achieving lower utilization and cost outcomes; however, quality outcomes were inconclusive based on the limited and variable metrics described in published demonstrations.
- The key strategies for implementing bundled payments for LEJR include developing highly-structured clinical pathways to standardize patient care, standardization of orthopedic implant choices, developing a care coordination infrastructure to track patients across the clinical episode, and limiting use of high-cost inpatient rehabilitation and skilled nursing facilities.
- Hospitals may face challenges in tackling the administrative burden of initiating LEJR bundled payment programs, aligning stakeholders to care redesign strategies, and taking on risk for medically-complex patients.

References

1. HCUP Nationwide Inpatient Sample (NIS): Healthcare Cost and Utilization Project (HCUP). 2011, Agency for Healthcare Research and Quality: Rockville, MD.
2. Cram, P., et al., *Total knee arthroplasty volume, utilization, and outcomes among Medicare beneficiaries, 1991-2010*. JAMA, 2012. **308**(12): p. 1227-36.
3. Shoen, C., et al., *Confronting costs: stabilizing U.S. health spending while moving toward a high performance health care system*. 2013, Commonwealth Fund Commission on a High Performance Health System.
4. Rosenthal, M.B., *Beyond pay for performance--emerging models of provider-payment reform*. N Engl J Med, 2008. **359**(12): p. 1197-200.
5. Shaw, F.E., et al., *The Patient Protection and Affordable Care Act: opportunities for prevention and public health*. Lancet, 2014. **384**(9937): p. 75-82.
6. Clough, J.D., B.D. Richman, and S.W. Glickman, *Outlook for Alternative Payment Models in Fee-for-Service Medicare*. JAMA, 2015. **314**(4): p. 341-2.
7. Tsai, T.C., et al., *Medicare's Bundled Payment initiative: most hospitals are focused on a few high-volume conditions*. Health Aff (Millwood), 2015. **34**(3): p. 371-80.
8. Mechanic, R.E. and S.H. Altman, *Payment reform options: episode payment is a good place to start*. Health Aff (Millwood), 2009. **28**(2): p. w262-71.
9. Porter, M.E. and R.S. Kaplan, *How to Pay for Health Care*. Harv Bus Rev, 2016. **94**(7-8): p. 88-98, 100, 134.
10. Shih, T., L.M. Chen, and B.K. Nallamothu, *Will Bundled Payments Change Health Care? Examining the Evidence Thus Far in Cardiovascular Care*. Circulation, 2015. **131**(24): p. 2151-8.
11. *Bundled Payment for Care Improvement (BPCI) Initiative: General Information*. 2016; CMS Website]. Available from: <https://innovation.cms.gov/initiatives/bundled-payments/>.
12. Matchar, D.B., H.V. Nguyen, and Y. Tian, *Bundled Payment and Care of Acute Stroke: What Does it Take to Make it Work?* Stroke, 2015. **46**(5): p. 1414-21.
13. Hussey, P.S., et al., *Closing the quality gap: revisiting the state of the science (vol. 1: bundled payment: effects on health care spending and quality)*. Evid Rep Technol Assess (Full Rep), 2012(208.1): p. 1-155.
14. Deblanco, S., *The payment reform landscape: bundled payment*. 2014, Health Affairs Blog.
15. Kurtz, S., et al., *Prevalence of primary and revision total hip and knee arthroplasty in the United States from 1990 through 2002*. J Bone Joint Surg Am, 2005. **87**(7): p. 1487-97.
16. Derman, P.B., P.D. Fabricant, and G. David, *The Role of Overweight and Obesity in Relation to the More Rapid Growth of Total Knee Arthroplasty Volume Compared with Total Hip Arthroplasty Volume*. J Bone Joint Surg Am, 2014. **96**(11): p. 922-928.
17. Belatti, D.A., et al., *Total joint arthroplasty: trends in medicare reimbursement and implant prices*. J Arthroplasty, 2014. **29**(8): p. 1539-44.
18. Kurtz, S., et al., *Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030*. J Bone Joint Surg Am, 2007. **89**(4): p. 780-5.

19. *The Health of America Report: A study of cost variations for knee and hip replacement surgeries in the U.S.* 2015, Blue Cross Blue Shield Association.
20. Sood, N., et al., *Medicare's bundled payment pilot for acute and postacute care: analysis and recommendations on where to begin.* Health Aff (Millwood), 2011. **30**(9): p. 1708-17.
21. Froimson, M.I., et al., *Bundled payments for care improvement initiative: the next evolution of payment formulations: AAHKS Bundled Payment Task Force.* J Arthroplasty, 2013. **28**(8 Suppl): p. 157-65.
22. *Medicare Program; Comprehensive Care for Joint Replacement Payment Model for Acute Care Hospitals Furnishing Lower Extremity Joint Replacement Services. Final Rule.*, H. Centers for Medicare and Medicaid Services (CMS), Editor. 2015, Federal Register. p. 73273-554.
23. Bolz, N.J. and R. Iorio, *Bundled Payments: Our Experience at an Academic Medical Center.* J Arthroplasty, 2016. **31**(5): p. 932-5.
24. Miller, H., *Bundling badly: the problems with Medicare's proposal for comprehensive care for joint replacement.* 2015, Center for Healthcare Quality and Payment Reform: Pittsburgh.
25. S, D. and F. de Brantes, *The Payment Reform Landscape: Why Medicare's Hip and Knee Replacement Payment Model May not Be the Answer For Other Payers and Purchasers.* 2015, Health Affairs Blog.
26. Gale, N.K., et al., *Using the framework method for the analysis of qualitative data in multi-disciplinary health research.* BMC Med Res Methodol, 2013. **13**: p. 117.
27. Iorio, R., *Strategies and tactics for successful implementation of bundled payments: bundled payment for care improvement at a large, urban, academic medical center.* J Arthroplasty, 2015. **30**(3): p. 349-50.
28. Iorio, R., et al., *Early Results of Medicare's Bundled Payment Initiative for a 90-Day Total Joint Arthroplasty Episode of Care.* J Arthroplasty, 2016. **31**(2): p. 343-50.
29. Clair, A.J., et al., *Cost Analysis of Total Joint Arthroplasty Readmissions in a Bundled Payment Care Improvement Initiative.* J Arthroplasty, 2016. **31**(9): p. 1862-5.
30. Dundon, J.M., et al., *Improvement in Total Joint Replacement Quality Metrics: Year One Versus Year Three of the Bundled Payments for Care Improvement Initiative.* J Bone Joint Surg Am, 2016. **98**(23): p. 1949-1953.
31. Iorio, R., et al., *Single Institution Early Experience with the Bundled Payments for Care Improvement Initiative.* J Bone Joint Surg Am, 2017. **99**(1): p. e2.
32. Jubelt, L.E., et al., *Changes in Discharge Location and Readmission Rates Under Medicare Bundled Payment.* JAMA Intern Med, 2016. **176**(1): p. 115-7.
33. Whitcomb, W.F., et al., *Experience with Designing and Implementing a Bundled Payment Program for Total Hip Replacement.* Jt Comm J Qual Patient Saf, 2015. **41**(9): p. 406-13.
34. Doran, J.P. and S.J. Zabinski, *Bundled payment initiatives for Medicare and non-Medicare total joint arthroplasty patients at a community hospital: bundles in the real world.* J Arthroplasty, 2015. **30**(3): p. 353-5.
35. Ridgely, M.S., et al., *Bundled payment fails to gain a foothold In California: the experience of the IHA bundled payment demonstration.* Health Aff (Millwood), 2014. **33**(8): p. 1345-52.

36. Froemke, C.C., et al., *Standardizing Care and Improving Quality under a Bundled Payment Initiative for Total Joint Arthroplasty*. J Arthroplasty, 2015. **30**(10): p. 1676-82.
37. Dummit, L.A., et al., *Association Between Hospital Participation in a Medicare Bundled Payment Initiative and Payments and Quality Outcomes for Lower Extremity Joint Replacement Episodes*. JAMA, 2016. **316**(12): p. 1267-78.
38. Navathe, A.S., et al., *Cost of Joint Replacement Using Bundled Payment Models*. JAMA Intern Med, 2017.
39. Kivlahan, C., et al., *Taking Risk: Early Results From Teaching Hospitals' Participation in the Center for Medicare and Medicaid Innovation Bundled Payments for Care Improvement Initiative*. Acad Med, 2016. **91**(7): p. 936-42.
40. Dummit L, Marrufo G, M.J., Bradley A, Smith L, Hall C, et al., *CMS bundled payments for care improvement (BPCI) initiative models 2–4: year 1 evaluation and monitoring annual report*. 2015, The Lewin Group: Falls Church, VA.
41. Dummit L, M.G., Marshall J, Tan E, Bradley A, Hall C, Lee Y, Kelly J, Hyland M, Cherry R, Melin C, et al., *CMS Bundled Payments for Care Improvement Initiative Models 2-4: Year 2 Evaluation & Monitoring Annual Report*. 2016, The Lewin Group: Falls Church, VA.
42. *Analysis of Bundled Payment*. 2010, Rand Corporation.
43. *Medicare participating heart bypass center demonstration*. 1998, Centers for Medicare and Medicaid Services: Baltimore, MD.
44. Bertko, J. and R. Effros, *Increase the use of bundled payment approaches*. 1998, The Rand Corporation.
45. Chandra, A., M.A. Dalton, and J. Holmes, *Large increases in spending on postacute care in Medicare point to the potential for cost savings in these settings*. Health Aff (Millwood), 2013. **32**(5): p. 864-72.
46. Slover, J.D., *You Want a Successful Bundle: What About Post-discharge Care?* J Arthroplasty, 2016. **31**(5): p. 936-7.
47. Tessier, J.E., et al., *Physicians With Defined Clear Care Pathways Have Better Discharge Disposition and Lower Cost*. J Arthroplasty, 2016.
48. Clement, R.C., et al., *Risk Adjustment for Medicare Total Knee Arthroplasty Bundled Payments*. Orthopedics, 2016. **39**(5): p. e911-6.
49. Rozell, J.C., et al., *Should All Patients Be Included in Alternative Payment Models for Primary Total Hip Arthroplasty and Total Knee Arthroplasty?* J Arthroplasty, 2016. **31**(9 Suppl): p. 45-9.
50. Weeks, W.B., et al., *The unintended consequences of bundled payments*. Ann Intern Med, 2013. **158**(1): p. 62-4.
51. Ellimoottil, C., et al., *Medicare's New Bundled Payment For Joint Replacement May Penalize Hospitals That Treat Medically Complex Patients*. Health Aff (Millwood), 2016. **35**(9): p. 1651-7.
52. Bushnell, B.D., *Physician-Hospital Alignment in Orthopedic Surgery*. Orthopedics, 2015. **38**(9): p. e806-12.
53. Raphael, D.R., et al., *Total joint Perioperative Surgical Home: an observational financial review*. Perioper Med (Lond), 2014. **3**: p. 6.

54. Kash, B.A., et al., *The perioperative surgical home (PSH): a comprehensive review of US and non-US studies shows predominantly positive quality and cost outcomes*. *Milbank Q*, 2014. **92**(4): p. 796-821.
55. CMS, *Notice of proposed rulemaking for bundled payment models for high-quality, coordinated cardiac and hip fracture care*. 2016.
56. Dummit L, M.G., Marshall J, Tan E, Bradley A, Hall C, Lee Y, Kelly J, Hyland M, Cherry R, Melin C, et al., *CMS Bundled Payments for Care Improvement Initiative Models 2-4: Year 2 Evaluation & Monitoring Annual Report*. 2016, The Lewin Group: Falls Church, VA.

Table I. Summary of LEJR Bundled Payment Demonstrations

The NYU Langone BPCI Model 2 Demonstration[23, 27-31, 40, 56]	
Bundle Demonstration Description	In January 2013, NYU Langone Medical Center (an urban, academic, tertiary hospital) implemented BPCI Model 2 for LEJR, cardiac valve replacement, and spinal fusion. The LEJR demonstration defined episodes to include services provided 72 hours before hospital admission in addition to the inpatient stay and the 90-day post-discharge period.
Implementation Strategies Pursued	<p>The hospital created a care coordination infrastructure which included clinical coordinators and an electronic dashboard to track patient progress through the clinical episode and facilitate communication among caregivers. The program developed evidence-based, streamlined clinical pathways through multidisciplinary collaboration. The hospital aimed to apply the pathways to 90% of patients; patient criteria was used to identify patients who would require services beyond these services[23]. In the pre-operative stage of care, the hospital restructured scheduling to minimize cancellations, reduced inefficient laboratory testing and outside medical clearance. Used Perioperative Orthopaedic Surgery Home (POSH) model for patient preoperative risk stratification and modification.</p> <p>Intraoperatively, they reduced operating time, improved multimodal pain management, and reduced implant costs. Postoperative initiatives included optimizing pain management, reducing inefficient blood product utilization, limiting urinary catheter use, promoting evidence-based and lower-cost venous thromboembolism (VTE) prevention strategies, and discharging patients on post-operative days 2-3 if possible. They prioritized discharge home whenever possible and minimized rehabilitation length of stay. They put guidelines in place to manage minor outpatient complications, and care coordinators and safeguarded protocol adherence by encouraging patients to return to the surgeon's office rather than presenting to the ED or an out-of-episode provider. Individual physician quality and performance metrics were tracked and reports were sent biweekly to physicians. Physician gainsharing agreements were created to provide potential reimbursements based on quality, cost-effectiveness, and volume.</p>
Effectiveness in Reducing Costs and Utilization	<p>A total of 721 patients were integrated into BPCI initiative in the first year of eligibility[23]. Based on findings from the first and second quarter of the demonstration, the institution reported that the pilot successfully achieved 8.1% and 17% savings for complicated LEJR cases and uncomplicated LEJR cases respectively. However, this figure did not include the institution's implementation costs. Besides reducing costs to Medicare, the model also resulted in lower OR time, ICU and consultant physician utilization.</p> <p>Discharge to inpatient facilities decreased from 67% to 33%; discharge to self-care increased from 3% to 11%; discharge to home with health care assistance increased from 33% to 67%.</p>
Effectiveness in Quality	Ninety-day readmission rates were 14% in year preceding start and 12% during first year but fell to 8% in the last years of implementation.

Baystate Health Demonstration[33]	
Bundle Demonstration Description	In 2011, an integrated health care delivery system initiated a bundled payment program with an independent group of orthopedic surgeons. Bundles were not defined by a discrete time period, but rather by specific components (beginning with the initial preoperative visit and concluding with the last of three scheduled post-operative office visits). Additionally, providers did not bear any financial risk if costs were higher than projected.
Implementation Strategies Pursued	Care redesign strategies pursued included early discharge, scheduling surgery earlier in the week and early in the day, creating compacts with patients to encourage adherence, and providing extra home physical therapy services to patients discharged directly home.
Effectiveness in Reducing Costs and Utilization	Costs per case decreased from \$26,412 to \$22,567. However, it should be noted that bundled payments did not include non-orthopedic physician fees and DME costs. This demonstration resulted in a modest decrease in hospital stay from 3.4 days to 3 days.
Effectiveness in Quality	There were no readmissions at 30 days, cases of mortality, surgical site infections, UTIs or anesthesia complications.
Horizons Health Care of New Jersey[34]	
Bundle Demonstration Description	In this pilot, a small, non-teaching orthopedic practice implemented bundled payments for both Medicare and non-Medicare patients aged 18 years and older. Bundles were defined as including the 30 days prior to procedure, the index procedure, and 90 days post-operative period.
Implementation Strategies Pursued	A number of care redesign strategies were implemented, including pre-operative patient education and physical therapy sessions and medical comorbidity optimization; improvement in pain control, early ambulation, lowering transfusion rates, standardizing implant choices, and eliminating unnecessary medical devices in the peri-operative phase of care; and early discharge with goal of discharge to home in the post-operative phase of care.
Effectiveness in Reducing Costs and Utilization	With regard to costs, the study reported a total savings of more than \$524,000 over the pilot period which averaged to approximately \$2,262 in savings per patient. Hospital length of stay decreased from 3.3 days to 1.9 days for TKA and from 2.9 days to 1.8 days for THA. A greater proportion of patients were discharged directly home: discharge to rehab decreased from 66.3% to 33.17% when comparing prior years to the pilot period. Interestingly, the pilot noted that there was a significant rise in procedure volume over the pilot period with TKA rising from 204 cases annually to 357 cases annually and THA procedures rising from 104 cases to 202 cases annually.
Effectiveness in Quality	Readmissions declined with the pilot reporting a 3.2% to 2.7% drop in 30-day readmission rates. While infection and major wound complications were reported to have remained stable; it was noted that inpatient complications increased from 6.4% to 8.6%. The study authors attributed this rise in complications to an increase in hospital coding.
California Integrated Health Association's Bundled Episode and Payment Gainsharing Demonstration[35]	

Bundle Demonstration Description	In 2010, Integrated Health Association’s (IHA) Bundled Episode and Payment and Gainsharing Demonstration implemented a bundled payment scheme for orthopedic procedures sought by commercially insured patients under the age of 65 in California. In this demonstration, bundles were defined as including facility, professional, and medical implant device charges for the index inpatient stay and a 90-day post-surgical warranty for readmissions. The definition excluded post-acute care due to provider reluctance to accept financial risk of services provided during this phase of treatment.
Implementation Strategies Pursued	Negotiation on bundle definition amongst IHA pilot participants was slow and achieving consensus was challenging; health plans sought broad definitions that captured many services whereas providers were reluctant to accept financial risk for post-acute services and non-risk adjusted payment rates. Following these difficult negotiations, half of the health plans and six of the initial participating hospitals dropped out of the pilot. The demonstration captured only a total of 35 cases over the pilot period. This low volume of procedures did not allow for the use of quantitative methods to assess the effect of the bundle on cost and quality outcomes. Interviews with multiple health plan and provider representatives affiliated with the pilot revealed that the pilot failed due to a number of barriers. One of the key barriers identified was the low volume of cases captured in the study. Low volume was ultimately attributed to having too narrow bundle definition and pilot participant dropout. The resulting low volume of cases limited the ability to spread the implementation costs of care redesign and did not provide sufficient motivation to change clinical practice patterns. Other barriers to successful implementation faced by the IHA pilot included lack of trust and competing interests between stakeholders, lack of technical infrastructure for processing claims, and significant delays due to state regulatory decisions.
Effectiveness in Reducing Costs and Utilization	No outcomes reported
Effectiveness in Quality	No outcomes reported
Providence Health and Services Demonstration[36]	
Bundle Demonstration Description	To high-volume hospitals initiated a bundled payment pilot for all LEJR patients (both privately-insured and Medicare-insured patients). Episodes were defined as all clinically related treatments used 30 days preoperatively to 90 days post-discharge. Payment arrangements included a set price negotiated between the hospital and the payer (either commercial insurance or Medicare depending on patient’s insurance status).
Implementation Strategies Pursued	Prior to bundle initiation, analysts looked at direct costs to examine baseline and variation. They then discussed variation in clinician practice with providers and worked with providers to develop standardized care pathways. These pathways changed practice in use of laboratory tests, pharmacotherapies, implants, and physical therapy. Authors reported that physician engagement was challenging to maintain over time when the gainshare model was perceived by some physicians to have failed to fairly

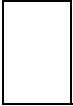
	distribute the savings. Experienced significant problems around the perceived transparency of data due to significant time lag in data availability and communication of gainshare outcome to physicians.
Effectiveness in Reducing Costs and Utilization	Data are based on 317 patients who took part in the pilot. Authors reported 67% of cases were at or under the target for total allowed claims. There were also \$256,800 in total savings. There was an 18% reduction in average LOS, more home self-care discharge, decreased home health care discharge, and decreased SNF discharge.
Effectiveness in Quality	The Press Ganey ‘Likelihood to Recommend’ hospital score, a measure of patient satisfaction, was on average higher for the bundle pilot cohort than the national average (95.5% vs. 89% respectively). Nearly all (98%) patients met Surgical Care Improvement Pilot (SCIP) compliance audits measures. There were no cases of mortality; there were 5 readmissions. Patient reported functional outcomes improved at 3-months post-op. Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index scores improved from a score of 50% pre-operatively to a score of 85% at 3-month follow-up.
Baptist Health System Demonstration[38]	
Bundle Demonstration Description	An integrated health system comprised of 5 hospitals participated in the ACE Model from June 2009 to June 2012 and BPCI Model 2 from October 2013- June 2015. The ACE Model demonstration bundled physician professional fees and hospital facility fees for LEJR procedures. The BPCI Model bundled the index hospitalization and 30 days of services post-discharge.
Implementation Strategies Pursued	The health system formed gainsharing agreements with surgeons: reviewed medical evidence, identified clinically equivalent implants, determined a lower target price for implants, and formed contracts with manufacturers that met that price. An online process for manufacturers to bid against each other was also created. In this way, the health system was able to reduce implant cost but retained surgeon choice. The health system also organized cost, spending, usage, and quality data into transparent reports; and explicitly articulated performance targets. In implementing bundles, a working group consisting of 4 orthopedic surgeons, a physiatrist, a hospitalist, and hospital executives was created.
Effectiveness in Reducing Costs and Utilization	Based on 3942 joint replacement episodes. Episode payments for non-complicated procedures declined by 20.8% (\$26785 in 2008 to \$21208 in 2015). Decreases in Medicare payments were not found to be statistically significant in ACE period but were statistically significant in the BPCI period. Episode payments for complicated procedures declined 13.8% from \$38537 in 2008 to \$33216 in 2015 (not statistically significant for either ACE or BPCI). For BPCI: the majority of savings 78.4% (\$2443 per case) came from postacute care and 21.7% (\$675 per case) of cost reductions came from inpatient hospital costs. For ACE: 80.5% of savings came from reduction in implant costs. IRF spending declined 54% from \$2601 to \$1185, and average SNF spending decreased by 24.3% from \$2476 to \$1875; there was

	a 9% increase in home health care spending per episode from \$2045 to \$2233.
Effectiveness in Quality	Readmissions rates were reported to have dropped from 6.4% to 5% while ED visits were found to have decreased from 7.4% to 6.5%; however, these decreases in readmission and ED visits were not found to be statistically significant.
AAMC Bundled Payment for Care Improvement Teaching Hospitals[39]	
Bundle Demonstration Description	Nineteen AAMC-affiliated teaching hospitals chose to create episodes around major joint replacement. Hospitals participated in BPCI Model 2.
Implementation Strategies Pursued	Cohort hospitals developed teams accountable for execution of the bundle. These teams varied considerably in their composition. Highly engaged teams that used data-driven interventions had a variety of interdisciplinary roles on the team (i.e. physician champions, dedicated data analysts, a clinical care manager, and legal counsel). Teams that were less familiar with the data and had more limited awareness of their clinical and financial results had frequent staff turnover or inadequate staff resources as a result of budget constraints or competing organizational priorities. Those programs that were reported to have been successful were described to have implemented risk-driven care management plans, partnerships with post-acute providers, data transparency among providers, standardized protocols to reduce variation, and active clinician involvement in bundle implementation teams.
Effectiveness in Reducing Costs and Utilization	Based on one year of financial results, hospitals that bundled LEJR conditions experienced Medicare savings. One hospital was able to reduce average episode payment for rehab from \$5000-\$8000 during 2009-2012 to \$1000 in 2014 by reducing discharge of patients to inpatient rehab. The hospital experienced average savings of \$4200 per episode in 2014. Some hospitals had already made past investments in quality and care coordination, achieving a high level of efficiency. Since BPCI target prices were derived from each provider's baseline period, these providers struggled to lower their already low costs. One such high-volume hospital only produced savings of less than 0.5% of its target price.
Effectiveness in Quality	Some hospitals that experienced increases in the number of hip fractures they treated met challenges in generating savings. One hospital's fracture rate increased by almost 10% for two quarters in 2014 and subsequently saw a dramatic drop in savings.
CMS National Bundled Payment for Care Improvement Data[37]	
Bundle Demonstration Description	From October 2013 to June 2015, 184 hospitals chose to adopt the BPCI Model 2 for LEJR procedures: 158 hospitals chose episodes that extended for 90 days post discharge, 1 hospital chose 60-day episodes, 25 hospitals chose 30-day episodes.
Implementation Strategies Pursued	BPCI Model 2 Participants were asked if they participated in 5 major types of care redesign: redesign of care pathways (standardized medication use,

	<p>implants and devices, patient discharge, pain management and follow-up protocols); enhancement of care delivery; patient activation, engagement, and risk management(i.e. developing patient education programs and setting expectations for post-surgical care, devising risk-stratification methods); care coordination(designated care navigators responsible for tracking patient progress throughout episode of care, implemented new IT systems that facilitated communication and data sharing,); and system changes to support care. The majority of BPCI participants reported engaging in all 5 strategies: 95% engaged in redesign of care pathways, 92% enhanced care delivery, 94% enhanced patient activation, engagement, and risk management; 94% developed care coordination strategies, and 81% instituted system changes to support care. Cost-reduction strategies focused on standardizing implant choices, limiting unnecessary use of post-acute care, and avoiding readmissions. In order to achieve cooperation from post-acute care providers, hospitals formed gainsharing agreements or promised sufficient volume of patients for referral. Some hospitals also developed a “preferred provider” list of high-quality PAC facilities. Patients received this list to inform their choice of post-acute care.</p>
<p>Effectiveness in Reducing Costs and Utilization</p>	<p>Payments for episodes lowered from \$30551 in baseline period to \$27265 in intervention period. For non-BPCI comparison episodes, there was also a decline in payments from \$30057 in baseline to \$27938 in intervention period. There was a statistically significant greater decline in costs for BPCI episodes vs. comparison episodes. SNF payments declined \$546 more and IRF costs declined by \$445 for BPCI episodes vs comparison population. There was a drop in institutional PAC (IRF, LTAC, SNF) use from 63.7% of patients to 53.2%. Hospital LOS declined 0.1 day more for BPCI population vs non-BPCI population.</p>
<p>Effectiveness in Quality</p>	<p>There was no statistically significant difference in 90-day unplanned readmissions, unplanned readmissions, ED visits, and postdischarge mortality between BPCI population and comparison population. In surveys of patients: 65% of BPCI patients indicated improved ability to walk without resting vs. 60% of non-BPCI LEJR patients and 64.8% of BPCI patients reported improved walking up and down stairs vs. 58% of non-BPCI patients. BPCI patients were also more likely to report improvement in pain and physical and emotional problems that limited social activities.</p>

Table 2. Summary of commonly pursued LEJR bundled payment implementation strategies.

	Strategies	Example Initiatives
Policy-Level Changes	Evidence-Based Pathways	Develop pre-operative, intraoperative, postoperative protocols based on evidence-based practices; standardized order-set
	Risk Assessment and Care Planning	Risk-stratify patients; use risk assessment to plan patient course (i.e. necessary preoperative testing and management, discharge destination)
	Coordinating Human Resources	Designate role for care coordinator; educate and communicate with postacute providers; adopt interdisciplinary and goal-oriented team activities (i.e. team rounds); establish partnerships with stakeholders (i.e. meet with providers and postacute stakeholders to review cost and quality data and form agreements on quality and efficiency metrics)
	Electronic Communication Infrastructure	Electronic platform for documenting all patient data and notes, tracking patient course, and communicating with providers across the care continuum
Provider-Level Changes	Preoperative	
	Efficient procedure scheduling	Minimize cancellations; schedule procedure earlier in the day
	Streamline pre-operative testing	Eliminate unnecessary laboratory testing, standardize medical clearance
	Patient education	Communicate anticipated operative course and discharge plan with patients; provide instruction on necessary preoperative preparation
	Risk Factor Modification	Manage chronic and co-morbidities; identify and address barriers to discharge; pre-operative PT
	Intraoperative	
	Optimize pain management	Adopt multimodal pain-management techniques, local blocks that allow for ambulation
	Efficient Prophylactic Practices	Eliminate unnecessary blood transfusions, adopt lower cost evidence-based VTE and perioperative antibiotics, limit catheter use, standardize wound management,
	Standardize Implants	Standardize provider implant choices to lower-cost options
	Postoperative	
	Early Discharge	Aim to discharge patients on second postoperative day; early ambulation and physical therapy
	Eliminate unnecessary use of postacute services	Prioritize discharge home when appropriate; limit SNF and rehab stay and transition to home health whenever possible
Post-discharge patient tracking	Follow-up calls with patients after discharge; implement guidelines for outpatient	



management of complications; care coordinators
track and triage post-discharge issues and
questions

Figure I. Summary Lower Extremity Joint Replacement Care Pathway

