Case Study

The PEBTF Total Joint Bundled Payment Pilot: A Best Practices Summary

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The authors thank Kate Farley, executive director of the Pennsylvania Employees Benefit Trust Fund, and Dr. Jack Frankeny, CEO and executive director at the Orthopedic Institute of Pennsylvania, for their roles in the pilot and their input as this case study was prepared.

Introduction

As an insurer for 74,000 Pennsylvania public employees and 64,000 retirees (as well as for some dependents), the Pennsylvania Employees Benefit Trust Fund (PEBTF) wanted to know whether moving away from standard fee-for-service network arrangements to value-based payment could improve health care affordability and quality. They chose to test a bundled payment model specifically, and narrowed their focus to total knee replacements and total hip replacements (TKR/THR) for pilot implementation in 2015.

Bundled payments are about far more than just packaging health care payments together. The care provided to a patient is budgeted and quality-measured as a full **episode of care**: the entire continuum of treatment for a medical need, not as piecemeal, disconnected services. Budgets for each episode are formulated, and a clinician's or facility's payment for the full episode of care is tied to quality and affordability outcomes. This is the model PEBTF chose, and they worked with the Health Care Incentives Improvement Institute® (HCI^3) to design and implement the precise elements of the program, including the use of HCI^3's PROMETHEUS Analytics© program to create episode budgets and evaluate quality data.

HCI3®

Sixty-nine patients took part in PEBTF's yearlong pilot and the experience yielded meaningful lessons, described in detail throughout this case study. Under the bundled payment program:

- The hospital facility and orthopedic practice involved instituted a robust and highly collaborative program of care improvement
- Patients' own evaluations of their care were largely positive
- Costs outside of inpatient stays went down an average of $4,189

This paper will discuss the methods involved, program results and PEBTF conclusions, with an emphasis on the rather dramatic care process improvements achieved by the participating facility and the Orthopedic Institute of Pennsylvania, and their potential implications for value-based payment going forward.

Background

In preparation for the pilot, PEBTF collaborated with a major hospital facility in Harrisburg to organize a targeted one-year, team-oriented pilot effort to improve utilization, quality, patient satisfaction and financial outcomes for joint replacements. That facility brought the Orthopedic Institute of Pennsylvania (OIP) into the discussion to serve as the physician component of the pilot.

The pilot did not include benefits changes or incentives to drive patients into the pilot program (patient steerage), and was subject to PEBTF review following the 2015 pilot year. Most bundled payment arrangements are laid out in contracts covering quality measures and related cost savings. This pilot didn't subject the parties on the delivery side to any downside risk (i.e., did not make them financially responsible for losses), so the project was arranged in an informal, handshake agreement. The parties worked together in good faith to implement and learn from the pilot.

Section 1: Bundled Payment Definition and Budgeting Parameters

HISTORICAL DATA ANALYSIS: In December 2014, HCI[3] ran three years of historical PEBTF claims data through the PROMETHEUS Analytics© software to develop a predictive model for the costs associated with TKR/THR episodes. The data runs leveraged both the regional costs of members covered by PEBTF plans and the health data of PEBTF members. Because a large amount of claims data was available through PEBTF, the entire model was generated exclusively using the PEBTF data; there was no need to supplement using any national claims databases.

The HCI[3] TKR/THR episode definitions contain episodes for initial total knee and total hip replacement procedures as well as revision procedures. Each procedure performed triggered its own episode; procedures could also be performed in either an inpatient or outpatient setting. Episode budgets for PEBTF members consisted of three separate calculations: predicted inpatient cost, predicted other cost, and expected complications using coefficients from logistic regression modeling. These included the base average costs, risk profiles and scores for each patient (based on historical risk factors).

In creating customized budgets per patient, these factors were used to calculate a patient's risk of complications and the expected costs of those complications:

- *Patient demographics:* Age, gender, and an indicator of whether a member has enrolled within the previous 6 months. This latter risk factor is intended to account for the patient's lack of claims history, which limits the number of potential comorbidities that can be identified in advance for the patient.

- *Comorbidities:* These are conditions or events that occurred prior to the start of the episode that can have a potential impact on the patient's risk of having a Potentially Avoidable Complication, and on the volume of expected typical services.

- *Episode Subtypes or Severity Markers:* These are markers that distinguish an episode as being more severe than another. They indicate either specific patient comorbidities that are known to make the procedure or condition more difficult to treat (e.g., obesity), or severity of the illness itself (e.g., hypertensive heart disease, renovascular and other secondary hypertension).

EPISODE TRIGGERS: Inpatient, outpatient or professional claims containing procedure codes for TKR/THR as well as a qualifying diagnosis code (see Tables A and B for trigger codes) were the "triggers" that would initiate a TKR/THR episode. PEBTF supplied the claims data to HCI[3] through a secure portal. Moreover, episode subtypes were used to define different types of joint replacements based on the procedure(s) performed as well as the underlying reason for the joint replacement, indicating the severity of the procedure. These subtypes helped to identify expected cost variation and were used to help severity adjust the expected costs or budgets for each patient. For a complete list of TKR/THR subtype groups, see Table C.

EPISODE DURATION: Episodes began 30 days prior to the procedure and ended 90 days postprocedure (or 90 days postdischarge if the procedure was performed in an inpatient setting). If a second TKR or THR procedure was performed during the 90-day look-forward window, the first episode ended the day before the second procedure was performed, and the second episode began with the date of the procedure, running through the full 90-day window post procedure. If a second TKR or THR procedure was performed within 30 days after the completion of the 90-day look-forward window of the first episode, the second episode look back window shortened to start the day after the first episode ended.

RELEVANT SERVICES: Services and costs associated with a TKR/THR procedure were grouped together to include:

- The inpatient stay that triggered the episode or the outpatient visit during which the procedure was performed
- The preoperative diagnostic work-up leading to the surgery
- Postdischarge and follow-up care

As part of the knee/hip replacement and revision episodes, HCI[3] evaluated services that are both typical or routine and considered part of expected care for TKR/THR procedures (e.g., imaging, anesthesia, rehabilitation services) and those that were related to complications associated with TKR/THR procedures (e.g. deep-vein thrombosis, infections). Acute myocardial infarction, stroke and pneumonia, which triggered their own episodes, are also associated back to the TKR/THR episodes as complications to assure that these conditions and their treatments are included as part of the complete TKR/THR episodes.

BUDGET CREATION, RECONCILIATION AND REPORTING: HCI[3] checked the PEBTF portal weekly to retrieve information provided by OIP, which included:

- Any new eligible patients
- Risk profiles/scores for those patients
- Subtypes noted

With that information and the previously calculated coefficients from the regression models, HCI[3] calculated a unique budget for each patient. Budgets were then uploaded back to the portal for PEBTF, OIP and staff at the participating facility to retrieve (this has relevance to how OIP surgeons managed each patient, discussed below).

PEBTF sent full claims data each quarter for each eligible member, and HCI[3] ran the data through the PROMETHEUS Analytics program to aggregate the costs for each triggered episode. HCI[3] generated reports showing the actual spending on each episode triggered, compared to the budgets calculated in advance.

The reports also showed quality scores to be shared with PEBTF, OIP and the facility. PEBTF, the facility, OIP and HCI[3] collaboratively drafted a quality scorecard to be used in conjunction with the episode cost information. The scorecard parameters and outcomes are discussed in Section 2 of this case study.

RETROSPECTIVE PAYMENT: The pre-existing fee-for-service and per-case contracts and payment procedures remained in place among PEBTF's third-party administrator, OIP and the facility. At the conclusion of the 2015 pilot year and into the first quarter of 2016, HCI[3] prepared final reports that included the aggregate total episode spending compared to budgeted spending for all completed episodes. The reports also included the provider quality scores.

BUDGET OUTCOMES: Sixty-nine patients completed a total hip replacement or total knee replacement episode of care during the 2015 pilot. Although total claims costs were close to budget overall, our analysis showed remarkable savings in some types of spending within the episodes. The over-budget spending was concentrated in the inpatient claims: compared to the total inpatient budgets developed in advance, inpatient claims, on average, were $4,246 over budget per patient. Not so with non-inpatient claims within the pilot episodes. That spending was under budget by an average $4,189 per patient. We attribute these savings to the process improvements put into place for pre-operative and post-discharge services described in the next section.

Section 2: Quality Scorecard and Clinical Outcomes

QUALITY-OF-LIFE AND PROCESS MEASURES: In addition to the financial objectives discussed above, the collaborative effort designed a quality scorecard with agreed-upon clinical objectives, along with a patient satisfaction survey. Table 1 lists the process of care measures (on which the clinical team scored 100 percent) and a quality-of-life measure. The quality-of-life objective was to score an 80 percent; the actual score was 87 percent.

TABLE 1

QUALITY SCORECARD AT 90 DAYS	CUMULATIVE	% COMPLIANCE
Assessment of Patient History	56/56	100
Physical Exam	56/56	100
Radiologic Evidence of Arthritis	56/56	100
Shared Decision Making-Trial Conservative Treatment	56/56	100
Venousthrombolembolism and Cardiovascular Risk Evaluation	56/56	100
• High Cardiac Risk	2 out of 56	N/A
• Cardiac Clearance	2 out of 2	100
Pre-Operative Antibiotic Given	56/56	100
ID of Implant in Operative Report	56/56	100
Physical therapy within 24 Hours of Surgery	56/56	100
Patient Reported Quality of Life at 3 Months	46/53 (3 nonreturned surveys)	87

CLINICAL OUTCOMES MEASURES (AT 90 DAYS): Table 2 details the clinical outcomes measures at 90 days postdischarge. What stands out are the impressive scores seen in the Western Ontario and McMaster University Arthritis Index questionnaires (Womac is an industry standard used to evaluate osteoarthritis conditions), and the fact that only one patient experienced a readmission.

But even more dramatic is the change in the postdischarge rehab mix. One of the most difficult aspects to optimize in total joint replacements is the process of rehabilitation care following discharge. As described in Section 3, and revealed in Table 2, the collaborative efforts the facility and OIP made in presurgery, day-of-surgery, and postsurgery care improvements paid off.

TABLE 2

CLINICAL OUTCOMES AT 90 DAYS	CUMULATIVE
Improvement in Functional Outcomes (Womac) at 6 weeks	89% improvement (49/55) 1 refused
Improvement in Functional Outcomes (Womac) at 6 months	85% improvement (29/34) 22 pending
Discharge Disposition following Index Admission (the admission that triggers the episode, or that overlaps with a non-stay trigger)	Home Physical Therapy 54% Home Exercise Program 10% Skilled Nursing Facility 6%, Outpatient Physical Therapy 30%
Length of Stay During Index Admission	2 days
Readmission within 90 Days	1.8% (1 of 56)
Surgical Site Intervention within 90 Days	0 (0 out of 56)
Deep Vein Thrombosis/Pulmonary Embolism within 90 Days	1.8% (1 out of 56)

Figure 1 demonstrates that the objective of getting more patients in an outpatient physical therapy setting moved from 13 percent of patients to 30 percent of patients. This may not sound like much, but in terms of prospective budgets for nonindex-stay-related charges, it meant an average savings of $4,189 per patient (as indicated in *Budget Outcomes* in Section 1).

FIGURE 1

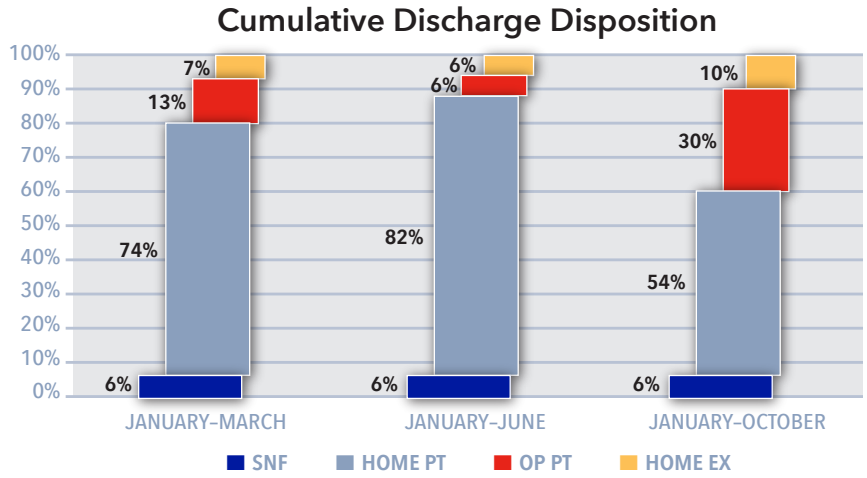
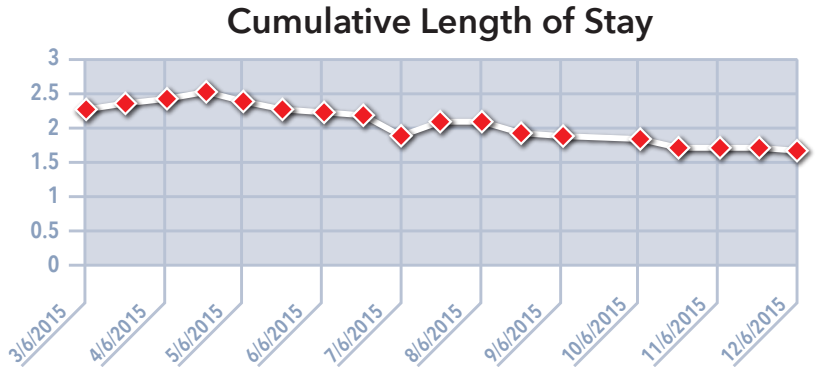


Figure 2 demonstrates the impact of OIP care re-engineering on lengths of stay (LOS). Despite the fact that there was an uptick in LOS during the first quarter of the pilot, managing towards protocol improvement steadily eroded LOS so that the average LOS arrived at the targeted two days. Because the network contract for the facility was based on a fixed unit cost DRG—a payment that does not go up or down based on the number of days in the hospital—LOS improvements yielded no cost savings to PEBTF, or to any resulting gainshares that might have been distributed to OIP. That said, process improvements that move patients out of the hospital and more quickly to optimal postdischarge settings redound to the benefit of individual patients. This is indicated by reductions in DVT, bedsores and hospital-acquired pneumonia associated with prolonged inpatient stays, and the potential for postdischarge complications and associated readmissions.

FIGURE 2



PATIENT SATISFACTION SURVEY: PEBTF administered a 17-question experience-of-care or patient satisfaction survey to sample the effects of care improvement on patients' sense of wellbeing before and during their inpatient stays. While no one enjoys being in the hospital for invasive surgery, it can be an unnecessarily bewildering and angst-ridden trial for patients and their families. Ultimately, the purpose of the survey was to discern whether patients felt as if a concerted effort was being made by attending doctors and nurses to proactively assuage their natural fears and questions. Without dissecting each and every question from the survey, 88.6 percent of responding patients reported a positive inpatient experience; however, we focus on four particular questions because on the one hand, physicians and hospital staff sometimes discuss patient care as if they and their families are invisible, and on the other, seem to be speaking a foreign language. Areas of strong consensus among patients:

- 100 percent answered "yes" to *"In your opinion, did your OIP physician and nurse provide you the information necessary about your surgery and what to expect after your surgery so that you felt like you were prepared?"*
- 100 percent answered "no" to *"Did the doctors talk in front of you about your care as if you weren't there?"*

However, some responses indicated areas needing improvement:

- 77 percent answered "yes" to *"When you had important questions to ask a nurse did you get answers that you could understand?"*
- 73 percent answered "yes" to *"Did the hospital staff tell you what medicines you were given and what they were for?"*

Section 3: Total Joint Care Process Improvements Instituted by OIP and the Facility

The Orthopedic Institute of Pennsylvania is a large, private-practice orthopedic group in Central Pennsylvania with 24 orthopedic surgeons, two pain management specialists, one occupational medicine physician, and 11 midlevel providers. Although OIP had been preparing for bundled payment arrangements since the Centers for Medicare and Medicaid Services announced the Bundled Payment for Care Improvement initiative in 2012, OIP's participation in the PEBTF effort was a major undertaking and intense learning experience in value-based care for OIP orthopedic surgeons who were accustomed to the fee-for-service model.

The joint replacement improvement process began as an interactive collaboration between the facility and OIP, starting with inpatient stay and implant costs. OIP supported the facility during negotiations with implant companies so that competitive pricing was obtained, despite the fact that many OIP surgeons had to change implant preferences and derived no direct economic benefit from the changes. OIP then worked internally to push its orthopedic staff towards streamlining protocols based on cost savings, such as eliminating certain standing treatments (e.g. Constant Passive Motion machines after TKR).

The task of getting 24 surgeons to agree to these types of standardization was accomplished by simply communicating a clear agenda on what would be decided at upcoming department meetings. If any surgeons did not show up they were, by default, accepting what the quorum of members present decided. If a surgeon later disagreed with a prior decision, he or she would then be asked to provide evidence defending their preferred treatment protocol at the next meeting. That rarely occurred. As a result, and over time, every inpatient process and protocol was ultimately accepted and standardized amongst all 24 surgeons and staff.

Dr. Jack Frankeny, CEO and Executive Director of OIP, developed a program to create a seamless care process from referral to discharge, and he introduced it to the facility's primary care providers (PCP). The postdischarge protocols and provider selection were developed jointly with the facility, which included:

- Getting all surgeons to agree to a common postoperative rehabilitation program
- Messaging these protocols to all postdischarge rehabilitation providers, and
- Monitoring how each provider performed

At this level of episode care delivery, the OIP registered nurse took over care coordination. She contacted every patient, either in person or by phone, in the pre-operative phase, to establish a bond of trust and to manage patient expectations, and worked closely with the entire team and their patients in the postdischarge phase to help avoid readmissions, complications, and other cost drivers.

Nurse coordinators affiliated with the facility also were available for calls from the patient and conducted calls to patients within one week of discharge. An OIP registered nurse was available 24 hours a day, 7 days a week for patient calls via a "hotline," and maintained frequent communication with each patient, regardless of inpatient or outpatient status. She communicated with providers of care postdischarge to ensure that any concerns were handles, to help address potential complications in a timely manner, and to help avoid readmissions. OIP established encrypted texting communication with many postdischarge providers to improve communication so that they could perform a type of "telemedicine," avoiding transportation costs and emergency room visits.

The THR/TKR episodes were divided into the three phases:

1) presurgery (30 days) 2) day-of-surgery, and 3) postsurgery (90 days).

PRESURGERY PROCESSES: In addition to the OIP registered nurse coordinating the clinical details of presurgery, day-of-surgery and postsurgery, the facility also assigned a dedicated nurse to coordinate the internal process of patient hand-off from referring primary care provider to surgeon in the hospital setting.

The team developed a screening process to identify which patients needed extra attention and resources to optimize their care. To buttress this process, OIP developed an iPad-based questionnaire to isolate potential risk factors, which were then communicated to the nurse coordinator at the facility, who worked with PCPs, nutritionists, smoking cessation personnel, weight loss specialists, and other care providers to aid optimization.

The list of risk factors agreed to by the surgeons was comprehensive so that all organ systems, lifestyle issues, and support structures were detected, and this is where the HCI^3 budgeting process is pertinent. In addition to the data gathering protocols described above, OIP could obtain each patient's predicted budget from the PEBTF portal to augment the surgical team's knowledge of relevant patient conditions. When indicated, the team was able to anticipate additional pre-operative care requirements that improved the odds that postsurgical complications did not occur; on several occasions, surgery was delayed until the team felt the patient was fully optimized for surgery (such as indicated need for weight loss).

OIP partnered with outpatient physical therapy (OP PT) to establish a pre-operative therapy evaluation and to schedule a first postoperative OP PT visit. During the patient's OIP office visit, the anticipated length of stay for the inpatient procedure was documented to establish the patient's expectation and all other providers of care across the episode. At this point, the discharge plan was established (open to change should a complication occur), and if a patient was to be discharged to an acute or sub-acute inpatient rehab center, arrangements were made preoperatively with preferred providers. If the attending doctor and nurse coordinator felt that the patient could be discharged to home, arrangements were made for either home health (nursing visits and PT visits), in-home outpatient PT, outpatient PT, or home exercises. According to clinical indications, each patient was routed to the appropriate mode of postsurgical rehabilitation by descending order of resource costs:

Sub-acute rehabilitation > home health (in excess of 4 visits);
home health (4 visits or less) > in-home outpatient PT;
and outpatient PT > home exercises.

Because continuity of care between patients and postdischarge providers tends to reduce inpatient lengths of stay (LOS), and also reduces patient anxiety about leaving the hospital setting, the following rehabilitation algorithm was communicated between inpatient and outpatient teams:

- If a patient was eligible to receive home health and was deemed "high risk" for complications and/or readmissions, the rehab agency performed a pre-operative home assessment
- If a patient was a candidate for in-home outpatient PT, the PT service performed a pre-operative home assessment
- If the patient was a candidate for discharge to outpatient PT postdischarge, he or she was scheduled to visit the PT site for "prehabilitation"

DAY-OF-SURGERY PROCESSES: The goal of day-of-surgery improvement was to initiate patient mobilization within two hours of arrival from the post acute care unit (PACU) and was incorporated into the patient education process. Early mobilization has been shown to reduce complications such as deep vein thrombosis, bedsores and pneumonia. It speeds recovery by shortening lengths of stay. Anesthesia protocols had to be modified to allow for rapid mobilization. A move away from general anesthesia—and the attendant nausea, vomiting, hangover effects and need for narcotics to control postop pain—toward spinal anesthetics supplemented by local injection of anesthetics into the joint allowed for more rapid mobilization.

Multimodal pain management protocols such as more non-narcotic pain prevention medications and fewer narcotic medications assisted with early mobilization. As the quality outcomes reveal in Section 2, LOS was shortened.

POSTSURGERY PROCESSES: Like the day-of-surgery improvements, the goal of postsurgical protocols was to reduce lengths of stay by discharging patients one day after surgery (if possible). This required identifying potential early discharge patients pre-operatively, making sure communications flowed smoothly between OIP and facility's inpatient staff, and redesigning PT processes to better prepare patients for early discharge.

To facilitate discharge one day after surgery:

- A THR/TKR discharge protocol was developed to establish seamless patient management between OP PT, home care, skilled nursing facilities, and rehab providers, with an emphasis on OP PT
- OIP worked with OP PT providers to create a process for in-home PT visits within 24 hours of discharge, including an assessment of readiness for OP PT
- The facility also developed a Patient Performance Record that would transition with the patient to OP PT

This was designed to maximize:

- Activities of daily living (ADL) performance, transfers and ambulation
- Establish a safe and effective exercise program
- Enhance range of motion (ROM) from 0 to 90+ degrees
- Provide a patient-tracking tool and patient hand-off communication tool for postacute providers and physician's office

Section 4: Conclusion

As a matter of operational routine, a well-structured bundled payment arrangement would be written into a contractual amendment that would, in turn, benchmark quality scores against any financial savings. But as a pilot, PEBTF proceeded with the facility and OIP on a series of verbal agreements and good faith. Because the model was retrospective, and upside-only (no parties on the delivery side were at risk of shouldering any losses) the lack of predetermined contractual terms was not problematic.

The excellent performance of the facility-affiliated and OIP teams in managing total joint replacement patients during the pilot period led to quality of care exceeding targeted quality benchmarks.

However the financial performance, on paper, seems less conclusive. Although the actual costs came in roughly at budget, costs could have been significantly lower if the facility's inpatient-stay reimbursement hadn't been a per-case rate negotiated with third-party administrators. That increase negated the financial benefit realized by OIP and the potential for gainsharing between PEBTF and OIP.

This brings about several observations on how others should consider contracting terms in pilots. First, when providers are not financially integrated, separate budgets should be formally attached to the facility and the professional services.

Second, downside risk should also be negotiated up front so that background payer-provider negotiations don't adversely affect the pilot.

Third, DRG payments don't go down when hospital stays are short. They eliminate the chance to capture savings that result from better quality care and more efficient processes that shorten lengths of stays.

Had at least the first two principles been applied in this pilot, the facility would have come over budget and had to pay a penalty to PEBTF, while OIP would have come under budget and received a gainshare. As is for PEBTF, ending with actual costs roughly equal to budget is a victory, and results in cost savings compared to what would have happened absent this pilot. The reason is clear: without this effort, the facility's prices would have increased as they did, and there would likely have not been any care process improvements and associated savings.

Our estimates are that total costs would have been, on average, more than $2,500 per patient higher than what they ended up being. The Orthopedic Institute of Pennsylvania deserves a lot of credit for their work in improving quality and lowering costs, despite the fact that the full financial benefits of doing so did not materialize on their side of the ledger.

At the outset of this paper, we alluded to the fact that plan staff would present pilot results to the PEBTF Board at the conclusion of the one-year, proof-of-concept period. Having occurred in early April 2016, the Board approved moving the bundled payment program forward with THR/TKR. PEBTF also is evaluating other episodes of care: lower back pain and cardiac procedures.

Finally, we conclude by referring to a recent HFMA Healthcare Business News article entitled, *"Most Hospitals Facing CJR Penalties: Analysis."*[1] According to several consultancy groups, at least 60 percent of hospitals in Medicare's Comprehensive Care for Joint Replacement (CJR) stand a good chance of losing money in the new mandated program, with primary reasons being linked to inadequate management of postdischarge utilization, re-admissions and sub-optimal rehab settings.

The article goes on to state, "…39 percent of total spending on hip and knee replacement episodes was tied to postdischarge care and readmissions." This figure corresponds nicely with the savings achieved in the PEBTF pilot, and as the collaborative efforts between PEBTF, the participating facility and OIP demonstrate, the issues detailed in the HFMA article can be effectively resolved—particularly if specialist physician groups are given adequate leeway and incentives to concentrate on care process improvement.

We believe this insight has policy implications. Medicare's desire to move fee-for-service purchasing to bundled payment is directionally correct, but its insistence on allowing only hospitals to participate may be short-sighted. Going forward, Medicare should consider widening the potential list of participating providers to physician-led groups that have reorganized themselves to be full-service bundled payment contractors. Not only would the potential for cost-saving, quality-improving innovations be accelerated, but consumer choice through competition would be greatly enhanced as well.

There's another key difference between Medicare's CJR program and our pilot: we adjusted for patient severity. The adjustments meant that participating surgeons could continue to care for patients who had many risk factors, and those patients wouldn't adversely affect the physician's outcomes. Information on severity adjustments also prepared physicians to calibrate the appropriate post-acute care for patients who would need it. Because Medicare's bundled payment program for joint replacement doesn't account for patient severity, it's unlikely to produce the same outcomes demonstrated in our pilot.

1 http://www.hfma.org/Content.aspx?id=47404&utm_source=Real%20Magnet&utm_medium=Email&utm_campaign=93642385

TABLE A: KNEE REPLACEMENT AND REVISION TRIGGER CODES

TRIGGER TYPE	CODES
ICD-9-PCS (PX) Triggers	0080, 0081, 0082, 0083, 0084, 8154, 8155
CPT / HCPCS Triggers	27446, 27447, 27486, 27487
ICD-9-CM (DX) Qualifying Diagnosis	2137, 2139, 2153, 2740, 27400, 27401, 27402, 27403, 27410, 27411, 27419, 27482, 27489, 2749, 71116, 71119, 71126, 71129, 71136, 71139, 71146, 71149, 71156, 71159, 71166, 71169, 71176, 71179, 71186, 71189, 71196, 71199, 71210, 71216, 71218, 71219, 71220, 71226, 71228, 71229, 71230, 71236, 71238, 71239, 71280, 71286, 71288, 71289, 71290, 71296, 71298, 71299, 7130, 7131, 7132, 7133, 7134, 7135, 7136, 7137, 7138, 7140 , 7141, 7142 , 71430, 71431, 71432, 71433, 7144 , 71489, 7149 , 71500, 71509, 71510, 71516, 71518, 71520, 71526, 71528, 71530, 71536, 71538, 71580, 71589, 71590, 71596, 71598, 71600, 71606, 71608, 71609, 71610, 71616, 71619, 71620, 71626, 71628, 71629, 71630, 71636, 71639, 71640, 71646, 71648, 71649, 71650, 71656, 71658, 71659, 71660, 71666, 71668, 71680, 71686, 71688, 71689, 71690, 71696, 71698, 71699, 7170, 7171, 7172, 7173, 71740, 71741, 71742, 71743, 71749, 7175, 7176, 7177, 71781, 71782, 71783, 71784, 71785, 71789, 7179, 71809, 71810, 71818, 71819, 71820, 71826, 71828, 71829, 71836, 71839, 71840, 71848, 71849, 71850, 71858, 71859, 71870, 71876, 71878, 71879, 71880, 71886, 71888, 71889, 71890, 71898, 71899, 71900, 71906, 71908, 71909, 71910, 71916, 71918, 71919, 71920, 71926, 71928, 71929, 71930, 71936, 71938, 71939, 71940, 71946, 71948, 71949, 71950, 71956, 71958, 71959, 71960, 71966, 71968, 71969, 7197, 71970, 71976, 71978, 71979, 71980, 71986, 71988, 71989, 71990, 71996, 71999, 72660, 72661, 72662, 72663, 72664, 72665, 72669, 72700, 72701, 7272, 7273, 72740, 72741, 72742, 72743, 72749, 72750, 72751, 72759, 72760, 72765, 72766, 72781, 72782, 72783, 7282, 7283, 7289, 7310, 7311, 7313, 7318, 7322, 7324, 7326, 7327, 7328, 7329, 73300, 73301, 73302, 73303, 73309, 7331, 73310, 73315, 73316, 73319, 73320, 73321, 73322, 73329, 73340, 73349, 7335, 7336, 7337, 73381, 73382, 73390, 73391, 73392, 73393, 73395, 73399, 73641, 73642, 7365, 7366, 73681, 73689, 7369, 7388, 7389, 7396, 7399, 75440, 75441, 75442, 75443, 75444, 75560, 75564, 75569, 7564, 75650, 75651, 75652, 75653, 75654, 75655, 75656, 75659, 7569, 8360, 8361, 8362, 8363, 8364, 83650, 83651, 83652, 83653, 83654, 83659, 83660, 83661, 83662, 83663, 83664, 83669, V134 , V1351, V1352, V4365, V494

TABLE B: HIP REPLACEMENT AND REVISION TRIGGER CODES

TRIGGER TYPE	CODES
ICD-9-PCS (PX) Triggers	0070, 0071, 0072, 0073, 0085, 0086, 0087, 8151, 8152, 8153
CPT / HCPCS Triggers	27125, 27130, 27132, 27134, 27137, 27138, S2118
ICD-9-CM (DX) Qualifying Diagnosis	2137, 2139, 2153, 2740, 27400, 27401, 27402, 27403, 27410, 27411, 27419, 27482, 27489, 2749, 71115, 71119, 71125, 71129, 71135, 71139, 71145, 71149, 71155, 71159, 71165, 71169, 71175, 71179, 71185, 71189, 71195, 71199, 71210, 71215, 71218, 71219, 71220, 71225, 71228, 71229, 71230, 71235, 71238, 71239, 71280, 71285, 71288, 71289, 71290, 71295, 71298, 71299, 7130, 7131, 7132, 7133, 7134, 7135, 7136, 7137, 7138, 7140 , 7141 , 7142 , 71430, 71431, 71432, 71433, 7144 , 71489, 7149 , 71500, 71509, 71510, 71515, 71518, 71520, 71525, 71528, 71530, 71535, 71538, 71580, 71589, 71590, 71595, 71598, 71600, 71605, 71608, 71609, 71610, 71615, 71619, 71620, 71625, 71628, 71629, 71630, 71635, 71638, 71639, 71640, 71645, 71648, 71649, 71650, 71655, 71658, 71659, 71660, 71665, 71668, 71680, 71685, 71688, 71689, 71690, 71695, 71698, 71699, 71805, 71809, 71810, 71815, 71818, 71819, 71820, 71825, 71828, 71829, 71835, 71839, 71840, 71845, 71848, 71849, 71850, 71855, 71858, 71859, 71860, 71865, 71870, 71875, 71878, 71879, 71880, 71885, 71888, 71889, 71890, 71895, 71898, 71899, 71900, 71905, 71908, 71909, 71910, 71915, 71918, 71919, 71920, 71925, 71928, 71929, 71930, 71935, 71938, 71939, 71940, 71945, 71948, 71949, 71950, 71955, 71958, 71959, 71960, 71965, 71968, 71969, 7197, 71970, 71975, 71978, 71979, 71980, 71985, 71988, 71989, 71990, 71995, 71998, 71999, 7200, 7202, 7310, 7311, 7313, 7318, 7321, 7322, 7324, 7326, 7327, 7328, 7329, 73300, 73301, 73302, 73303, 73309, 7331, 73310, 73314, 73315, 73319, 73320, 73321, 73322, 73329, 73340, 73342, 73343, 73349, 7335, 7336, 7337, 73381, 73382, 73390, 73391, 73392, 73395, 73396, 73397, 73398, 73399, 73630, 73631, 73632, 73639, 73681, 73689, 7369, 7386, 7388, 7389, 7393, 7394, 7395, 7396, 7399, 75430, 75431, 75432, 75433, 75435, 75442, 75444, 75561, 75562, 75563, 75569, 7564, 75650, 75651, 75652, 75653, 75654, 75655, 75656, 75659, 7569, 83500, 83501, 83502, 83503, 83510, 83511, 83512, 83513, V134 , V1351, V1352, V424 , V4364, V494

TABLE C: KNEE AND HIP REPLACEMENT AND REVISION SUBTYPE GROUPS

KNRPL SUBTYPE GROUPS	HIPRPL SUBTYPE GROUPS
Aseptic Necrosis	Arthropathy Hip, Pelvis, Thigh
Deformities, Lower Limb	Aseptic Necrosis
Gout and Other Crystal Arthropathies	Congenital Dislocation of Hip
Infective Arthritis	Deformities, Lower Limb
Inflammatory Arthropathies	Dislocation Hip
Knee Deformities	Gout and Other Crystal Arthropathies
Knee Derangements	Hip/Pelvis Deformities
Malunion	Infective Arthritis
Morbid Obesity	Inflammatory Arthropathies
Nonunion	Malunion
Obesity	Morbid Obesity
Osteoarthritis, Knee	Nonunion
Osteoarthritis, Other Joints	Obesity
Osteoporosis, Osteitis Deformans	Osteoarthritis, Hip
Other Arthropathies	Osteoarthritis, Other Joints
Other Deformities, Limb, Other Sites	Osteoporosis, Osteitis Deformans
Overweight	Other Arthropathies
Partial Knee Replacement	Other Deformities, Limb, Other Sites
Partial Knee Revision	Overweight
Pathologic Stress Fracture, Femur, Pelvis	Partial Hip Replacement
Rheumatoid Arthritis	Partial Hip Resurfacing
Sleep Apnea	Partial Hip Revision
Total Knee Replacement (Primary)	Pathologic Stress Fracture, Femur, Pelvis
Total Knee Revision	Rheumatoid Arthritis
Traumatic Dislocation Knee	Sleep Apnea
	Total Hip Replacement
	Total Hip Resurfacing
	Total Hip Revision

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