“Margin of Excellence” is a series of reports dedicated to uncovering next-generation, evidence-based total cost management improvement opportunities, relying on integrated data and services.

The reports provide detailed insights on costs looking at a single setting, or multiple settings, and across the continuum. The data and benchmarks can be leveraged to implement evidence-based strategies and tools designed to tackle inefficiencies in healthcare, ranging from variation in clinical practice to resource utilization – fulfilling the dual mission of improving care and reducing costs. The analyses tap Premier’s robust database, which offers a holistic view across hundreds of providers – linking clinical, financial and supply chain data with scale that provides accurate insights.
Executive Summary

Hip and knee replacements can improve quality of life and provide significant relief for those suffering with severe arthritic conditions. With Americans living longer than ever, total joint replacements represent one of the most commonly performed surgeries in the United States, accounting for more than one million procedures annually.\(^1\) This number is expected to grow, with projections estimating more than four million joint arthroplasties will be performed each year by 2030.\(^2\)

In 2008, total knee replacement inpatient costs exceeded $9 billion—making it the highest aggregate cost among the 10 fastest growing procedures.\(^3\) Because the surgical segment represents a large proportion in terms of volume, care and costs, it’s important for health systems to standardize practices and boost outcomes for total joint replacements, especially in a world that is increasingly shifting to value-based care and bundled payments. With these pressures, there is an increased push for providers to take on more risk and better coordinate care to optimize these procedures – with the ultimate goals of avoiding patient readmissions, improving recovery and outcomes and reducing costs overall.

Cost of Total Knee Replacements

In 2008, total knee replacement inpatient costs exceeded $9 billion—making it the highest aggregate cost amount the 10 fastest growing procedures.\(^3\)
How Variation in Total Joint Replacements Affects Quality and Costs

Despite the high volume of these surgeries, there’s significant variation in both the costs and quality outcomes for hip and knee replacements. For example, the rate of complications, including infections or implant failures post-surgery, can be up to three times higher at some facilities compared to others. As patients’ risk for complications rise, so does the risk for readmissions or longer inpatient stays. As a result, there’s also tremendous variations in cost. On average, Medicare expenditures for surgery and hospitalization can range from $16,500 to $33,000 across geographic areas.

Another major area of variation lies within the implanted hips and knees themselves. Prosthetic implants are one the largest non-labor expenses for total joint replacements procedures. The market is concentrated among a few manufacturers - with four companies accounting for more than 80 percent market share. List prices can sometimes average more than $10,000. The prices have skyrocketed in a little over a decade (1998-2011) - on average, the list price grew nearly 300 percent.

In terms of price variation for these devices, researchers found very limited variation in device costs associated with patient characteristics, but more than 90 percent of variance was related to both hospital characteristics (purchasing process, etc.) and variance within the hospitals (surgeon preference and practices, etc.) for knee and hip implants.

Another study found hospitals vary widely in the price paid for their implants used in total joint replacement procedures. Researchers found that up to 50 percent of variation is related to a hospital’s purchasing approach and its specific characteristics – including vendor negotiations,
vendor relationships with surgeons and other factors. When looking deeper at purchasing practice, the study also found that hospitals that negotiated prices after surgeons had already made their selections of preferred vendors paid an average of 17 percent more for knee implants and 23 percent more for hip implants after controlling for other factors, compared to hospitals who collaborated with surgeons on their purchasing decisions. The savings left on the table may be associated with a hospital’s limited flexibility to negotiate after surgeons have made their choices around implant use.

Researchers found that up to 50 percent of variation in implant costs is related to a hospital’s purchasing approach and its specific characteristics — including vendor negotiations, vendor relationships with surgeons and other factors.

It’s easy for hospital leaders to simply stop at pricing when considering ways to reduce costs for these procedures. They may cast clinicians, particularly those who use high-cost implants and other surgical products, as being contrary to “organizational success” or “tone-deaf” about financially sustainable clinical practices. However, handing out directives and forcing standardization to lowest-cost devices can quickly turn off key clinical audiences or cause them to become defensive if they are not married to clinical care effects.

If hospitals and health systems want to truly manage margins around total hip and knee procedures, curbing inpatient costs must be a two-pronged approach involving standardizing practice to boost quality and standardizing device use to reduce price variation. Leveraging data to help inform these decisions is crucial to understanding internal and external trends, establishing shared decision-making and creating better alignment between physicians and hospitals when undertaking these procedures.
Success Story:

**WAKE FOREST UNIVERSITY BAPTIST MEDICAL CENTER – WAKE FOREST, NC**

Wake Forest University Baptist Medical Center (WFUBMC), an academic health system made up of four acute care hospitals and more than 1,000 beds, enlisted Premier to tackle the rising costs of high-value implants in 2017. As one strategy that was part of a total cost management approach to tackling variation and standardization in care delivery and operations, the high cost of devices and implants used by surgeons represented a major opportunity to improve margins, as these supplies represent one of the highest cost categories for most health systems. Working with Premier, WFUBMC targeted high-cost implants used in five disease states, including spine, joint arthroplasty, cardiac rhythm management, trauma and neuromodulation, accounting for more than $45 million in spend.

The High-Value Implant Advisory Services team at Premier analyzed the purchases in each of these disease states across the WFUBMC system. Using Premier’s proprietary database consisting of high-value implant data from more than 1,100 hospitals, the team aimed to reduce pricing disparity across functionally equivalent products. With a robust database to analyze internal spend data and external pricing using cross-reference benchmarking, the team identified opportunities for cost savings and created a strategy to move forward. With support and engagement from the faculty, who are crucial to the process, Premier delivered RFPs to WFUBMC vendors in the targeted service lines to reduce pricing disparity both internally and compared to the market. Premier’s team partnered with the WFUBMC staff to hold vendors accountable during the RFP process to drive savings and negotiate new contracts on high-value implants.

As an academic medical center, Wake Forest requires access to multiple vendors to explore and examine best practices through research. Through this initiative, the faculty continues to have choices, but with better contract terms.
WFUBMC leveraged Premier’s cross-reference benchmarking, data analytics and advisory services to achieve improved pricing parity across suppliers. The faculty are also able to use their preferred vendors, with minimal impact to product or supplier options. Savings started with the first high-value implant project after only four months; in the six months following, the collaboration between WFUBMC and Premier generated $3.6 million in total savings in the five disease states, and $775,000 on total joints.

**Assessment of Providers Optimizing Total Joint Replacements**

Optimizing total joint procedures has been a prevalent strategy for providers as the shift to value-based care models like bundled payments and ACOs have incented improved patient care and reduced costs within surgical service lines.

Premier researchers reviewed inpatient data from 869 facilities, representing more than 283,000 patient discharges over a 17-month period (October 2015 to March 2017). The patient population represents MS-DRG 469 and 470 (major joint replacement with and without complicating conditions).

Within the analysis, Premier found that providers have made significant progress in reducing overall length-of-stay and readmissions for these procedures. The focus on quality shines through in the data and the optimization efforts – from incorporating comprehensive perioperative risk assessments to leveraging narrow post-acute care networks - have produced significant improvements in patient outcomes for total joint replacement procedures.
Key Finding
#1
Median length of stay for total joint replacements is **two days** – 50 percent of cases fall between two to three days.

Key Finding
#2
Trending this over time, length-of-stay for total joint replacements have fallen from an average of **3.2 days to 2.3 days** over a five-year period for 279 facilities – representing a 28 percent decrease.

Key Finding
#3
**Median Cost Per Overall Procedure: $14,520** - 50 percent of cases fall between the $12,000-$17,900 range – representing variation in terms of costs for these procedures.
As hospitals have been tackling standardizing care for these procedures, variation still exists around certain components of the procedure rather than in quality of care delivery – especially related to resource utilization, pricing of devices and other aspects of efficiency such as operating room time.

**FIGURE 1: Variation Around Resources, Labor Leveraged in Total Joint Replacements**

<table>
<thead>
<tr>
<th>Overall Use</th>
<th>Use Rate</th>
<th>25th Cost</th>
<th>75th Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery Related</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthesia - General</td>
<td>57.6%</td>
<td>$96</td>
<td>$454</td>
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<tr>
<td>Anesthesia - Local</td>
<td>22.0%</td>
<td>$4</td>
<td>$141</td>
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<tr>
<td>Anesthesia - Unspecified</td>
<td>20.3%</td>
<td>$17</td>
<td>$357</td>
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<tr>
<td>Anesthetics</td>
<td>94.6%</td>
<td>$38</td>
<td>$202</td>
</tr>
<tr>
<td>Operating Time</td>
<td>97.6%</td>
<td>$2,182</td>
<td>$4,627</td>
</tr>
<tr>
<td>Bone Cement</td>
<td>39.7%</td>
<td>$31</td>
<td>$167</td>
</tr>
<tr>
<td>Bone Cement with Abx</td>
<td>28.2%</td>
<td>$35</td>
<td>$267</td>
</tr>
<tr>
<td>Red Blood Cells</td>
<td>5.4%</td>
<td>$9</td>
<td>$37</td>
</tr>
<tr>
<td>Tranexamic Acid</td>
<td>74.4%</td>
<td>$29</td>
<td>$95</td>
</tr>
<tr>
<td>Pharmacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-infectives</td>
<td></td>
<td></td>
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<tr>
<td>Cefazolin</td>
<td>85.2%</td>
<td>$22</td>
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<tr>
<td>Vancomycin</td>
<td>25.3%</td>
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<tr>
<td>Other Abx</td>
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<tr>
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<td>$99</td>
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<tr>
<td>Non-Narcotics</td>
<td>87.2%</td>
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<tr>
<td>Venous Thromboembolism Prevention - Mechanical</td>
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<tr>
<td>Venous Thromboembolism Prevention - Pharmaceutical</td>
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<td>Diagnostics/ Treatments</td>
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<tr>
<td>Imaging - CT</td>
<td>6.0%</td>
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<td>$26</td>
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<tr>
<td>Imaging - X-Ray</td>
<td>80.8%</td>
<td>$71</td>
<td>$168</td>
</tr>
<tr>
<td>Physical and Occupational Therapy</td>
<td>98.7%</td>
<td>$435</td>
<td>$3,115</td>
</tr>
</tbody>
</table>

**DEEPER DIVE ON VARIATION: WHAT’S WORKING**

- **Blood utilization and tranexamic acid:** When looking at the use of blood transfusions, very few patients warrant one. Instead, surgeons have increasingly incorporated tranexamic acid, which helps for bleeding control – which is a win-win for both patients and providers as unnecessary blood use can potentially impact patient safety.
• **Pharmaceuticals:** When reviewing the data around many commonly used pharmaceutical interventions used during total joint procedures like anti-infectives, pain management drugs and venous thromboembolism prophylaxis (to help treat conditions like deep vein thrombosis), there doesn’t appear to be overuse or misuse, and pricing variation is limited.

**DEEPER DIVE ON VARIATION: WHAT CAN BE OPTIMIZED**

• **Anesthesia:** Using multimodal anesthesia with more local use compared to general use, can help decrease sedation in patients and encourage early mobility. With local anesthesia, patients are more likely to have strength to get out of bed, while reducing risk of deep vein thrombosis and pneumonia. In addition, local anesthesia can facilitate an accelerated move from hospital to home rather than a longer stay in the hospital or a post-acute care setting. However, the data highlights this practice hasn’t been widely adopted (22 percent of patients receiving local anesthesia vs. 52 percent receiving general anesthesia). Additionally, with general anesthesia being more expensive than local anesthesia, this would also reduce costs if local anesthesia was more widely used within total joint replacement procedures.

• **Operating room efficiency:** Time is money, and providers who have standardized protocols and practices are often more efficient, reducing the amount of time a patient has to spend in a surgery suite. When examining the data, the highest-performing hospitals within the cohort (25th percentile) accounted for just over $2,000 in spending for labor within the operating room compared to the lower-performing hospitals (75th percentile) who accounted for more than $4,600 in operating room labor spend – signifying opportunities to enhance throughput within the operating room for total joint replacements.

• **Bone cement use with and without antibiotics:** Bone cement with antibiotics are more expensive than those without, yet research does not clearly indicate these products demonstrate they are more effective in improving patient outcomes. Standard bone cement were used in 39.8 percent of patients studied, while 29.8 percent received bone cement with antibiotics. Bone cement with antibiotics also cost 120 percent more per patient than those without antibiotics ($618 vs. $280).
Devices and other supplies are the largest overall cost within total joint procedures.

Looking deeper on pricing of implants, Premier found a cohort of nearly 350 hospitals paid a weighted average of $4,464 for primary knee implants, with 50 percent paying between $4,066 and $5,609 for the devices.

The same cohort paid a weighted average of $5,252 for primary hip implants, with 50 percent paying between $4,759 and $6,463 for the devices.

If all hospitals within the cohort closed the pricing gap and accessed the same pricing as the top 25th percentile of providers, there’s a savings opportunity of $23.7 million in knee implants and $19.1 million for hip implants.
Success Story: BAYHEALTH – DOVER, DE
Bayhealth, central and southern Delaware’s largest healthcare system, collaborated with Premier to identify savings on high-value implants used in procedures associated with four disease states including Spine, Joint Arthroplasty, Cardiac Rhythm Management and Fracture Management – some of the biggest opportunities to reduce costs on supply spend without compromising care.

The High-Value Implant Advisory Services team at Premier analyzed Bayhealth purchasing trends across implants associated within the four disease states representing over $14 million in spend, and examined price variations using benchmarked data from Premier’s proprietary high-value implant database consisting of data from more than 1,100 hospitals. Using Premier’s robust cross-reference benchmarking analytics and advisory services, the team was able to identify over $2.7 million in savings, and the data and strategy were presented to the physicians. The physicians and supply chain were aligned with the financial goals of the project, and with physician support, Premier began to solicit RFPs in the targeted service lines to eliminate pricing disparity both internally and compared to the market. The team also partnered with Bayhealth leaders to navigate the RFP process with vendors to maximize savings.

Implant costs specifically associated with total hip replacement and total knee replacement procedures account for a large share of total costs of the overall procedure and reimbursement to hospitals. Partnering with Premier, Bayhealth supply chain worked closely with their orthopedic service line to target these high-value implants, implementing a projected savings of over $1.1 million.
Benchmarking Progress

Using Premier data, providers have a compass to help them improve clinical variation and resource utilization around inpatient total joint replacements, and measure progress against peer benchmarks.

With constrained resources, hospitals and health systems are doing less with more. Whether looking at optimization system wide or pinpointing specific practices that account for wide variation in care, providers can drive real change within orthopedics and implant vendors for total joint replacements.

Success Story:
AMERICAN ANESTHESIOLOGY AND NEW HANOVER REGIONAL MEDICAL CENTER – WILMINGTON, NC

With bundled payments on the horizon, leaders at American Anesthesiology and New Hanover Regional Medical Center wanted to get ahead while also striving to bring value to their institutions and patients. A member of the Premier and the American Society of Anesthesiologists Perioperative Surgical Home Collaborative, a major priority for the hospital was to focus on high-revenue service lines and streamline care to support true clinical integration. Orthopedics was selected as one of the top opportunity areas.

Working with American Anesthesiology, the anesthesia group that works closely with New Hanover’s surgeons on various procedures, the two organizations worked to determine how to really drive value into these procedures and improve all aspects of a hospital encounter. This meant implementing an effective pre- and post-operative care program. With motivated service line champions, all stakeholders were on board to make the necessary changes in order to improve patient outcomes and quality of care.

Each patient now goes through a pre-operative assessment before a total joint replacement – helping the care team manage comorbidities and educate the patients on what to expect before, during and after the
surgery. The team created a roadmap to surgery and established a joint camp, where the patient is provided education on the entire process, from the decision to have the surgery through the recovery process and what to expect through each stage. With this strategy, hospitalists are able to learn more about these patients prior to surgery and treat conditions like anemia before the procedure.

The group also examined the performance of the five surgeons conducting total joint replacements – looking at variation between top performers and the other surgeons. The team examined what practices were standard among top performers and leveraged those actions to encourage other surgeons to adopt these strategies, helping improve the process and resulting in better outcomes. Additionally, surgeons were shown preference cards of the supplies they used – helping them realize the economic impact of their preferred supplies. Allowing them to dig down provided a new level of transparency on implant and supply costs, and the economics behind their choices. This data drove evidence-based decision making on everything from the medicine used, the amount of labs needed and the blood transfusions performed.

The hospital also hired clinical navigators, who are the main point of contact for patients if an issue arises. This type of concierge medicine greatly enhanced patient satisfaction. Hospitalists evaluate patients in the Surgical Navigation clinic, where they undergo a risk assessment for readmissions and blood management. Paramedics also are available to visit patients before and after their total joint procedure to check their homes for triggers that could cause readmissions, such as home set up and items to trip on. Hospitalists determine if the patients have a primary care doctor, and if not, will schedule them to return to a transitional care clinic for proper medical follow-up to prevent possible readmission.

After implementing the new processes, staffing model and best practices and following the progress, the team saw extraordinary results in quality of care: there were no mortalities in the first year, and they cut complication rates by one-third and readmissions by half. The hospital
hasn’t had to pay a penalty to CMS since the improvements were initiated, and length of stay has also decreased to 1.8 days. In terms of cost management, these optimization efforts have translated into $4.2 million in savings in the first year of the program.

Leaders who oversaw this work highlight lessons learned, including how efforts like these can’t be driven by just one cohort. It requires significant collaboration and communication with all stakeholders involved to ensure everyone is on the same page. Another key learning is to engage and educate patients so they have a better understanding of what their care team is doing and how they can partner with providers to accelerate their recovery. Setting patient expectations about the journey through the procedure and post-discharge is a crucial part of their recovery.

The team has now moved from focusing on total joint procedures and applying lessons learned to spine, coronary artery bypass grafting and colorectal surgery.

**Best Practices in Total Joint Replacement Pricing Optimization**

Providers have been making significant inroads in optimizing total joint replacements in terms of care delivery and patient outcomes in an inpatient setting. Implants have been more difficult to manage in terms of pricing, but data and tools are available to reduce variation and hold implant manufacturers accountable.

Each hospital and health system is different – so there is no single, one-size-fits-all solution to tackling variation in care delivery and resource utilization in total joint replacements. Therefore, a multifaceted approach to achieve performance improvement should be tailored based on the institution’s resources, patient populations, unique data trends and leadership priorities.
BEST PRACTICES TACKLING PRICING ON IMPLANTS

Premier’s High-Value Implant Advisory Services sees an average of 13 percent savings on joint arthroplasty implants in all-play pricing initiatives.

01

BEST PRACTICES:
CLEANSE AND UNDERSTAND DATA

In a total joint replacement, hospitals and health systems should look to maintain visibility around all components being used in a procedure. Even if a hospital chooses to purchase using "construct" pricing, in order to successfully analyze pricing and utilization in the future, it’s important to create a structure with visibility to all items that make up a knee or hip construct. This will allow supply chain leaders to examine pricing details and benchmark across vendors for each component. Because a knee or hip implant can be done in many different combinations, leaders need to understand the usage. Without this information, leaders can’t talk to surgeons about what is being used and why patterns should shift.

02

BEST PRACTICES:
BENCHMARK PRICING AGAINST PEERS

It is important to run benchmarks against national peers with similar characteristics in terms of implant volume. Often, a third-party vendor is needed to offer this level of transparency and open access to pricing variation on all components used within a hip or knee implant. In addition to external benchmarking, Premier’s cross-reference benchmarking allows health systems to compare current vendors’ pricing on functionally equivalent products within their institution to curb pricing variation across an enterprise.
03

BEST PRACTICES: PARTNER TO SET ACCURATE, ATTAINABLE PRICING

Health systems need assistance to cleanse their data, normalize it and remove outliers in order to really understand pricing trends. An ideal partner would help a hospital or health system create a tailored pricing strategy based on a number of factors, including taking into consideration how supportive surgeons will be and the volume of procedures being done. An achievable pricing strategy should be not be based on a generic set of algorithms. Conducting a thorough analysis with a data expert who understands the health system’s culture, trends, surgeon preferences and vendor relationships, can help develop a realistic approach to pricing and generate savings.

After this analysis, vendors should feel compelled to participate in negotiations which will help generate realistic savings dependent on current contract terms. When developing a strategy, it’s important to not arbitrarily demand price concessions with vendors, but rather to support concessions with data to set a pricing strategy and achieve surgeon buy-in. For instance, if the price variation for vendor A’s product only deviates around seven percent from an average paid among peers, while vendor B charges a 20 percent markup compared to the average, there’s more opportunity to eliminate wider price disparity with vendor B. Instead of just achieving savings, this eliminates disparity across vendors. This should be viewed not only as a negotiation, but also as a strategy to hold vendors accountable and achieve market-competitive pricing.

04

BEST PRACTICES: SHARE THE DETAILS

It’s important to share the pricing information compiled collaboratively – informing leaders in supply chain, contracting, surgeons, clinical and service lines, as well as the C-suite. This benchmarking information helps provide context for those who may question the need to renegotiate contracts with vendors, outline the savings that could be generated from better price points and increase the level of transparency around pricing of high-cost hip and knee implants.
BEST PRACTICES: GET SURGEONS ON BOARD

One of the most important audiences to reach are the people who work with these implants everyday: the surgeons. Without their support, pricing parity efforts can be futile. Leaders must use the data and pricing benchmarks with their surgeons to ensure they understand the economics behind decision-making. When discussing this work, surgeons should understand, in the case of a vendor all play, that the intent is to continue to provide them with choice of vendors – but their support is needed when going into conversations with vendors to obtain reasonable, credible pricing. Everyone within a health system should be on the same page and delivering consistent messaging to vendors around contract negotiation of implants.

BEST PRACTICES: BE MINDFUL OF THE INITIAL CONTRACTED PRICE

Sometimes with construct pricing, a vendor will contract at the hospital’s construct price, but add-ons result in additional costs on top of the construct price. Hospital leaders should be aware of these potential pricing pitfalls and create constructs and terms and conditions that address add-ons. The issue of transparency and visibility is crucial for leaders who are negotiating these contracts. This can help ensure consistency and accuracy around pricing for the implants being used in the constructs.
Summary

Providers have come a long way in working to deliver more efficient, effective care around total joint replacements – so much so that Medicare has agreed to begin reimbursing for total knee replacements within an outpatient setting without having the patient set foot within the four walls of the hospital. However, opportunities to generate savings still exist within total joint replacements, especially in terms of reducing variation around the pricing of supplies and implants used in these procedures.

Premier’s trend data highlights the tremendous opportunity for total cost management performance improvement in the area of joint replacement. For more information on Premier’s expertise, unique data sets and contract negotiation strategies for optimizing total joint costs across institutions, please visit us online at premierinc.com

Methodology

Data includes 869 facilities, representing more than 283,000 patient discharges during a 17-month period (October 2015 to March 2017). The patient population represents MS-DRG 469 and 470 (major joint replacement with and without complicating conditions).

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