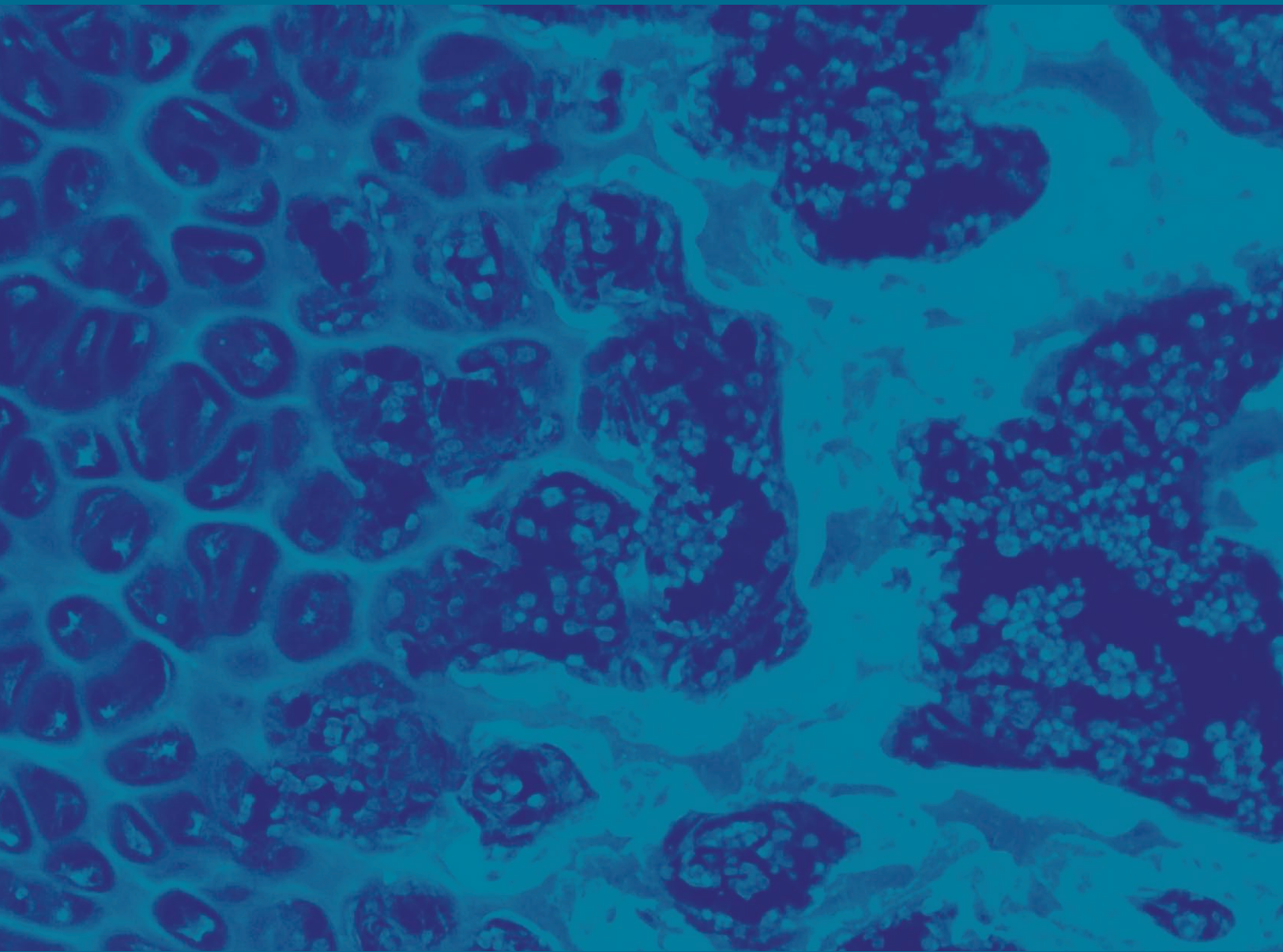




Orthopedic Surgery

2017 QUALITY AND OUTCOMES REPORT



19,000+

ORTHOPEDIC SURGERY
PROCEDURES

32%

DECREASE IN
LENGTH OF STAY UNDER
BUNDLED PAYMENTS

Top 10

IN U.S. NEWS &
WORLD REPORT

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Dear Colleagues and Friends:

On behalf of everyone in the Department of Orthopedic Surgery at NYU Langone Health, we are pleased to present you with our *2017 Quality and Outcomes Report*. This year's report describes our efforts over the last 12 months to improve quality, achieve better patient outcomes, and help build a healthcare system that provides the highest possible value.

We began publishing biennial departmental reports seven years ago. How does this exercise fit into our mission as a patient care organization? Our answer is expressed in the famous saying of Socrates: "The unexamined life is not worth living."

We firmly believe that in medicine, as in life, regular self-examination is essential. The only way to improve the care we provide is to step back, evaluate our progress, understand our successes, and identify what we need to do better.

For us and our colleagues, that belief translates into several core commitments.

First, we are committed to continuous measurement. On a day-to-day basis, we track every aspect of the care we provide—from process measures to patient outcomes to resource utilization. Measuring our performance helps us spot opportunities to be more effective.

Second, we are committed to research. Our faculty continuously asks questions and answers them with the highest methodological rigor. Our research activities are critical to understanding what is working in orthopedic care and what needs to change.

Third, we are committed to data transparency. We believe the only way for orthopedic surgeons to improve outcomes is to share their results across organizational boundaries. By presenting our findings in this report, we hope to support specialty-wide efforts to transform data into actionable results.

Fourth, we are committed to providing leadership in public policy. One of the main goals of this report is to further the healthcare industry's dialogue about important policy issues—including the exciting yet difficult transition from fee-for-service to value-based care.

Most important, we are committed to our patients. Our department consists

of more than 200 faculty members who represent every specialty area within orthopedic surgery. What ties us all together is our passion for providing excellent patient care. That passion defines the environment we continually strive to foster here at NYU Langone.

On behalf of the entire faculty, we extend our sincerest thanks to you for your interest in our biennial *Quality and Outcomes Report*. It is our profound hope that our contributions to orthopedic care will combine with the achievements of your organization and many others to improve outcomes for all patients.



JOSEPH D. ZUCKERMAN, MD

A handwritten signature in black ink, appearing to read "W.A.L. Thompson".

Walter A.L. Thompson
Professor of
Orthopedic Surgery
Chair of Orthopedic Surgery
Surgeon-in-Chief
NYU Langone
Orthopedic Hospital




JOSEPH A. BOSCO, MD

A handwritten signature in black ink, reading "Joseph A. Bosco".

Professor of
Orthopedic Surgery
Vice Chair for Clinical Affairs
NYU Langone
Orthopedic Hospital

Primer on Bundled Payments in Orthopedic Surgery



 Claudette M. Lajam, MD

The Evolution of Bundled Payments

Orthopedic surgery is a major driver of health system costs. By the year 2023, musculoskeletal disease will account for nearly 30% of U.S. healthcare spending. As a result, policymakers have made orthopedic surgery a prime focus of efforts to move from volume-based to value-based payment.

The contemporary concept of healthcare value was formulated in 2010 by Michael E. Porter of Harvard Business School. He described value in healthcare as outcomes that matter to patients divided by the cost required to achieve those outcomes. Over the last decade, the government has introduced several new payment models, including the accountable care organization and patient-centered medical home models, that aim to increase healthcare value by incentivizing both quality and cost control. For orthopedic surgery, the most important recent innovation is bundled payments.

Bundled payment arrangements provide a single flat fee for a defined episode of care. The episode typically encompasses both the inpatient care and the post-acute care related to a procedure or a diagnosis. This bundled payment model creates financial risk for healthcare providers. If actual costs are higher than the fixed payment, the provider takes a loss on the episode. On the other hand, successful cost control leads to financial rewards. If actual costs are lower than the fixed fee, the provider retains the excess. However, cost control is not the only measure of success. Bundled payment programs safeguard care quality through a variety of quality measures and clinical performance thresholds.

From the start, joint replacement has been a focus of bundled payment programs. Total joint arthroplasty is a common, easily definable procedure that generates significant costs for the Centers for Medicare & Medicaid Services (CMS). At the same time, significant variability in joint arthroplasty costs and outcomes suggests that major financial savings and quality improvements are attainable. Over the last decade, CMS has developed several iterations of a bundled payment model for joint arthroplasty.

ACUTE CARE EPISODE (ACE) DEMONSTRATION

CMS launched the ACE demonstration in 2009 as a pilot study to explore the practicality of bundled payments. The demonstration applied a flat-fee payment model to hip or knee replacement or revision, as well as to certain cardiovascular Medicare Severity Diagnosis Related Groups (MS-DRGs). Orthopedic procedures drove the largest aggregate savings, and the demonstration reduced overall costs per episode by 10% to 15%.

BUNDLED PAYMENTS FOR CARE IMPROVEMENT (BPCI) INITIATIVE

Driven by the success of the ACE demonstration, CMS introduced the BPCI initiative in 2011. This voluntary program expanded the bundled payment concept to dozens of care episodes. Under Model 2 of the BPCI initiative, the bundle covers all Medicare Part A and Part B services provided during the inpatient stay and the 90 days following discharge. For lower extremity joint arthroplasty, the BPCI initiative yielded average savings of 15% and led to increased quality.

COMPREHENSIVE CARE FOR JOINT REPLACEMENT (CJR) MODEL

In 2015, CMS finalized regulations for the CJR model, the first mandatory bundled payment program in the United States. It requires all hospitals in 67 defined metropolitan areas to participate in the program for major joint replacement (MS-DRG 469 and MS-DRG 470). Like the BPCI initiative, the CJR model is based on an episode of care that includes the 90-day post-discharge period.

SURGICAL HIP AND FEMUR FRACTURE TREATMENT (SHFFT) MODEL

Most hospitals have successfully managed episode costs and quality for elective joint replacement. These episodes are fairly consistent in terms of inpatient and post-acute care utilization. In contrast, most program participants have found it much more difficult to manage non-elective joint replacement surgery resulting from hip fracture. Overall costs are up to 50% higher for hip fracture patients, driven in part by higher readmission rates, and less successful clinical outcomes as a result of the absence of preoperative risk modification. Hip fracture is especially a challenge for low-volume community hospitals, which generally have a higher proportion of fracture patients among their hip arthroplasty patients.



↑ Ivan Fernandez-Madrid, MD

In recognition of the challenges associated with this patient population, CMS has made select changes to the pricing methodology of both the BPCI initiative and the CJR model. In 2016, CMS also finalized regulations for a new joint arthroplasty bundled payment model that reflects the increased costs and variability of hip fracture episodes. The SHFFT model, which went into use in 2017, is a mandatory program for hospitals in CJR-required metropolitan areas. The bundled payments cover all Medicare Part A and Part B services for MS-DRGs 480, 481, and 482, beginning with the hospital admission and ending 90 days after discharge.

THREE COMMON GOALS ACROSS PROGRAMS

The evolution of bundled payments for orthopedic surgery illustrates three themes in the government's approach. CMS seeks to:

- Drive quality improvement by encouraging coordination of care between acute and post-acute providers
- Drive orthopedic surgery toward cost efficiency by rewarding the most efficient providers
- Spur hospitals and orthopedic surgery leaders to address the clinical and population health issues that undermine the goals of value-based payment

Hospital-Acquired Conditions (HACs): The Bundle Buster

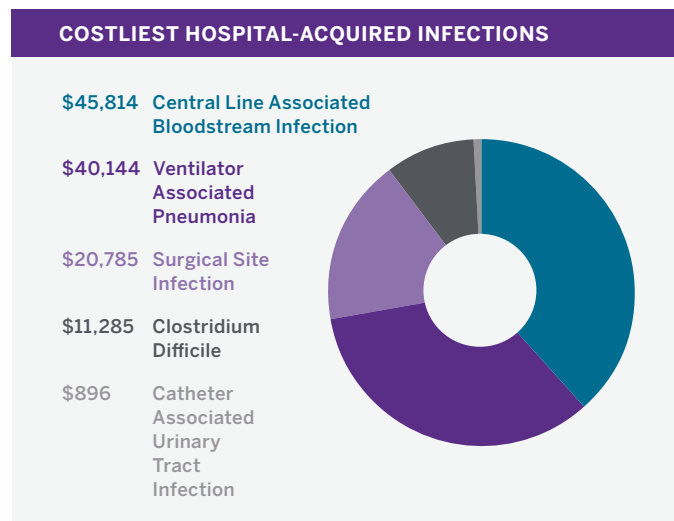
As government and private payers expand bundled payment arrangements for orthopedic surgery, hospitals must focus on controlling the factors that lead to poor outcomes and high costs. High on the list of controllable factors are HACs.

HACs are complications that could reasonably have been prevented through the application of evidence-based guidelines. When present as a secondary diagnosis, HACs result in the assignment of a case to a more expensive Diagnosis-Related Group. The federal government's HAC Reduction Program penalizes hospitals in the bottom quartile for risk-adjusted HAC quality measures. In the context of bundled payment programs, HACs increase episode costs and represent a poor outcome.

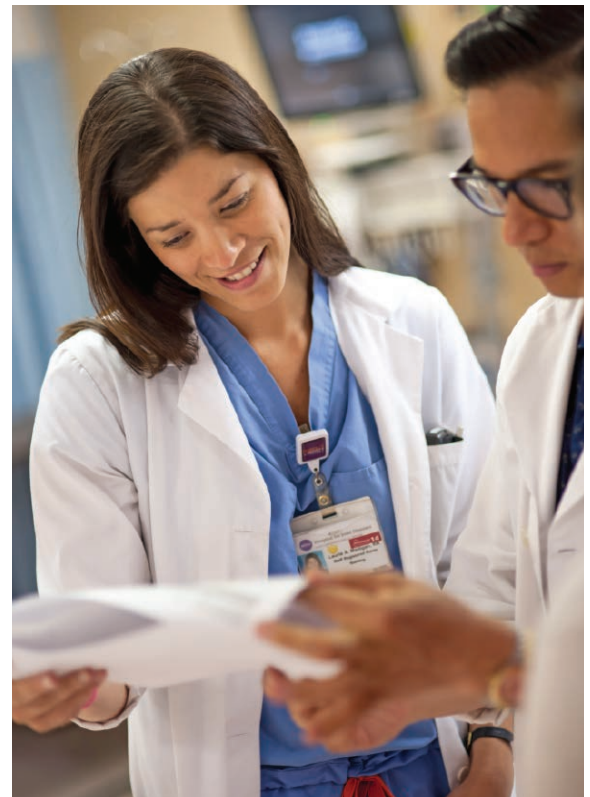
Hospital-acquired infections (HAIs) drive the bulk of HAC costs. Despite widespread implementation of quality improvement initiatives to reduce infections, U.S. providers spend an estimated \$9.8 billion annually to treat HAIs. According to research published in *JAMA Internal Medicine*, the most expensive HAI is central line-associated bloodstream infection (CLABSI), which costs \$45,814 per case.

Reducing HACs requires a multidisciplinary effort with strong leadership from nurses as the first line of defense against these conditions. Of all patient care team members, nurses generally have the most powerful influence over HACs. For instance, the nurse is often the first provider to notice the signs of infection and skin breakdown. This speaks to the importance of organizational fluidity and interdisciplinary communication.

↓ Laurie A. Madigan, RN, and Michael M. Tagadaya, RN



Source: Zimlichman E, Henderson D, Tamir O, Franz C, Song P, Yamin CK, Keohane C, Denham CR, Bates DW. Health Care-Associated Infections A Meta-analysis of Costs and Financial Impact on the US Health Care System. *JAMA Intern Med*. 2013 Dec 9-23; 173 (22): 2039-46.



Our Experience with Bundled Payments

NYU Langone Health has extensive experience managing orthopedic surgery under bundled payment arrangements. Our institution began participating in the Bundled Payments for Care Improvement (BPCI) initiative for major joint replacement in 2013.

At that time, we launched several initiatives aimed at increasing the quality of patient care, decreasing costs, and improving efficiency. Since then, we have continued to hone our processes, with the ongoing goal of increasing overall healthcare value for our patients. During this period, our bundled payment initiatives have:

- Decreased average length of stay from 4.27 days to 2.9 days
- Decreased discharges to inpatient facilities from 63% to 19%
- Decreased the 90-day readmission rate from 17% to 8%
- Achieved positive margins versus Centers for Medicare & Medicaid Services (CMS) target price in each of the first five reconciliations
- Decreased hospital cost per case by \$7,000 overall and \$6,300 for the bundle
- Saved 8.1% and 17% versus the target reconciliation for Diagnosis-Related Group (DRG) 469 and DRG 470, respectively
- Realized net savings of \$4.7 million for DRG 470 in the first six month cycle (2013–14)

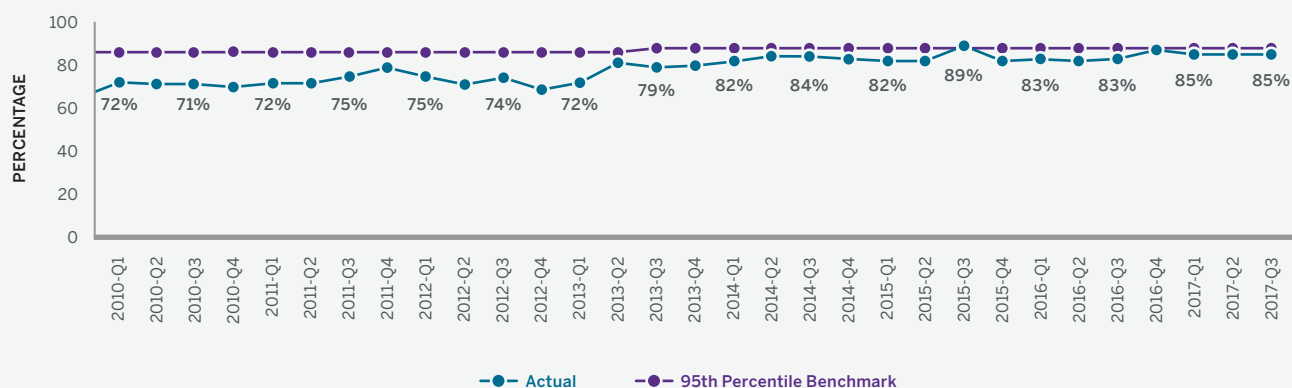
As part of our dedication to the bundled payment model, our institution has focused on maintaining and improving our performance on quality measures. An increasingly important component of healthcare quality is patient satisfaction, and the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is the national standard for collecting and publicly reporting information about patients' care experience. Hospital performance on HCAHPS is a quality measure for both the Comprehensive Care for Joint Replacement (CJR) model and the Surgical Hip and Femur Fracture Treatment (SHFFT) model.

We are proud that we fall near the 95th percentile benchmark on three HCAHPS measures—patients' likelihood to recommend the hospital, the responsiveness of our hospital staff to patient needs, and providing patients with adequate discharge information.

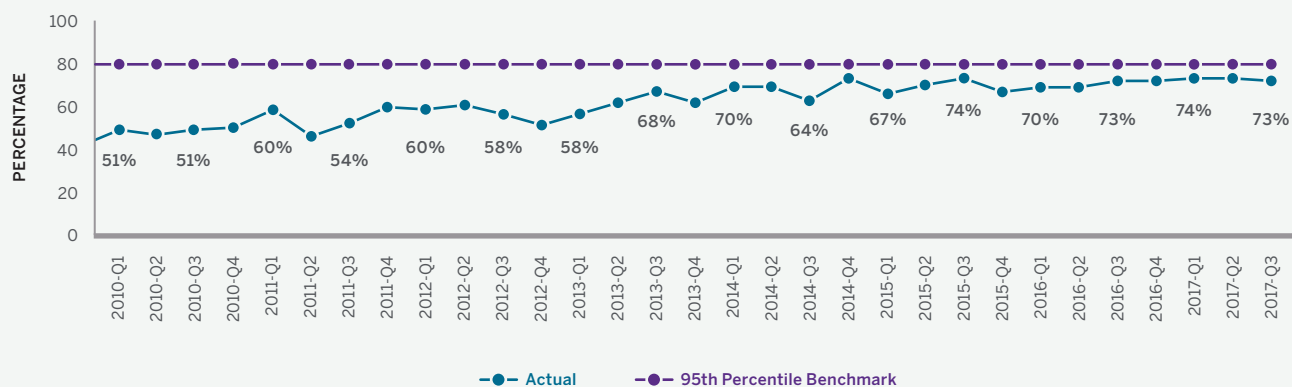


↑ Bret C. Jacobs, DO, and Kirk A. Campbell, MD

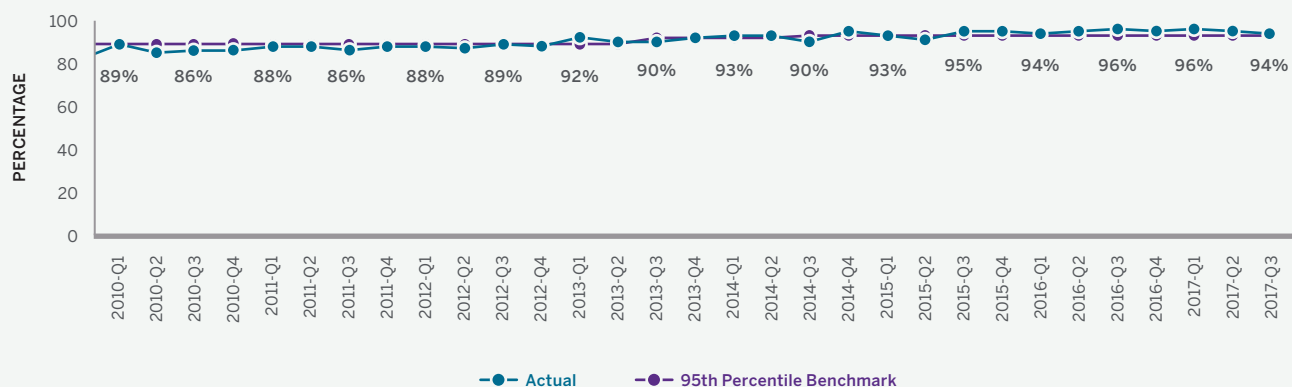
HCAHPS MEASURE: LIKELIHOOD TO RECOMMEND



HCAHPS MEASURE: RESPONSIVENESS OF HOSPITAL STAFF



HCAHPS MEASURE: PROVIDING PATIENTS WITH ADEQUATE DISCHARGE INFORMATION



Important Questions for Orthopedic Leaders

The bundled payment model is an effective mechanism for encouraging quality and cost control. However, it also creates several new practical and ethical issues. As bundled payments become increasingly prevalent in orthopedic surgery, physicians will need to address these issues and work collaboratively to develop workable solutions.

This year, orthopedic leaders at NYU Langone focused on several operational and ethical questions connected to the rise of bundled payments. Summarized here are our thoughts on two key questions.

CAN WE USE GAINSHARING TO PROVIDE HIGHER-VALUE CARE FOR OUR PATIENTS?

Orthopedic surgery encompasses several high-cost, high-volume procedures with diversity in physician practices and outcomes. Because of these factors, gainsharing in orthopedic surgery has the potential to deliver significant cost savings to hospitals—and therefore significant income to physicians.


But despite the possible benefits of gainsharing, hospital and orthopedic leaders should approach it with circumspection: It should not be seen as the sole solution to cost containment challenges but as one part of an overall solution to total cost management. In addition, as with any operational change, gainsharing carries some risk. If not implemented properly and linked to long-term strategic goals, a gainsharing arrangement can be difficult to sustain. In the worst-case scenario, gainsharing becomes an entitlement program rather than a reward program linked to specific performance changes and standards.

It is also important to understand the market context. Not all physicians will be attracted to gainsharing initiatives, but in some situations the physician community may force the issue. For hospitals in congested markets, this could be a significant matter. A hospital may need to implement gainsharing initiatives to compete for quality physicians: in these situations, gainsharing may be key to standing out from competitors, maintaining a reputation for innovation, or capturing a market-leading position.

To ensure the success of a gainsharing initiative, several key items must be in place, including strong data systems, a mission-focused organizational framework, and a significant number of savings opportunities. Strong hospital-physician relations are

essential to developing a gainsharing program that serves the interests of patients, the hospital, and physicians. And, of particular importance, there must be one or more “physician champions” to spearhead the gainsharing initiative.



 Gail S. Chorney, MD

Physician champions have the ability to form partnerships with physicians known for practice innovation, and are well-respected among their peers. Ultimately, peer-to-peer education and persuasion will make or break a gainsharing initiative.

HOW DO WE MANAGE THE UNINTENDED ETHICAL CONSEQUENCES OF HIGH-VOLUME CENTERS OF EXCELLENCE?

High-volume centers of excellence in orthopedic surgery provide high-quality, cost-effective care. However, every cost control strategy must be vetted and monitored for its unintended consequences. In the case of orthopedic centers of excellence, there are paradoxical ethical issues that must be examined.

The development of regional high-volume centers of excellence has the potential to create an access barrier to high-quality care for patients of low socioeconomic status. First, the ability to travel to regional centers of excellence is affected by a patient's socioeconomic status. Poorer patients have a more

difficult time accessing these centers, and therefore, a higher proportion of them will obtain care at lower-volume hospitals. Second, economically disadvantaged patients are more likely to obtain their joint replacements at low-volume hospitals, regardless of publicly available data showing inferior outcome rates. Combined, these factors increase the healthcare outcome disparity observed between the rich and the poor. This is an ethically untenable situation.

Orthopedic leaders must make sure that efforts to develop centers of excellence help elevate the level of care for all patients. First, we must work to ensure that the disadvantaged have physical access to these centers. Second, we must insist that the evidence-based care pathways and processes used at high-volume centers be disseminated to lower-volume hospitals. These actions can both improve disadvantaged people's access to high-volume centers of excellence and improve the quality of care received at lower-volume centers.



↑ Joseph A. Bosco, MD, and Joseph D. Zuckerman, MD

Our Recommendations for Managing Orthopedic Bundled Payments

NYU Langone Health has been involved in bundled payment programs since 2013. Our experience with the challenges of this payment model has spurred us to develop recommendations for clinical leaders. We call these recommendations the Seven Pillars of Bundled Payment Success.

1. IDENTIFY AND MODIFY PATIENT RISK FACTORS PREOPERATIVELY

Under bundled payments, the hospital assumes financial risk for complications, especially those that lead to increased postacute charges. Orthopedic surgery leaders should spearhead the implementation of preoperative risk assessment tools to identify opportunities to reduce patients' risk before surgery—for example, by helping patients control their diabetes or by treating pre-existing *Staphylococcus aureus* colonization. Risk identification can also enable providers to improve the economics of the episode by billing services under a more appropriate Diagnosis-Related Group (DRG).

2. ADOPT EVIDENCED-BASED CLINICAL PATHWAYS

Orthopedic surgery leaders should promote efforts to standardize care to evidence-based best practices. This can help elevate the practice of low-volume providers, which will improve outcomes and costs for the entire department. For example, implementing evidence-based blood management protocols can help a department reduce transfusion-related complications and avoid the costs of unnecessary blood product use.

3. ESTABLISH A ROBUST DATA COLLECTION AND DISSEMINATION INFRASTRUCTURE

The federal government reconciles episode costs and payments retrospectively, often months after the services have been provided. To successfully manage an episode of care, providers must carefully track utilization and expenses in real time. Use hospital accounting and data systems to capture the cost of all

aspects of care, including pre-admission testing, implants or any other materials used during the procedure, the inpatient stay, services provided during the 90 days after the hospital stay, and any stakeholder payments. Robust data collection enables hospitals to respond proactively to issues that could lead to a poor outcome and/or increase costs.

4. IDENTIFY VARIATION IN OUTCOMES AND COSTS

Cost and outcome variations across an institution are a prime opportunity for optimizing care episodes. Data often show no correlation between high costs and superior patient outcomes, and providers who are outliers in terms of episode costs can often be persuaded to adopt more efficient practice patterns. Variation analysis can also be used to identify and reduce unnecessary waste. Both efforts help hospitals control costs, an important discipline under bundled payments.

5. MAXIMIZE AND DEMONSTRATE QUALITY

The discussion about bundled payments often centers on cost control. However, it is critical to keep in mind that quality measures are also an essential component of these programs. CMS bundled payment programs use three principal quality measures—the hospital-level risk-standardized complication rate, Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results, and patient-reported outcomes. To perform well under bundled payments, hospitals must work to optimize care quality and patient outcomes.



 Jonathan Vigdorichik, MD

6. CONTROL POST-DISCHARGE CARE AND COSTS


Under the Comprehensive Care for Joint Replacement and Surgical Hip and Femur Fracture Treatment (SHFFT) bundles, hospitals are responsible for costs incurred during the 90-day post-discharge period. In some cases, post-acute care represents up to a third of total episode spending. Orthopedic surgery leaders need to collaborate with providers across the care continuum to control post-discharge costs. As discussed in Pillars 1 and 2, preoperative risk modification and evidence-based protocols are important tools for minimizing costs, including costs incurred after discharge as a result of complications.

7. IDENTIFY AND ALIGN STAKEHOLDERS

Successful bundled payment management requires the careful orchestration of physicians, nurses, ancillary staff, and post-acute providers. Hospital administrators and orthopedic leaders must work to align all stakeholders on the mission and goals of the bundled payment program. Gainsharing arrangements are an effective way to align orthopedic surgeons with cost control and quality improvement priorities. In addition, interdisciplinary leadership teams are key to organizing clinical units to provide coordinated services across the episode of care.

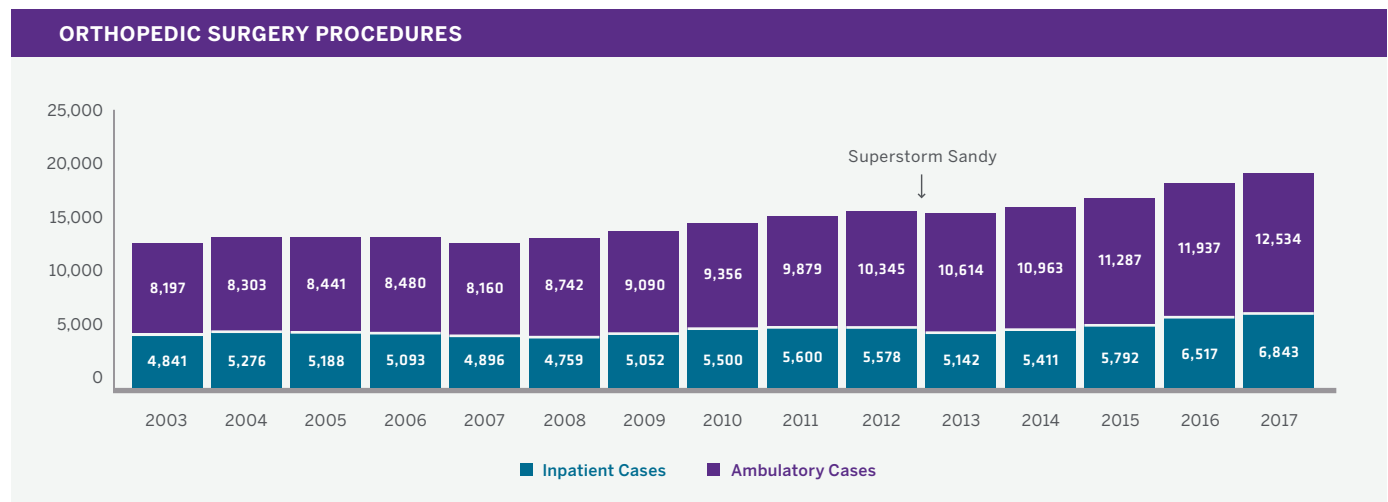
Quality, Outcomes, and Patient Safety



 Eric J. Strauss, MD

Volume Helps Drive Outcomes

High case volume improves the performance of both institutions and individual physicians. We are committed to leveraging the Department of Orthopedic Surgery's high volume to identify the most effective treatments, hone our proficiency, and improve patient outcomes.



DEPARTMENT PROCEDURE VOLUMES

In 2017, the department performed more than 19,000 orthopedic surgery procedures. Following the interruptions caused by Hurricane Sandy, our annual case volume has continued to grow steadily, with a 23% increase in inpatient and outpatient procedure volumes since 2013.

EXPLORING THE LINK BETWEEN JOINT REPLACEMENT VOLUME AND OVERALL HOSPITAL QUALITY

Several studies have demonstrated an association between higher procedure volumes and better patient outcomes. For example, higher volumes at both the surgeon and the hospital levels have been linked to lower rates of complications and mortality across several specialties, including orthopedic surgery. Recently, we initiated a study to determine whether the same relationship exists between orthopedic surgery volume and overall hospital quality.

Our goal was to determine whether hospitals with a high volume of total joint arthroplasty procedures perform better in government pay-for-performance (P4P) programs than their lower-volume counterparts. Using data on 123 hospitals from 2013 to 2015, we examined the relationship between joint

arthroplasty volume and performance in three Centers for Medicare & Medicaid Services (CMS) programs: the Hospital-Acquired Condition (HAC) Reduction Program, the Hospital Readmissions Reduction Program (HRR), and the Hospital Value-Based Purchasing (VBP) Program.

Our study demonstrated a positive association between hospital joint replacement volume and combined performance in the three P4P programs. However, when we looked at individual programs, the only measure that was significantly associated with higher volume was VBP performance. Higher joint replacement volume was not associated with better hospital performance with regard to HAC penalties or readmission penalties.

One possible explanation for this finding is that Medicare P4P measures look at overall hospital performance and thus the data reflect outcomes across all specialties, not only joint replacement surgery. As a result, the quality effect of high joint arthroplasty volume may be muted in the context of hospital quality measures. Another possible explanation is that since the Affordable Care Act was in its infancy during the period under study, presumably hospitals were at the beginning of their learning curve for the three P4P programs. Therefore, the volume/quality effect may not yet have manifested across the full range of P4P measures.

Initiatives to Improve Quality, Outcomes, and Costs

To raise the quality of orthopedic care for all patients, we conduct patient safety and outcomes research, with a particular emphasis on the increasing burden of medical costs. Here, we highlight some of our recent efforts to improve the quality, cost, and outcomes of orthopedic care through research.

EVIDENCE-BASED BLOOD MANAGEMENT INTERVENTION DECREASES TRANSFUSION RATES

Nearly 13.5 million units of red blood cells (RBCs) are transfused each year in the United States, making transfusion one of the most common hospital procedures. The annual cost of these transfusions is more than \$3 billion. Some portion of this spending likely represents waste, since randomized trials show that restrictive transfusion rates do not adversely affect outcomes. Prior studies show that clinical decision support (CDS), including education and technology changes, can improve institutional transfusion habits. Our goal was to determine whether CDS interventions could reduce transfusion use and costs at NYU Langone Orthopedic Hospital.

We tracked blood transfusions for all inpatients over two consecutive periods totaling 24 months: the pre-intervention period from January 2014 to February 2015 and the post-intervention period from March 2015 to December 2015. A total of 69,159 discharges were included. The intervention had two components: (1) embedding new institutional transfusion guidelines in the computerized provider order entry (CPOE) system and (2) providing targeted education to physicians in high-utilizing service lines, including medicine, cardiothoracic surgery, orthopedic surgery, and general surgery. According to the institutional guidelines, transfusion for hemoglobin values > 7 g/dL was considered potentially inappropriate (PI-RBC). The primary outcome was PI-RBC use per 100 patient discharges for the entire institution. We also analyzed PI-RBC use for physicians in medicine service lines who received targeted education (M+e), physicians in surgical service lines who received targeted education (S+e), and physicians in surgical service lines who did not receive targeted education (S).

Overall, our institution decreased PI-RBC transfusions from 13.4 units to 10.0 units per 100 discharges, with nine consecutive months below the baseline mean ($p = .002$). PI-RBC transfusions in the M+e group decreased from 15.7 units to 11.0 units per 100 discharges, with nine consecutive months below the baseline mean ($p = .002$). PI-RBC transfusions in the S+e group decreased from 19.6 units to 15.1 units per 100 discharges, with seven consecutive months below the baseline mean ($p = .008$). In contrast, the S group decreased PI-RBC transfusions from 12.9 units to 11.5 units per 100 discharges, without consistent months below the baseline mean.

We calculated savings using the estimated cost of \$522 per unit of RBCs. The overall cost decrease was \$17,748 per 1,000 discharges. By intervention group, the cost reduction per 1,000 discharges was \$24,534 for group M+e, \$23,490 for group S+e, and \$7,308 for group S. There was no significant post-intervention change in quality metrics, length of stay, death index, or case mix index.

Physicians may be unaware of the disadvantages of aggressive RBC transfusion strategies and may transfuse inappropriately, causing potential harm and financial cost. Our study showed that targeted education combined with CPOE-embedded guidelines is an effective means of influencing physician behavior, and that the combined education-technology intervention is more effective than the CPOE intervention alone.

REMOTE VIDEO AUDITING (RVA)

RVA is a process by which surgical cases are captured live on video cameras. Each of our operating rooms are equipped with video cameras. Operative cases are then chosen at random to be remotely observed on a live basis. Videos are viewed in a remote secure location on a real-time basis. They are not recorded. Our residents review the cases with an attending to look for potential breaks in sterile technique. We use an electronic-based grading tool on which to record observations.

RVA is a powerful tool, which we will leverage to improve general OR discipline in order to increase patient safety and reduce SSIs. This program aligns with NYU Langone Health's commitment to transform itself into a High Reliability Organization (HRO). This is especially important as, in the future, SSIs following hip and knee replacement surgeries will be included in the Centers for Medicare & Medicaid Services (CMS) hospital-acquired conditions (HACs) penalty program. We have partnered with our nurse educators to develop a document that defines proper OR sterile techniques and practices. Our goals for RVA are:

- OR quality improvement and SSI reduction through increasing awareness of sterile technique and promoting OR discipline
- Provide our residents and trainees with education on sterile technique and experience in participating in quality and safety improvement programs



↑ Donna P. Phillips, MD

- Promote teamwork and camaraderie with OR staff; both of these satisfy ACGME and CLER requirements for trainee participation in continuous quality improvement (CQI) programs. We feel that involving first or second-year residents is the most effective way of achieving our goals

We created a document that accompanies the RVA cloud-based observation instrument, which details proper sterile technique according to AORN and APIC standards. This includes a primer on proper OR attire, safe handling of sharps, maintaining a sterile field, proper OR personal movement, and correct skin prepping and patient draping technique. These are essential components of a safe OR. Traditionally, formal resident education in these areas has been inconsistent. This is an opportunity to raise the educational standard in OR sterile technique for our residents. Additionally, this document will have content stressing mindfulness and proper teamwork between staff and residents.

To date Donna P. Phillips, MD, clinical professor of orthopedic surgery, and her team have viewed 22 surgeries performed by 18 different attendings. Her team's findings have been extremely informative. Trends observed include:

- Sleeves contaminated when gown put on for surgeon—usually with shaking out gown
- Surgeons and assistants have hands out of sterile field
- Brushing against drapes by non-scrubbed staff
- Beards not covered consistently; beard covers not always adequate
- Masks not consistently used properly

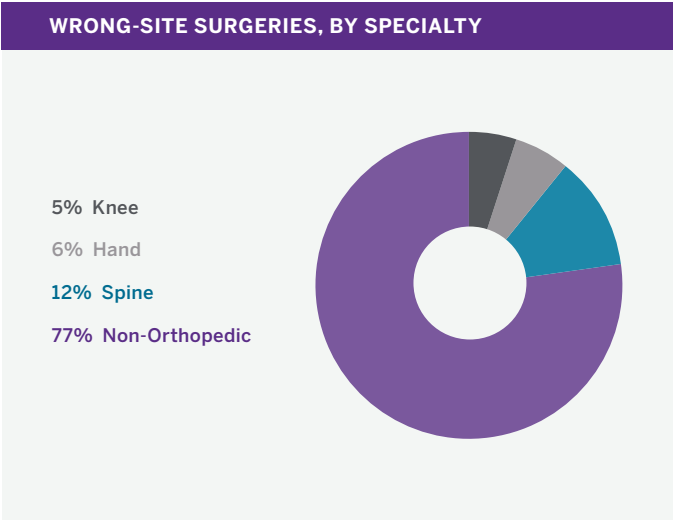
These findings have been communicated with our entire department and we are convinced that this increased awareness will result in higher quality care and increased patient safety.

HOW COMMON IS WRONG-SITE SURGERY IN ORTHOPEDICS?

Wrong-site orthopedic surgery is a rare but preventable catastrophic event that harms patients, surgeons, and surgical teams. Most hospitals have adopted the World Health Organization Surgical Safety Checklist and the Joint Commission’s Universal Protocol for Preventing Wrong-Site, Wrong-Procedure, and Wrong-Person Surgery. Nonetheless, these adverse events continue to occur in orthopedic practices in the United States.

Every orthopedic surgeon is at risk for performing a wrong-site surgery during his or her career. Although the true incidence of wrong-site surgery is not known, it appears to vary depending on subspecialty:

- As many as 1 in 4 orthopedic surgeons will be involved in a wrong-site surgery during an active 25-year surgical career
- Orthopedic spine surgeons appear to be at highest risk for wrong-site surgery, with errors occurring as frequently as 1 in 3,000 cases
- Orthopedic hand and arthroscopic knee surgeons may experience wrong-site surgery as frequently as 1 in 27,000 cases



Source: Santiesteban L, Hutzler L, Bosco JA 3rd, Robb W 3rd. Wrong-site surgery in orthopedics: prevalence, risk factors, and strategies for prevention. *JBJS Rev.* 2016 Jan; 4 (1): e5.

Pennsylvania is one of the few states that mandate reporting of wrong-site surgery; since 2004, the state has collected data on more than 500 wrong-patient, wrong-body part, wrong-side, and wrong-level events. The figure shown here, which breaks these events down by specialty, suggests that orthopedic surgery accounts for nearly a quarter of wrong-site procedures.

STRATEGIES FOR PREVENTING WRONG-SITE SURGERY

Surgical leadership, commitment, and vigilance are critical to preventing wrong-site surgery and ensuring that validated safety processes are used in all orthopedic settings. Orthopedic leaders at NYU Langone Health recently used two closely linked interventions to increase patient safety:

- Our institution maintains an electronic database of patient safety information. Project leaders used this database to identify surgical bookings that specified the wrong side for a procedure (regarded as a “near-miss” event). They then provided education to appropriate surgeons and staff on the safety implications of inaccurate scheduling.
- Project leaders also began observing time-out procedures in the OR and reviewing time-outs for deficiencies. They then provided targeted feedback to surgeons and OR staff who performed time-outs improperly, and counseled them on correct processes.

Within six months, the incorrect booking rate decreased from 0.75% to 0.41% (p = 0.0139). In addition, the improper time-out rate was reduced from 18.7% to 5.9% (p < 0.0001).



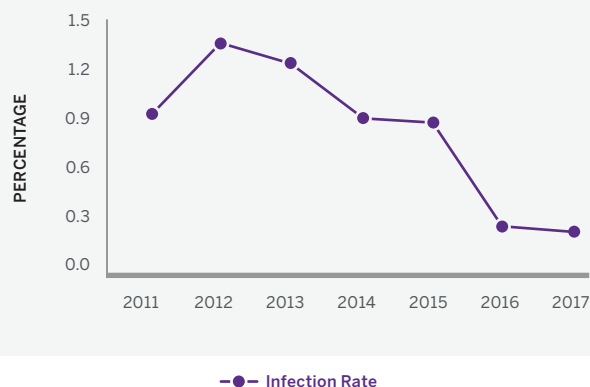
↑ Toni M. McLaurin, MD

SURGICAL SITE INFECTION REPORT

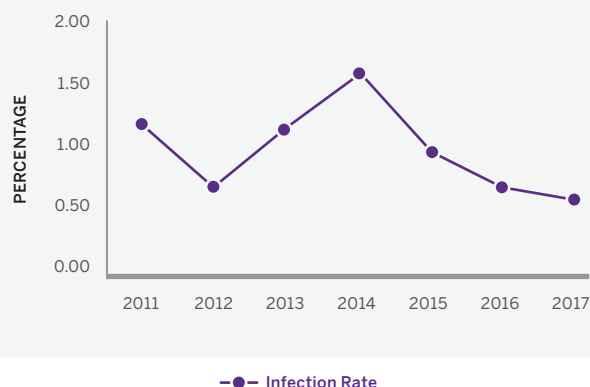
Preventing deep surgical site infection (SSI) is a major priority for the Department of Orthopedic Surgery. Over the last several years, our SSI rates have fluctuated as department leaders implemented improved care processes and clinical protocols—and responded to new clinical and operational challenges.

The overall rate of deep SSI at NYU Langone Health is low, and SSI rates in all categories have declined steadily over the last two years. The SSI rate for primary knee arthroplasty now stands at 0.24%, the lowest ever at our institution.

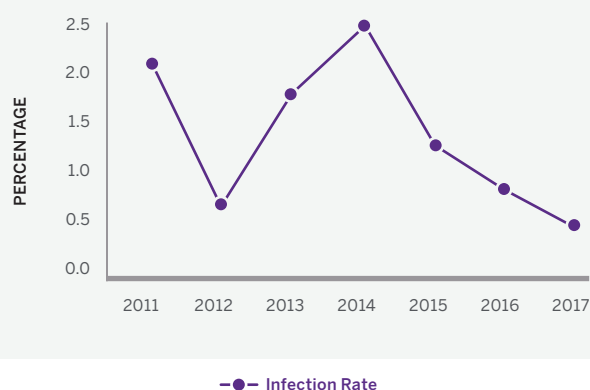
SURGICAL SITE INFECTION RATE KNEE ARTHROPLASTY (PRIMARY)



SURGICAL SITE INFECTION RATE HIP ARTHROPLASTY (PRIMARY)



SURGICAL SITE INFECTION RATE SPINE





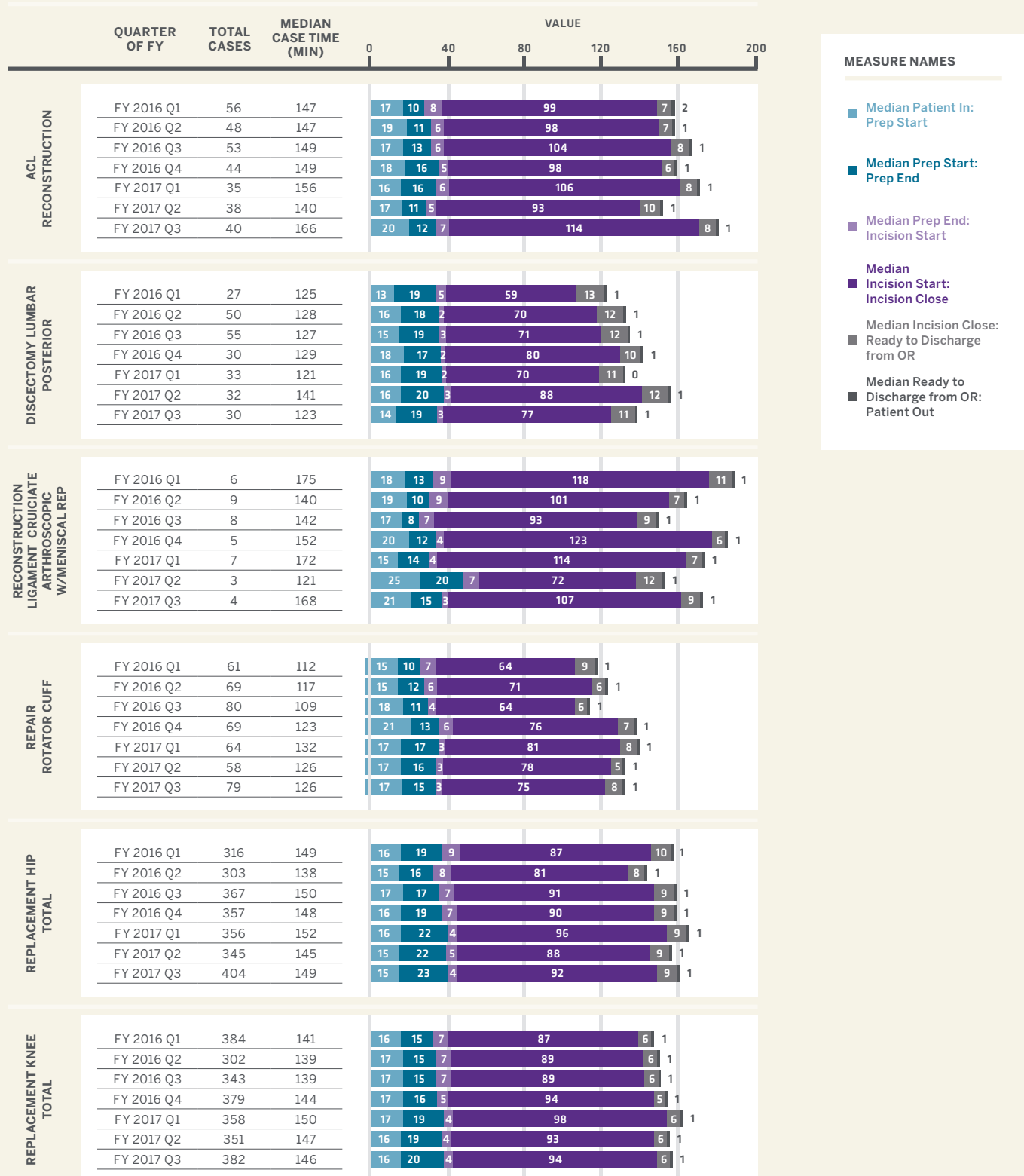
James D. Slover, MD

TRACKING AND UNDERSTANDING PROCEDURE-SPECIFIC OR CASE TIMES

Surgeons naturally work at different speeds. Nevertheless, longer case times represent higher costs—a major obstacle to improving OR performance under bundled payment. While more complex cases often require extended operating time, longer case time does not necessarily mean higher quality. Research using the New Zealand National Joint Registry shows that operating too quickly and too slowly both lead to poor outcomes. Outcomes

begin to worsen as operative time (incision to closure) falls below 45 minutes and when operative time surpasses 90 minutes. At NYU Langone Orthopedic Hospital, we track department case times and report them on a quarterly basis (see graph). Breaking out the data by surgical area helps department leaders understand the issues that may be driving long median case times. We also examine outlier cases, drilling down on the specific causes of long operating time. Addressing these factors systematically—with process improvement and education—helps us keep operating times within an acceptable range.

Components of Procedure Specific OR Case Times



OPTIMIZING LENGTH OF STAY

One goal of the Department of Orthopedic Surgery is to ensure that joint replacement patients are discharged as expediently and as safely as possible. Yet in the new environment of value-based payment, orthopedic leaders are taking a deeper look at practices surrounding hospital discharge.

Bundled payment programs make providers responsible for costs and outcomes across the entire episode of care, from surgery through the 90-day post-acute period. This expansion of the care episode calls for a nuanced approach to discharge planning. Specifically, providers now need to weigh the outcome and cost implications of multiple post-surgery pathways, including inpatient hospitalization, sub-acute rehabilitation, and home recovery.

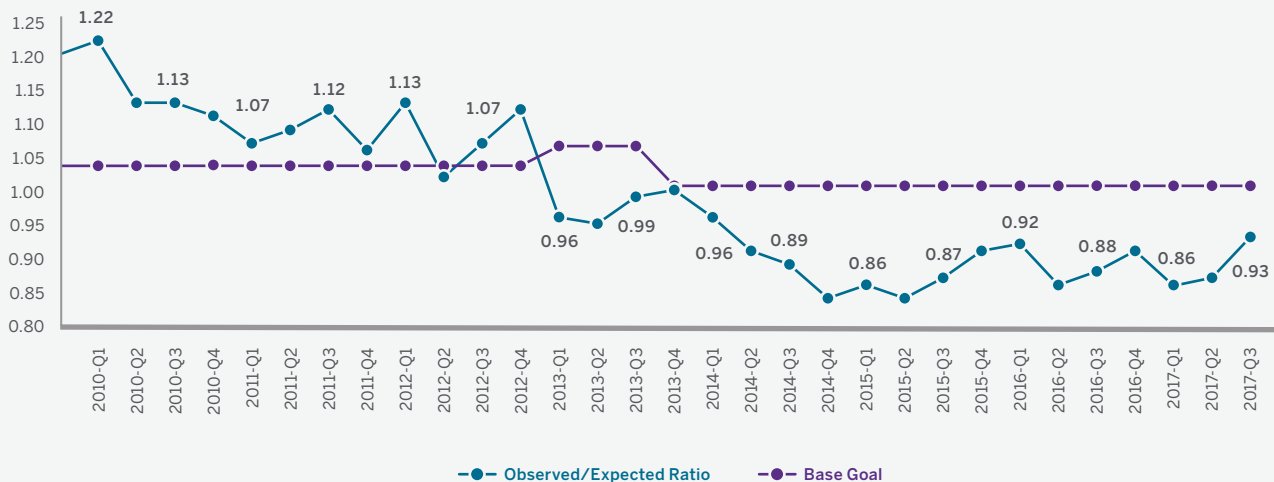
We continue to strive for a balanced approach focused on what is best for patients. Building on our efforts to reduce length of stay overall, we are leading initiatives to fine-tune discharge decisions to ensure the best patient outcomes in the most cost-efficient manner.

LENGTH OF STAY REDUCTION

Minimizing inpatient days following joint replacement surgery remains a sound clinical goal. Reducing length of stay helps patients recover faster; decreases the likelihood of many complications, including infections; and helps control inpatient costs. To this end, the Department of Orthopedic Surgery has developed two innovative programs for knee and hip replacement patients:

- The Guided Patient Services (GPS) Program facilitates efficient discharge with upfront planning and communication. A social worker works with the patient before hospitalization, to set the patient's expectations about the hospital experience and his or her discharge plan. Any issues are addressed prior to admission, leading to a smoother discharge process.
- The Rapid Rehab Program allows eligible patients to begin rehabilitation immediately after surgery, while they are still in the post-acute care unit (PACU). The program has significantly reduced average length of stay for joint replacement patients, and participants report higher levels of patient satisfaction.

LENGTH OF STAY



Average length of stay for primary hip and knee procedures at NYU Langone Orthopedic Hospital, 2010 through Q3 of 2017.

MAXIMIZING VALUE OF POST-DISCHARGE CARE

Prompted by bundled payment programs, orthopedic providers are examining the cost and outcome implications of discharge from the inpatient facility to a subacute rehabilitation facility versus discharge home.

There is no clear evidence that rehabilitation facilities, which add to the cost of care, improve patient outcomes following joint replacement. In contrast, home discharge with home-based rehabilitation and physical therapy is lower cost and provides excellent clinical outcomes. In light of this, orthopedic leaders should consider whether it is cost-efficient to keep patients in the hospital longer if it enables home discharge.

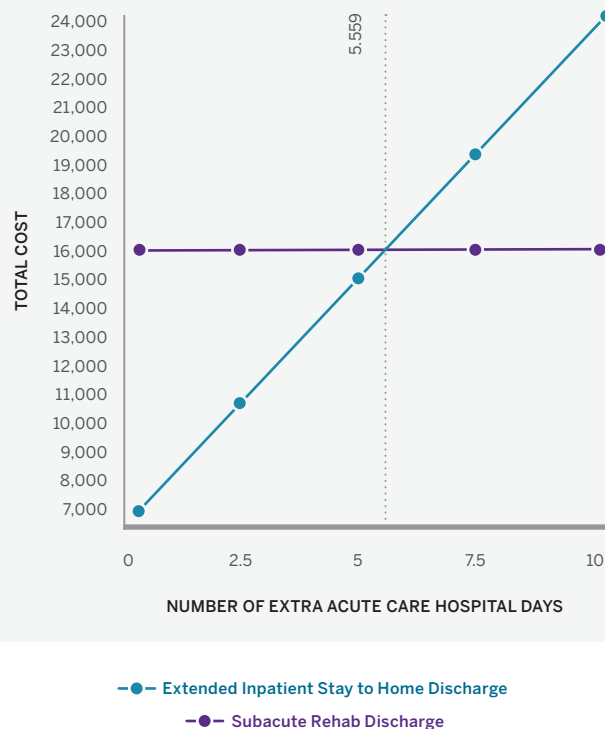
To answer this question, we examined the total episode costs of two post-acute care strategies: discharge to a rehabilitation center and extended inpatient stay followed by discharge home with services.

Many patients discharged to a post-acute inpatient rehabilitation facility will be there for an extended stay before being discharged home. In a typical scenario, the patient remains in the facility for 21 days, for a total cost of approximately \$16,000. In contrast, an extended inpatient stay costs approximately \$3,000 per day.

Because the cost of additional acute care hospital days is relatively low and the cost of an extended stay at an inpatient rehabilitation facility is relatively high, it can be cost-effective to extend the patient's inpatient stay—if it allows therapy and recovery to progress, enabling a safe home discharge.


Our decision analysis data demonstrate that keeping patients in the acute facility for up to 5.2 additional days results in overall lower costs than discharge to a post-acute facility—which supports the importance of a balanced approach to discharge decisions. We do not suggest that all joint replacement patients should be discharged home, but rather, that a discharge that is both safe and cost-efficient—not a shorter inpatient length of stay—should be the primary focus of discharge planning. Extending the inpatient stay is a strategic option that merits careful consideration.

COST ANALYSIS OF EXTENDED INPATIENT STAY VS. DISCHARGE TO REHABILITATION FACILITY



Quality and Outcomes Data by Subspecialty



 Laith M. Jazrawi, MD

Division of Trauma and Fracture Surgery

The Division of Trauma and Fracture Surgery has developed robust databases for tracking the clinical outcomes of trauma patients. Every patient treated by trauma faculty is enrolled in at least one outcomes database.

PREDICTING COST OF CARE FOR HIP FRACTURE PATIENTS

Hip fracture in older patients has serious health and financial consequences. Given the expected increase in the older population, proper management of hip fracture in these patients is imperative. Previous studies have shown that the PersonCare Score (PCS) can predict mortality in middle-aged and geriatric fracture patients during hospitalization. The PCS is expressed as a percentage between 0% and 100%. We wanted to determine whether the PCS could also predict resource utilization.

The study included all patients aged 55 years and older who were admitted with a primary diagnosis of hip fracture between October 1, 2014, and December 31, 2015. A total of 125 consecutive hip fracture patients were included in the cohort and prospectively followed throughout their hospitalization. No patients were lost to follow-up.

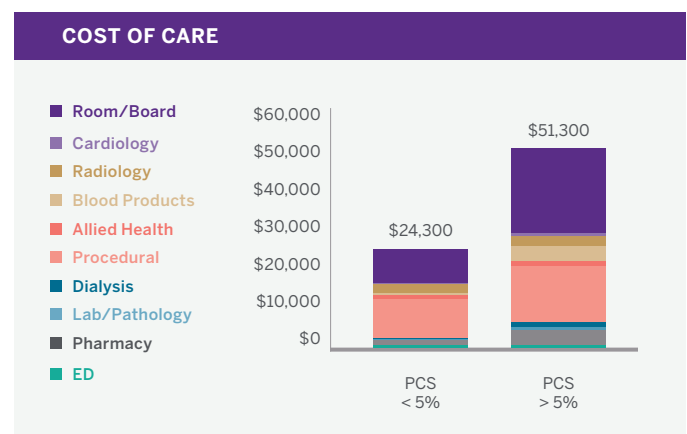
The mean age at the time of injury was 80 ± 11 years. Of the 125 patients, 96 were female and 29 were male. The patient cohort included 67 intertrochanteric fractures and 40 femoral neck fractures. Of the 125 patients, 116 underwent operative fixation and 5 were treated nonoperatively. Of patients treated operatively, 69 underwent open reduction internal fixation, 30 underwent hip arthroplasty, and 17 underwent closed reduction with percutaneous screws. The mean PCS was $4.6\% \pm 13.0\%$. Seventeen patients had a $PCS \geq 5.0\%$, our predetermined cutoff for higher risk. The average length of stay was 8.6 ± 5.6 days. Patients with a $PCS \geq 5\%$ had a significantly longer length of stay, 12.6 ± 9.9 days versus 8.0 ± 4.4 days. The average cost of care per patient was \$28,113. Procedural costs and room/board accounted for the majority of costs—an average of \$10,415 and \$10,354, respectively. There was a significant difference in cost of care between patients above and below the PCS high-risk cutoff. Patients with a $PCS \geq 5\%$ had an average total cost of \$51,300; those with a $PCS < 5\%$ had an average total cost of \$24,300.

The PCS represents a patient's risk of inpatient mortality. Patients with a higher risk of mortality tend to require increased hospital resources, as shown by the association between PCSs and hip fracture costs. Patients with a higher risk

of mortality (i.e., $PCS \geq 5\%$) incurred more than double the hospital costs of patients with a lower mortality risk.

We found that a very simple PCS calculated upon hospital admission could be used as a triage tool—not only to identify patients with an increased risk of inpatient mortality, but also to predict low-cost versus high-cost patients on the basis of their anticipated resource utilization. As such, the PCS could serve as a potential guide for inpatient triage toward specialized pathways of care, with the aim of improving quality and decreasing the overall cost of care.

Moving forward, healthcare providers and families may seek alternatives to lengthy and complicated hospital stays at the end of life, and tools such as the PCS may provide both with the necessary information to make informed choices about complex healthcare decisions following hip fracture.



Division of Shoulder and Elbow Surgery

The Division of Shoulder and Elbow Surgery's Shoulder Research Group conducts clinical, basic science, and translational studies to advance the understanding and treatment of shoulder and elbow ailments.

CHANGES IN DRIVING PERFORMANCE FOLLOWING SHOULDER ARTHROPLASTY

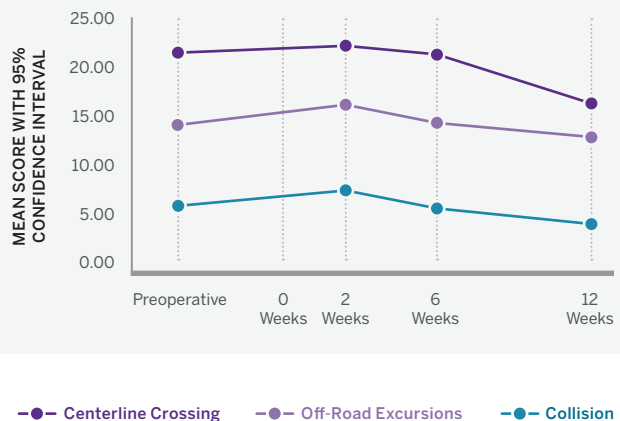
Shoulder arthroplasty significantly improves pain and overall quality of life in patients suffering from end-stage shoulder arthritis. Unfortunately, both shoulder arthritis and shoulder arthroplasty surgery adversely affect driving, a necessary task for many patients. Although previous studies show that up to 65% of patients report the ability to resume driving after shoulder arthroplasty, these studies do not characterize the appropriate postoperative time frame for the safe resumption of driving.

To address this question, we recruited subjects from a pool of patients scheduled for anatomical or reverse total shoulder arthroplasty surgery. All subjects had a valid driver's license. Driving performance was measured using a previously validated driving simulator. The simulated driving circuit represented a suburban environment with standard turns, traffic intersections, pedestrian crosswalks, and several hazards routinely encountered during driving situations. Driving performance was quantified in terms of the number of overall collisions, centerline crossings, and off-road excursions. To establish a baseline, participants received training and then "drove" in a simulated driving session. This baseline test was performed immediately before surgery. After surgery, participants completed similar driving sessions at postoperative weeks 2 (POW2), 6 (POW6), and 12 (POW12).

The data demonstrated that driving performance generally returned to preoperative baseline levels at POW6 and showed improvement against the baseline at POW12. The Visual Analog Scale for pain and the Shoulder Pain and Disability Index were significantly correlated with the number of collisions, suggesting that clinicians could use patient pain metrics to guide driving recommendations. Greater driving experience and younger age were also significant factors and had a positive effect on driving performance.

On the basis of our findings, clinicians could suggest a window of 6 to 12 weeks after surgery for the gradual return to driving. However, for patients of older age, with less driving experience, or with a greater pain level, the gradual return to driving could need to be delayed to 12 weeks following surgery.

DRIVING PERFORMANCE SCORES PREOPERATIVELY AND AT 2, 6, AND 12 WEEKS



THE INCIDENCE OF SUBSEQUENT SURGERY AFTER OUTPATIENT ARTHROSCOPIC ROTATOR CUFF REPAIR (ARCR)

ARCR provides excellent long-term results for patients with symptomatic rotator cuff tears for whom nonoperative treatment is unsuccessful. Since prior studies suggest an unclear association between functional outcomes and anatomical healing, we sought to characterize the incidence of and the risk factors for subsequent ipsilateral shoulder surgery following ARCR.

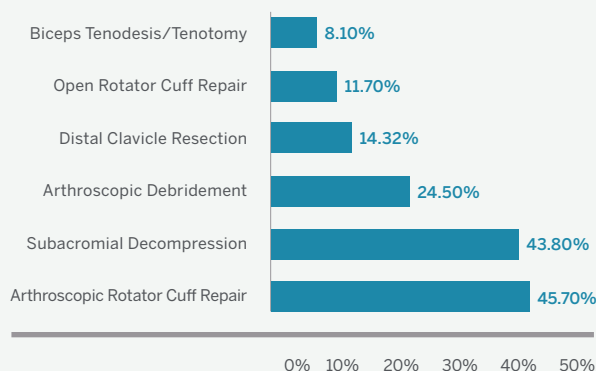
A query of the New York Statewide Planning and Research Cooperative System database using Current Procedural Technology codes identified patients with isolated outpatient ARCRs from 2003 through 2014. We collected demographic data as well as concomitant International Classification of Diseases, 9th Revision, Clinical Modification codes for each patient. Risk factors were identified by comparing patients who underwent subsequent shoulder surgery to those who did not.

Between 2003 and 2014, the annual volume of outpatient ARCRs increased 301% (from 1,200 to 4,812). Among all ARCR patients, 6% (1,826 of 30,430) underwent subsequent outpatient ipsilateral shoulder surgery, which included ARCR (45.7%),

subacromial decompression (43.8%), arthroscopic debridement (24.5%), distal clavicle resection (14.32%), open rotator cuff repair (11.7%), and biceps tenodesis/tenotomy (8.1%). Among all patients who underwent revision rotator cuff repair, 57.3% did so within two years of their primary surgery. Significant risk factors for subsequent surgery included younger age, the presence of a workers' compensation claim, and tobacco use.

Although reasons for repeat ipsilateral shoulder surgery are multifactorial, younger age, tobacco use, and the presence of a workers' compensation claim are independent predictors of subsequent outpatient procedures. A history of tobacco use was associated with accelerated time to subsequent surgery.

SUBSEQUENT OUTPATIENT IPSILATERAL SHOULDER SURGERIES AFTER ARTHROSCOPIC ROTATOR CUFF REPAIR



THE INFLUENCE OF A HISTORY OF CLINICAL DEPRESSION ON PERIOPERATIVE OUTCOMES IN ELECTIVE TOTAL SHOULDER ARTHROPLASTY

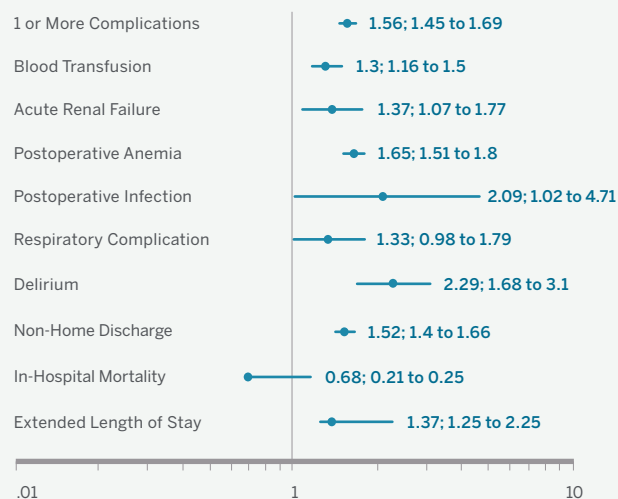
In the United States, clinical depression affects 16.9% of the general population and 20% to 80% of individuals who have chronic medical conditions. Previous studies have demonstrated that clinical depression adversely affects patient-reported outcomes, postoperative pain, and overall healthcare costs. Studies have also reported higher rates of perioperative complications and mortality among patients with clinical depression undergoing hip and knee arthroplasty surgeries.

However, there is minimal information on patients with clinical depression who undergo elective total shoulder arthroplasty (TSA), so we sought to examine the effect of depression on outcomes after these procedures.

We used the National (Nationwide) Inpatient Sample (NIS) to identify patients who had elective TSA between 2002 and 2012 in the United States and to identify associated clinical depression and other comorbidities in the study patients. During this period, 224,060 patients underwent elective TSA. Among these patients, the rate of clinical depression rose from 5.1% in 2002 to 15.4% in 2012. The overall prevalence of clinical depression over the entire study period was 12.4%. Compared to patients without clinical depression, patients with depression had longer hospital stays (2.5 ± 1.6 days versus 2.2 ± 1.6 days), greater likelihood of non-home discharge (16.6% vs. 11.8%), and more postoperative complications, including delirium, infection, anemia, and acute renal failure.

Orthopedic surgeons should be aware of the association between depression and postoperative complications following TSA and should consider using multidisciplinary teams to address clinical depression and help optimize outcomes in this patient population.

DEPRESSION IN TSA: ODDS RATIOS FOR COMPLICATIONS



Division of Sports Medicine

The Division of Sports Medicine faculty perform more than 5,000 procedures annually, including arthroscopic procedures on the knee, shoulder, elbow, and ankle.

DETERMINATION OF RISK FACTORS FOR 30-DAY READMISSION FOLLOWING SHOULDER SURGERY IN SPORTS MEDICINE

Readmissions following surgical procedures are costly and decrease patient satisfaction. With the emphasis on value-driven healthcare and the rising volume of shoulder surgery, it has become increasingly important to decrease the risk of readmission following these procedures. We sought to identify risk factors for readmission following shoulder surgery.

We used the National Surgical Quality Improvement Program database to identify all patients undergoing surgery for shoulder pathology from 2013 to 2014. Procedures included rotator cuff repair, labral repair for instability, and arthroscopy/debridement. Perioperative variables collected for each patient included patient demographics, comorbidities, and surgical factors. A total of 21,136 patients were identified. Of these, 228 (1.1%) were readmitted within 30 days. To identify significant risk factors for readmission, we constructed a multivariate regression

model, controlling for significant comorbidities, lab values, and operative variables.

For all shoulder surgery patients, factors that significantly predict 30-day readmission were inpatient surgery (odds ratio [OR] = 2.81, $p < .001$), functional dependence (OR = 2.71, $p = .006$), preoperative hypertension (OR = 1.54, $p = .031$), abnormal creatinine (OR = 1.59, $p = .033$), operative time (OR = 1.003, $p = .001$), and American Society of Anesthesiologists (ASA) score (OR = 1.96, $p < .001$). The same readmission risk factors were significant for labral repair patients and arthroscopy/debridement patients, considered separately. For patients undergoing rotator cuff repair, inpatient procedure, abnormal creatinine, and ASA score were significantly predictive of readmission.

Recognizing these risk factors may give providers the opportunity to modify perioperative care for at-risk patients to reduce the incidence of postoperative readmission.

SIGNIFICANT PREDICTORS OF READMISSION FOLLOWING SHOULDER SURGERY			
RISK FACTOR	ODDS RATIO	95% CONFIDENCE INTERVAL	P
Inpatient procedure	2.81	1.92-4.10	< 0.001
General anesthesia	2.53	0.93-6.89	0.071
Functional dependence	2.71	1.34-5.51	0.006
Hypertension	1.54	1.04-2.27	0.031
Abnormal creatinine	1.59	1.46-3.13	0.033
ASA score	1.96	1.45-2.61	< 0.001
Operative time	1.003	1.001-1.006	0.001

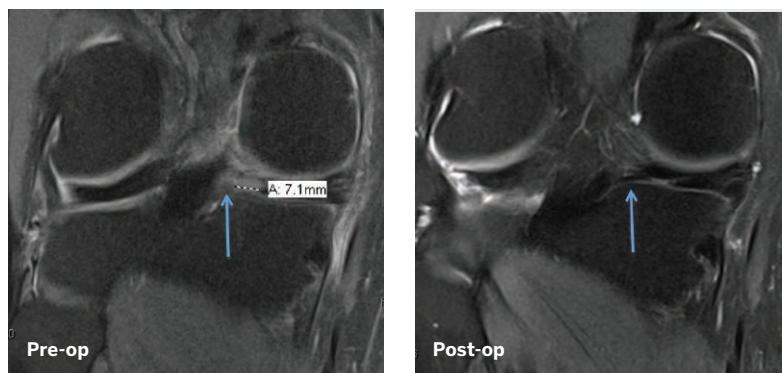
CLINICAL OUTCOMES AT TWO-YEAR FOLLOW-UP AFTER TRANSTIBIAL MEDIAL MENISCAL ROOT REPAIR

Meniscal root tears can lead to meniscal extrusion, loss of hoop stress distribution, and increased contact pressures within the tibiofemoral articulation, potentially leading to premature osteoarthritis. We sought to evaluate the effectiveness of the transtibial suture pull-out technique with two locking cinch sutures for medial meniscal root repair.

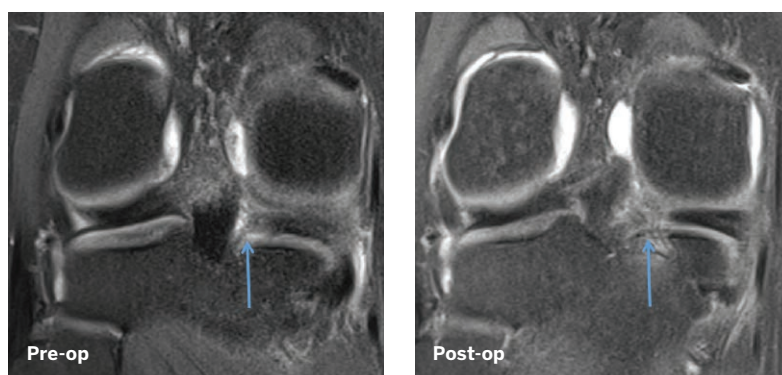
We evaluated 18 patients at a mean follow-up of 24.9 months. The International Knee Documentation Committee score increased from 45.9 preoperatively to 76.8 postoperatively, and the Lysholm knee score increased from 50.9 preoperatively to 87.1 postoperatively.

On magnetic resonance imaging (MRI), one root appeared completely healed, 16 appeared partially healed, and one appeared not healed. The mean tunnel placement for these patients was 5.29 mm away from the anatomical footprint. Mean extrusion increased from 4.74 mm preoperatively to 5.98 mm postoperatively. No patients with greater than 3 mm of extrusion on preoperative MRI had less than 3 mm of extrusion on postoperative MRI. International Cartilage Repair Society grades for both medial femoral condyle and medial tibial plateau worsened significantly.

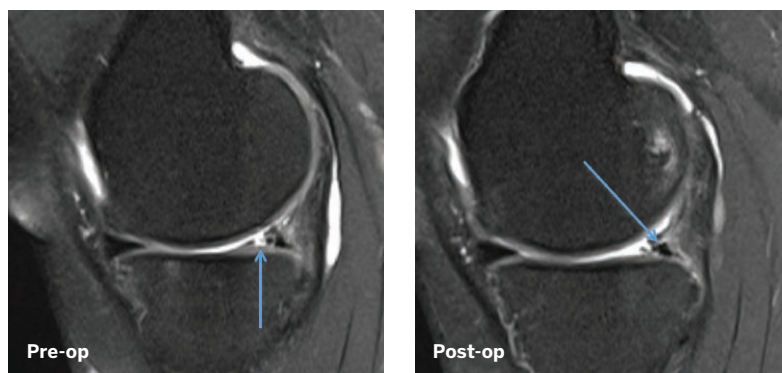
Patients treated with the transtibial suture pull-out technique with two locking cinch sutures had improved clinical outcomes. However, on follow-up MRI, these patients had only partial healing in the majority of cases, increased extrusion, and progression of medial compartment cartilage defect grade.



Preoperative and postoperative coronal MRI images demonstrating a completely healed meniscus. The signal intensity of the repair is black (similar in signal to the normal meniscus).



Preoperative and postoperative coronal MRIs demonstrating a partially healed meniscus. The repaired meniscus is intermediate in signal (not black).



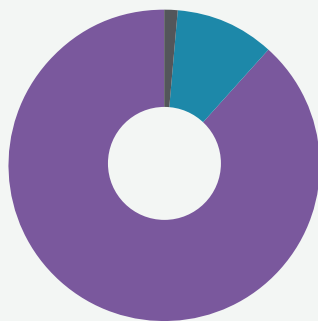
Preoperative and postoperative sagittal MRI images demonstrating a completely non-healed meniscus.

Division of Adult Reconstructive Surgery

The Division of Adult Reconstructive Surgery has 29 surgeons who performed more than 4,500 joint replacement procedures in 2017, including primary hip and knee replacements and complex revisions and reconstructions.

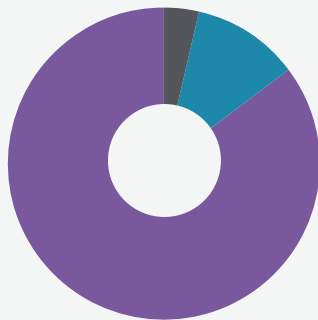
2017 TOTAL HIP PROCEDURE VOLUMES

30 Bilateral Total Hip Arthroplasty
215 Revision Total Hip Arthroplasty
1,839 Primary Total Hip Arthroplasty



2017 TOTAL KNEE PROCEDURE VOLUMES

91 Bilateral Total Knee Arthroplasty
266 Revision Total Knee Arthroplasty
2,047 Primary Total Knee Arthroplasty



USING RISK MITIGATION AND PATIENT OPTIMIZATION TO ENSURE ACCESS TO TOTAL JOINT REPLACEMENT

Healthcare reform aims to decrease the costs associated with elective procedures while maintaining or improving care quality. One mechanism for achieving this goal is bundled payments. Under programs such as the Bundled Payments for Care Improvement (BPCI) initiative, the hospital, the surgeon, the insurer, and the patient become stakeholders in determining the resources allocated to a procedure and the ultimate cost of the

episode of care. This model incentivizes provider stakeholders to control costs, yet it may have unintended consequences, such as incentivizing the restriction of care for patients at higher risk of complications. These patients may include individuals who are from lower socioeconomic classes, have higher rates of comorbidities, or have less access to centers of excellence—and who, therefore, may incur more costs and be considered fiscally unsound for this payment model.

The Division of Adult Reconstructive Surgery is committed to maintaining access for higher-risk patients for total joint arthroplasty. At NYU Langone Health, clinical leaders use evidence-based, standardized protocols to increase value without sacrificing quality or patient outcomes. Our Perioperative Orthopedic Surgical Home (POSH) program helps medically optimize patients for surgery. The goal is to mitigate risk factors for perioperative and postoperative complications through early detection and preoperative management of patient comorbidities.

Patients at high risk for complications and readmission are identified using the Readmission Risk Assessment Tool (RRAT), a scoring system developed at NYU Langone Health. The RRAT is based on modifiable risk factors that have been linked to higher readmission rates, including cardiac and stroke-predisposing conditions, increased body mass index, poor diabetes control, venous thromboembolic disease history or thrombophilia, smoking, behavioral/neurocognitive problems, drug and alcohol abuse, and *Staphylococcus aureus* colonization or infection risk. Patients who score high for readmission risk receive surgeon-directed preoperative risk factor optimization.


Through standardization of the preoperative screening process and optimization protocols, we have decreased overall length of stay, discharges to inpatient post-acute care facilities, and readmission rates at 30-, 60-, and 90-day intervals over a three-year period. Of note, our 90-day readmission rate for joint arthroplasty patients was reduced substantially, from 13% to 8%.

Delaying care to allow for medical optimization is the right thing to do for high-risk patients and the healthcare system, but restricting access to care is unacceptable. It is imperative that we focus our efforts on inclusion and optimization of these patients. Risk identification and mitigation have resulted in considerable cost savings for our hospital system while ensuring a pathway to joint replacement for higher-risk patients.

Division of Pediatric Orthopedic Surgery

The Division of Pediatric Orthopedic Surgery is projected to increase fivefold with a growing faculty and the anticipated 2018 opening of the new Hassenfeld Children's Hospital at NYU Langone.



 Pablo G. Castañeda, MD

QUALITY OF CARE IN PEDIATRIC ORTHOPEDIC SURGERY

In the Division of Pediatric Orthopedic Surgery, we define quality as care provided in a safe, timely, effective, efficient, equitable, and patient-centered manner. We are constantly seeking ways to improve the value of the care we provide by decreasing costs while achieving the same or better outcomes.

The future of our division depends on the combination of three principles:

- Remaining dedicated to metrics and transparency
- Pursuing variation reduction and quality improvement
- Embracing systematic efforts to improve outcomes for children under our care while increasing the value to the entire system

Our primary objective is to deliver extraordinary patient care and achieve the best possible clinical outcomes – defined not only by clinical result, but also by family and patient satisfaction. This is achieved by ensuring each patient receives care from the most appropriate provider, and are now using tablet technology to track patient/parent-reported outcomes and determine the effect of our interventions on patients' quality of life.

We also focus on patient safety with an emphasis on reducing complications. As part of this goal, we encourage faculty members to be innovative and thoughtful in the pursuit of performance improvement. Key priorities include

building systems for recognizing improvement opportunities, reporting our quality metrics transparently, analyzing quality data, and pursuing iterative modifications of care.

RADIATION EXPOSURE AND PEDIATRIC PATIENT SAFETY

The pediatric population is uniquely susceptible to the effects of radiation exposure associated with medical imaging; thus, orthopedic surgeons often face a dilemma when considering the clinical utility of a specific imaging study for a pediatric patient. It is crucial that physicians caring for children with musculoskeletal injuries or conditions understand the risks, benefits, and alternatives in making these important decisions.

Physicians in the Division of Pediatric Orthopedic Surgery are national leaders in disseminating information about newer imaging technologies that lower radiation exposure risk for pediatric patients. One new option is EOS Imaging's low-dose 3D imaging system, which scans patients while they are standing up. Because the system images patients in the natural weight-bearing posture, orthopedic surgeons are able to see the interaction between the joints and the rest of the musculoskeletal system, particularly the spine, hips, and legs. This technology reduces radiation exposure while still producing all the information needed for making the best patient care decisions; it is thus an excellent imaging option for pediatric patients.

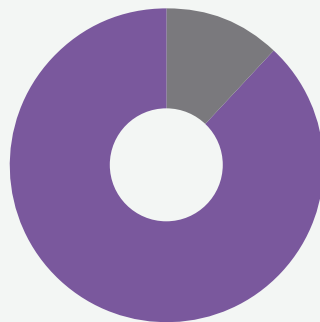
Division of Foot and Ankle Surgery

The Division of Foot and Ankle Surgery is one of the oldest divisions of its kind in the United States, tracing its origins to surgeon innovators such as Dr. Paul Lapidus and Dr. Melvin H. Jahss.

The Diabetic Foot and Ankle Center is a tertiary referral center specializing in the prevention of amputations in patients with diabetes. At the center, orthopedic surgeons, podiatrists, plastic surgeons, physiatrists, vascular surgeons, and prosthetic/orthotic specialists manage complications such as ulcers, infections, and Charcot deformities, while an endocrinologist and a nurse practitioner provide overall diabetes management.

FY 2017 FOOT AND ANKLE SURGERY VOLUMES

147 Inpatient
1,065 Ambulatory



IMPROVING SURGICAL OUTCOMES FOR DIABETIC PATIENTS

Patients with diabetes have a greater risk of poor surgical outcomes. To improve surgical care for this population, the Diabetic Foot and Ankle Initiative at NYU Langone Health implemented preoperative planning at the point of surgery recommendation. Our objectives were to reduce hospital length of stay and facilitate safe discharge to home.

The care team worked with diabetic patients scheduled for surgery with same-day admission. They established an inpatient plan of care preoperatively and implemented preoperative vendor service referrals in anticipation of home discharge. Average length of stay was 2.1 days for patients who received this intervention and 4.8 days for patients who did not. For patients who received the intervention, there were no readmissions (as defined) within the 30-day post-discharge period. With regard to patient satisfaction measures, patients who received the intervention overwhelmingly rated preoperative preparation and hospitalized care as “good” or better and home care services as “fair” or better.



↑ Steven Sheskier, MD

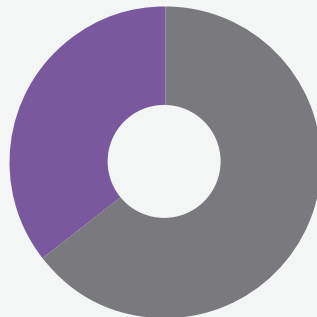
Division of Spine Surgery

The Division of Spine Surgery faculty use the latest techniques to treat spinal conditions, and are committed to an evidence-based, patient-centered approach to the management of spinal disorders.

The research program is focused on optimizing patient care by using cutting-edge techniques in the analysis of clinical outcomes. Faculty members have helped pioneer the use of large administrative databases to carry out high-volume analysis of risk factors in spinal surgery.

FY 2017 SPINE DIVISION DISCHARGES

1,632 Inpatient
897 Ambulatory



THE IMPORTANCE OF PATIENT EXPERIENCE MEASURES IN IMPROVING PRESS GANEY SCORES

























Several payment programs developed by the Centers for Medicare & Medicaid Services (CMS) use the results of patient experience surveys to help determine hospital reimbursement. One of the most commonly used tools is the Press Ganey survey, which evaluates several patient experience measures, such as communication with providers, communication of discharge information, and pain control. We wanted to know which measures had the greatest influence on patients' overall rating of the hospital and whether those measures differed across orthopedic subspecialties.

We performed a retrospective review of 4,076 Press Ganey survey results from patients who had undergone inpatient orthopedic surgery in the Divisions of Spine Surgery, Adult Reconstructive Surgery, and Trauma and Fracture Surgery between 2013 and 2015. A correlation analysis was performed between each of the patient experience measures and the overall hospital rating.


We found that in spine surgery, the most significant driver of overall hospital satisfaction was communication with doctors, followed by communication with nurses and the hospital environment. In adult reconstructive surgery, the most influential driver of overall satisfaction was discharge information, followed by communication with nurses and care transitions. In orthopedic trauma surgery, the most important driver of overall satisfaction was care transitions, followed by communication with nurses and the hospital environment.

Our analysis showed subspecialty variation in the primary factors influencing patients' overall satisfaction with their inpatient hospital stay following orthopedic surgery. It also demonstrated the importance of communication with nurses and the hospital environment across all subspecialties and years evaluated. Therefore, allocating resources to uphold our Magnet designation for nursing excellence and to maintain a quiet and clean hospital atmosphere may improve overall patient satisfaction.

PATIENT EXPERIENCE MEASURES CORRELATED WITH OVERALL HOSPITAL RATINGS (BY DIVISION)

PRESS GANEY MEASURE	SPINE SURGERY	ADULT RECONSTRUCTION	ORTHOPEDIC TRAUMA
Communication with doctors			
Communication about medicines			
Communication with nurses			
Care Transitions			
Discharge information			
Hospital Environment			
Pain management			
Responsiveness of hospital staff			

 Strong correlation: 0.6 or above

 Moderate correlation: above 0.4 but below 0.6

 Weak or no correlation: 0.4 or lower

INTRAOPERATIVE FLUID ADMINISTRATION DURING MULTILEVEL SPINE SURGERY AFFECTS EXTUBATION STATUS: A PROPENSITY SCORE MATCHED (PSM) ANALYSIS

Improved understanding of spine anatomy and advances in fusion techniques have made the performance of complex multilevel spine fusion procedures common. However, multilevel spine surgery is associated with high complication rates, possibly because patients undergoing these procedures are at risk for delayed extubation. For surgeries involving large blood loss and prolonged surgical times, there is disagreement on optimal protocols for intraoperative fluid replacement. Few studies have evaluated how the type and the proportion of intraoperative fluid affect early versus delayed extubation in multilevel spine surgery.

We performed a single-center retrospective review of 246 adult patients who underwent procedures with four or more levels of thoracic and/or lumbar spine fusion between January 2012 and October 2013. Patients were categorized by postoperative extubation status, with 198 patients receiving immediate extubation (IMEX) in the operating room (OR)/post-anesthesia care unit (PACU) and 48 patients receiving delayed extubation (DEX) outside the OR/PACU. Patients were PSM for age, body mass index, American Society of Anesthesiologists grade, duration of surgery, number of spine levels fused, performance of three-column osteotomy, and intraoperative estimated blood loss (EBL). Additional analysis was performed for the type and the

proportion of fluids administered for increasing levels of EBL and the associated impact on IMEX versus DEX.

PSM analysis demonstrated that increased administration of non-cell saver blood products (NCSB) and increased ratio of crystalloids to colloids infused were independently associated with DEX. Increased EBL was associated with increased NCSB infusion for IMEX and DEX. However, with increasing EBL, the proportion of crystalloids infused was reduced for IMEX ($R = -0.5$, $p < .001$) while the proportion of crystalloids infused remained relatively unchanged for DEX ($R = -0.27$; $p = .06$). Of patients receiving a crystalloid-to-colloid ratio $> 3:1$, 26% had DEX; in comparison, no patients receiving a crystalloid-to-colloid ratio $\leq 3:1$ had DEX ($p = .009$). Patients who had DEX had more cardiac and pulmonary complications and surgical site infections and longer intensive care unit and hospital stays ($p < .05$).

Our results indicate that the type and the proportion of intravenous fluid administered during multilevel spine fusion surgery influences extubation status independently of age, comorbidities, operative time, and EBL. Immediate extubation was facilitated by diminishing the proportion of crystalloid to total intraoperative fluid administered. Consequently, patients expected to have high EBL are at risk for delayed extubation if the proportion of crystalloid administered is not reduced relative to total intraoperative fluid. When permissible, prompt postoperative extubation may reduce complications and facilitate early postoperative rehabilitation.

↓ Thomas J. Errico, MD, and Anthony K. Frempong-Boadu, MD



TOTAL HIP ARTHROPLASTY (THA) IN THE SPINAL DEFORMITY POPULATION: DOES DEGREE OF SAGITTAL DEFORMITY AFFECT RATES OF SAFE ZONE PLACEMENT, INSTABILITY, OR REVISION?

Changes in spinal alignment and pelvic tilt alter acetabular orientation in predictable ways, which may have implications for the stability of THA. Patients with sagittal spinal deformity may be at particularly high risk of THA instability because of postural compensation for abnormal spinal alignment.

Using standing stereoradiography, we evaluated the spinopelvic parameters, acetabular cup anteversion, and inclination of 139 THAs in 107 patients with sagittal spinal deformity. Standing images were compared with supine pelvic radiographs to evaluate dynamic changes in acetabular cup position. Dislocation and revision rates were procured through retrospective chart review. The spinal parameters and acetabular cup positions were compared for dislocators and non-dislocators.

Our results showed that the rate of THA dislocation in this cohort was 8.0%, with a revision rate of 5.8% for instability. Patients who sustained dislocations had significantly higher

spinopelvic tilt, T1-pelvic angle, and mismatch of lumbar lordosis and pelvic incidence. Among all patients, 78% had safe anteversion while supine, whereas only 58% had safe anteversion when standing, because of increases in spinopelvic tilt. Among dislocating THAs, 80% of patients had safe anteversion, 80% of patients had safe inclination, and 60% had both parameters in the safe zone.

In this cohort, patients with THA and concomitant spinal deformity had a particularly high rate of THA instability despite having an acetabular cup position traditionally considered within the range of acceptable alignment. This dislocation risk may be driven by the degree of spinal deformity and by spinopelvic compensation. Surgeons should anticipate potential instability after hip arthroplasty for patients with spinal deformity and adjust their surgical plans accordingly.

Division of Hand Surgery

The Division of Hand Surgery is one of the nation's largest academic and clinical divisions of its type. The faculty consists of more than 20 subspecialty-certified and fellowship-trained hand surgeons.

WIDE AWAKE HAND SURGERY (WAHS) PROTOCOL

Common hand surgeries such as carpal tunnel release, trigger finger release, and Dupuytren's contracture release are usually performed with an anesthesiologist administering anesthesia and intravenous sedation. Patients indicated for these hand procedures are required to undergo the same perioperative process—including preoperative testing and intravenous access insertion—as patients undergoing much more complex procedures.

WAHS is a surgical technique whereby common hand procedures are conducted under local anesthesia administered by the surgeon. In WAHS, anesthesia and hemostasis are achieved with local injections of numbing agents and vasoconstrictors in the wrist or the hand. This obviates the need

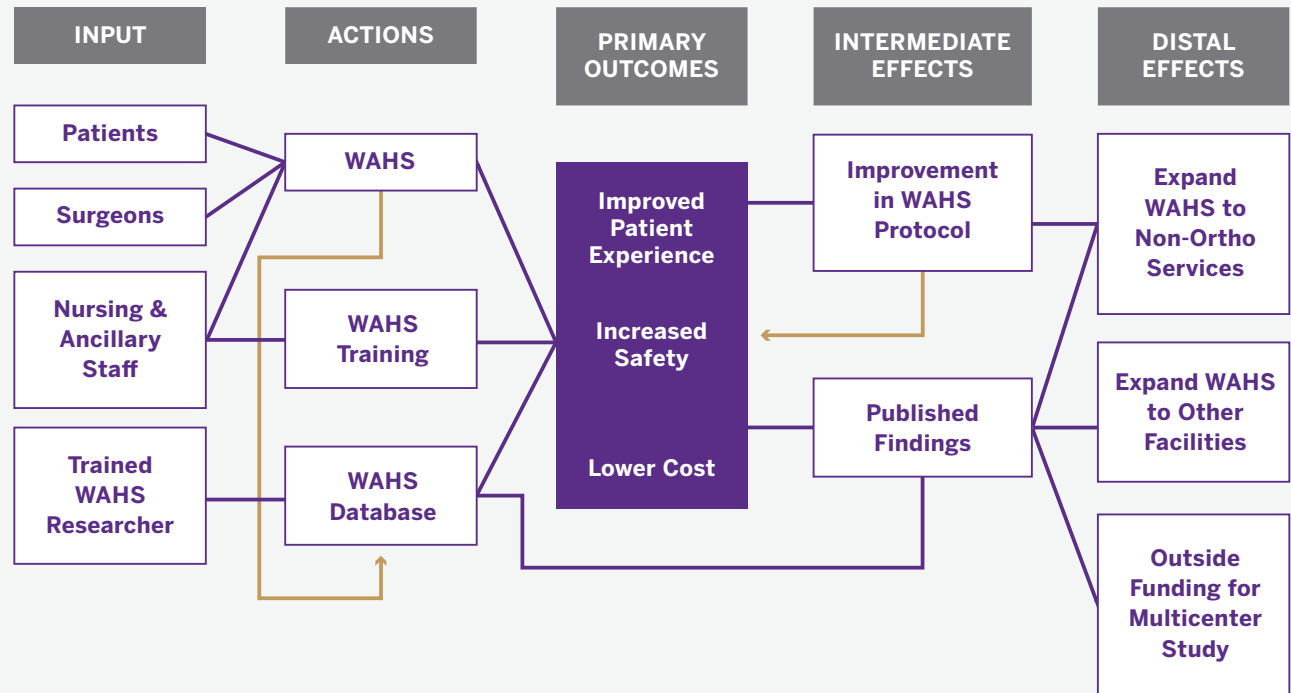
for traditional anesthesia, tourniquets, intravenous access, post-surgical hospital beds, patient chaperones, associated operating room staff, and fasting before surgery. Furthermore, since patients are awake during the procedure, WAHS can provide surgeons with real-time feedback—for instance, during tendon repair, patients can be asked to actively range their fingers.

WAHS has been successfully performed at NYU Langone Health and other centers around the country. However, current requirements specify that WAHS must be performed with an anesthesiologist present and in a fully equipped operating room rather than in an ambulatory procedure room. These measures drastically limit the ability of WAHS to reduce costs and streamline care. Having patients prepare for



↑ S. Steven Yang, MD, MPH

LOGIC MODEL FOR THE IMPLEMENTATION OF WIDE AWAKE HAND SURGERY



traditional anesthesia under the direction of an anesthesiologist when no anesthesia is administered is a burden to patients and an unnecessary allotment of hospital resources. Furthermore, the use of an operating room when its equipment is not needed misappropriates valuable block time and staffing.

To address these issues and help realize the potential of an ambulatory approach to hand surgery, we designed an Institutional Review Board–approved study to monitor the outcomes of the WAHS protocol. Preliminary evaluation and

prospective monitoring of WAHS cases have shown that there have been no complications related to the anesthesia and that no cases had to be converted to regular anesthesia. In addition, 100% of WAHS patients reported that they would have the surgery performed in the same way again.

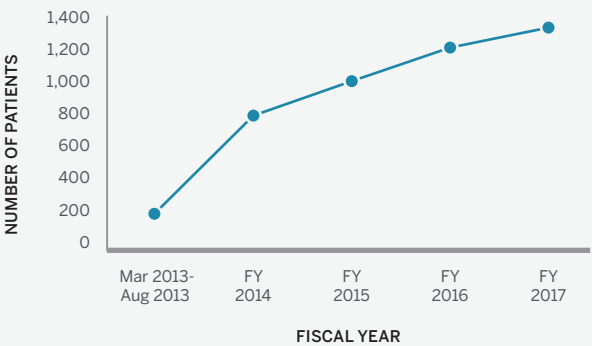
At NYU Langone, the WAHS protocol was initiated by a limited group of hand surgeons. Once the protocol is perfected, it will be expanded to the entire division and to other services and facilities.

Division of Primary Care Sports Medicine

The Division of Primary Care Sports Medicine faculty members collaborate with orthopedic surgeons, musculoskeletal radiologists, physical therapists, exercise physiologists, nutritionists, and psychologists to treat injuries that affect athletes and their performance.

The Concussion Center was established to provide comprehensive care for patients with concussions. Concussion is a complex and growing area of concern, as the incidence of this injury in youth and professional sports rises and new facts emerge about how it affects the brain. The immediate and long-term effects of concussion can impair a person’s neurological, psychological, and physical health. Our center is led by a multidisciplinary team of experts, including adult and pediatric neurologists and physical medicine and rehabilitation physicians, neurosurgeons, sports medicine physicians, emergency medicine physicians, nurses, neuropsychologists, physical and occupational therapists, and neuroradiologists. Working together as a team, these clinicians offer each patient the personalized treatment plan that best meets his or her needs.

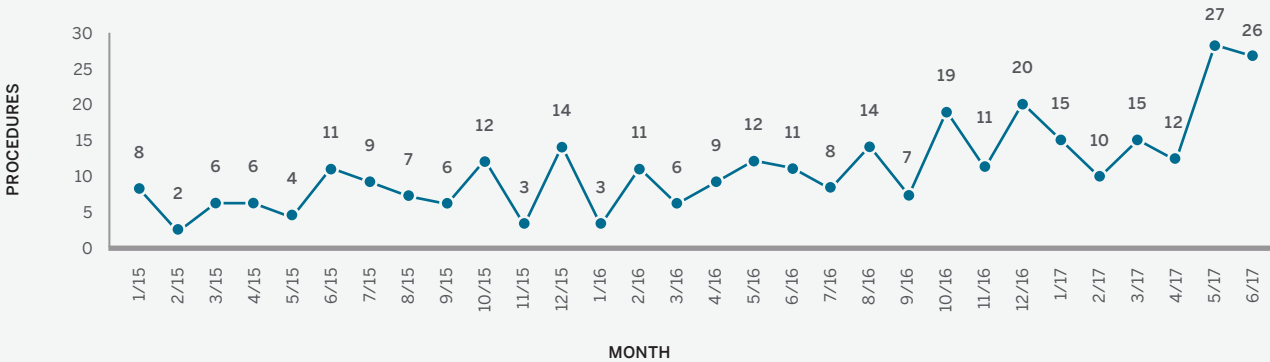
CONCUSSION CENTER:
TOTAL PHYSICIAN VISITS SCHEDULED



NEW THERAPEUTIC MODALITIES IN SPORTS MEDICINE

The Division of Primary Care Sports Medicine is a leader in the study and use of emerging therapies such as biologics (platelet-rich plasma, bone marrow aspirate, and stem cells), extracorporeal shockwave therapy, and glyceryl trinitrate patches. The division uses these therapeutic modalities in appropriate candidates with orthopedic conditions ranging from strains and sprains to osteoarthritis.

SPORTS BIOLOGICS MONTHLY VOLUME



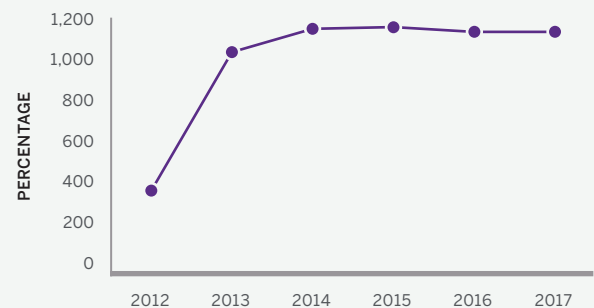
Division of Orthopedic Oncology

The Division of Orthopedic Oncology and Perlmutter Cancer Center work together to care for patients with a broad spectrum of neoplastic processes involving the musculoskeletal system.

Our orthopedic surgeons collaborate with colleagues in medical oncology, pediatric oncology, radiation oncology, pathology, and radiology to diagnose and treat benign and malignant tumors of the bone and the soft tissue. This multidisciplinary approach helps ensure that patients with complex disease states receive the best available treatments.

The Division of Orthopedic Oncology continued to grow its clinical and surgical volumes in 2016. The addition of new faculty members to the Department of Pediatrics and the Department of Medicine's Division of Hematology and Medical Oncology has enhanced our ability to provide multidisciplinary care to patients with bone and soft tissue cancers.

ORTHOPEDIC ONCOLOGY OUTPATIENT VISITS



↓ Pierre Saadeh, MD, and Timothy B. Rapp, MD



Integrated Quality and Safety Initiatives



Integrated Quality and Safety Initiatives

A strong patient safety program requires the active participation of everyone involved in the care process. At an academic medical center, that means it is essential to engage residents and medical students in quality and safety training and initiatives.

GRADUATE AND UNDERGRADUATE MEDICAL EDUCATION

At NYU Langone Health, this approach achieves two goals. First, it helps us build and maintain a culture of safety in which every member of our care team feels comfortable reporting safety issues without fear of retribution. Residents and medical students are traditionally in subordinate positions, so it is important to overcome their reluctance to speak up about potential safety problems.

Second, involving students and residents in patient safety is key to teaching quality and safety concepts to the next generation of physicians. We regularly lecture both medical students and residents on critical issues in safety and quality. Our program instills students and residents with a strong sense of their obligation to enhance patient safety and improve overall quality.

QUALITY AND PATIENT SAFETY CONCENTRATION

Our unique Quality and Patient Safety Concentration gives medical students a strong foundation in quality and patient safety principles, with a focus on musculoskeletal care.

The five components of this concentration are patient safety, patient satisfaction, quality indicators, public policy initiatives, and improvement strategies. Students learn strategies and mechanisms for planning, implementing, and measuring quality and patient safety initiatives. All students in this concentration are required to submit a research abstract on a quality/safety topic. More than 25 medical students have participated in the Quality and Patient Safety Concentration since its inception five years ago.

GRADUATE MEDICAL EDUCATION

One of the best ways to teach safety and quality concepts to new physicians is to involve them in research. In recent years, the Department of Orthopedic Surgery has involved residents in more than 100 research projects involving patient safety and quality.

In addition, the department collaborates with leaders across NYU Langone to develop new strategies for improving safety and quality education. Faculty participate actively in the medical center's Task Force on GME Patient Safety and Quality Curriculum, which helps ensure a strong quality/safety core curriculum across education programs and departments.

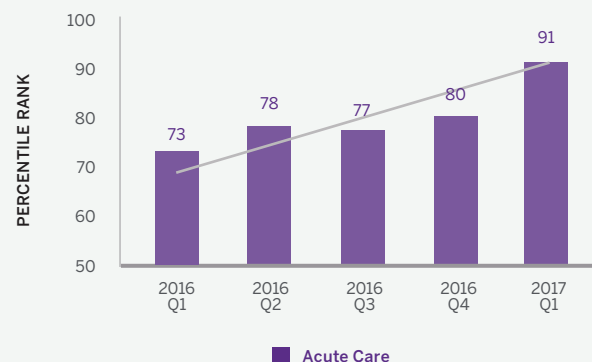
ONGOING NURSING QUALITY AND SAFETY PROJECTS

The Magnet-designated nursing department at NYU Langone actively partners with the Department of Orthopedic Surgery to ensure safe, high-quality care for our patients. We have collaborated on several successful patient safety programs, including a recent project to increase patients' understanding of their medications and side effects.

Although several unit-based teams were already working to improve patient education about medications, each unit operated on its own, isolated from the other units, without a coordinated, programmatic approach for communication about medications and with no venue for sharing unit-based best practices throughout the organization.

Through an interdisciplinary team approach led by Nursing and the Lean Management Team, nurses working alongside physicians have developed a standardized process for education about medications that is now being used by all units across the continuum. The interdisciplinary team developed, reviewed, and approved a standardized education tool, and its use has proved successful. Between the first quarter of 2016 and the first quarter of 2017, our composite Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) domain scores for communication about medications have risen from the 73rd percentile to the 91st percentile.

ACUTE CARE COMMUNICATION ABOUT MEDICINES COMPOSITE



Presentations and Publications on Quality and Safety

SELECTED PODIUM AND POSTER PRESENTATIONS

American Academy of Orthopedic Surgeons Annual Meeting (Orlando, FL, March 1–5, 2016)

- Socioeconomic Status Independently Affects HCAHPS Scores
- End Tidal Carbon Dioxide (ETCO₂) Predicts Pulmonary Embolism in Postoperative Orthopedic Patients
- Psychiatric Conditions Impact 90-Day Hospital Readmission Rates Following Total Joint Replacement
- The Relationship Between Hospital Payer Mix and Volume Growth in Total Joint Arthroplasty
- The Incidence of Unplanned Admission from an Outpatient Orthopedic Surgery Center
- Comparison of Perioperative Times at an Ambulatory Surgery Center and an Outpatient Hospital
- Improvement in TJA Quality Metrics: Year One vs. Year Three of the Bundled Payment for Care Initiative
- The Effect of Severity of Illness on Spine Surgery Costs Across New York State Hospitals
- Hospital Specific Hip Arthroplasty Surgical Site Infection Rates Do Not Correlate with Other Procedure SSI Rates
- Lifetime Initiative for the Management of Arthritis (LIMA): Understanding Arthritis as a Disease State
- Antibiotic Stewardship in Orthopedic Surgery: Principles and Practice (Moderator)

2016 Scientific Program and Sir Robert Jones Lecture (New York City, May 5–6, 2016)

- Utilization of Lumbar Spinal Fusion in New York State: Trends and Disparities
- Improvement in Total Joint Replacement Quality Metrics: Year One vs Year Three of the Bundled Payment for Care Initiative
- Risk Stratified Venous Thromboembolism Prophylaxis Following Total Joint Arthroplasty: Aspirin and Sequential Pneumatic Compression Devices Versus Aggressive Chemoprophylaxis
- The Design of a Total Knee with Anatomic Motion and Laxity Based on Replicating Normal Structural Mechanisms
- Prior S. Aureus Nasal Colonization Remains a Risk Factor for Surgical Site Infections Following Decolonization: Analysis of 14,959 Patients

Raney Professorship in Orthopedics (Chapel Hill, NC, June 3–4, 2016)

- Navigating the Alternative Payment Universe

Association for Healthcare Resource & Materials Management CQO Summit (San Diego, August 1, 2016)

- Alternative Payment Models and Orthopedic Surgery

National Association of Healthcare Quality Conference (New York City, September 16, 2016)

- Creating Value in Total Joint Replacement

California Hospital Association: Implementing CJR—Strategies for Success (Los Angeles, October 25, 2016)

- Developing and Implementing Quality Improvement Strategies

Becker's ASC 23rd Annual Meeting (Chicago, October 27–29, 2016)

- The Seven Pillars of Bundled Payment Success: Orthopedics and Beyond

U.S. News & World Report The Future of Healthcare Symposium (Washington, DC, November 3, 2016)

- CJR and Bundled Payments

Michigan Arthroplasty Registry Consortium for Quality Improvement Meeting (Ann Arbor, MI, November 4, 2016)

- Keys to Success in the Alternative Payment Universe: Bundling and Beyond

American Association of Hip and Knee Surgeons Annual Meeting (Dallas, November 10–13, 2016)

- Revision Total Hip Arthroplasty: Reducing Hospital Cost Through Fixed Implant Pricing
- Co-Infection with Hepatitis C and HIV in Total Hip Arthroplasty: An Incremental Effect of Disease Burden
- It's a Brave New World: Alternative Payment Models and Value Creation in Total Joint Replacement (Symposium II: Creating Value in Joint Replacement)
- Optimizing the episode symposium: the future of bundled care

Orthopedic Summit: Evolving Techniques (Las Vegas, December 7–10, 2016)

- Decreasing Total Joint Implant Costs and Physician Specific Cost Variation Through Negotiation

OR Business Management Conference (New Orleans, February 1, 2017)

- Key Quality Metrics to Achieve High-Value Health Care

2nd Annual Safety in Spine Surgery Summit (New York City, February 10, 2017)

- Cell Saver in Orthopedic Spine Surgery: A Value Based Utilization Analysis
- Institution-Wide Blood Management Protocol Reduces Transfusion Rates Following Spine Surgery
- Failure of Bundled Payment in Spine Surgery

American Academy of Orthopedic Surgeons Annual Meeting (San Diego, March 14–18, 2017)

- The Keys to Success in Bundled Payment Models
- Variations in Hip Fracture Baseline Patient Demographics, Comorbidities, and Severity of Illness: Repercussions on Bundled Payment for Care Initiative
- Two-Year Experience of the Lumbar Spine Fusion Bundled Payments for Care Improvement Initiative
- Hip Arthroplasty for Fracture vs. Elective Patients: One Bundle Does Not Fit All

American College of Medical Quality (Washington, DC, March 29–April 1, 2017)

- An Evidence Based Blood Management Protocol Decreases Transfusion Rates Following Total Joint Arthroplasty
- Use of Cell Saver in Spinal Surgery: A Value Based Utilization Analysis

ICJR Transatlantic Orthopaedic Congress (New York, NY October 13, 2017)

- Value based medicine: quality metrics and the future of hospital and physician payment

Orthopedic Trauma Association Annual Meeting (Vancouver, BC, October 13, 2017)

- Bundled based payment symposium: value based medicine

OR Manager's Bootcamp (Dallas, Texas, October 23, 2017)

- The future of bundled payments

2017 National Caucus on Arthritis and Musculoskeletal Health Disparities (Washington, DC, November 8–9)

- Ethics, disparities and bundled payments

SELECTED PEER-REVIEWED PUBLICATIONS

- Adrados M, Theobald J, Hutzler L, Bosco J. The centralization of total joint arthroplasty in New York State: an analysis of 168,247 cases. *Bulletin of the Hospital for Joint Diseases* (2013). November 2016; 74(4): 282-286.
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- Behery OA, Kouk S, Chen KK, Mullaly KA, Bosco JA, Slover JD, Iorio R, Schwarzkopf R. Skilled nursing facility partnerships may decrease 90-day costs in a total joint arthroplasty episode under the Bundled Payments for Care Improvement Initiative. *The Journal of Arthroplasty*. October 16, 2017; 10.1016/j.arth.2017.10.013.
- Behery OA, Kester BS, Williams J, Bosco JA, Slover JD, Iorio R, Schwarzkopf R. Patterns of ninety-day readmissions following total joint replacement in a bundled payment initiative. *The Journal of Arthroplasty*. April 2017; 32(4): 1080-1084.
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- Bosco J, Iorio R, Barber T, Barron C, Caplan A. Ethics of the physician's role in health-care cost control: AOA critical issues. *Journal of Bone and Joint Surgery*. American Volume. July 2016; 98(14): e58.
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- Bosco JA, Tejada P, Catanzano AJ, Stachel AG, Phillips MS. Expanded gram-negative antimicrobial prophylaxis reduces surgical site infections in hip arthroplasty. *The Journal of Arthroplasty*. March 2016; 31(3): 616-621.
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- Buza JA 3rd, Liu JX, Jancuska J, Bosco JA 3rd. The regionalization of total ankle arthroplasties and ankle fusions in New York State: a 10-year comparative analysis. *Foot & Ankle Specialist*. June 2017; 10(3): 210-215.
- Catanzano AA, Hutzler LH, Bosco JA. The relationship between hospital payer mix and volume growth in total joint arthroplasty: a 12-year analysis. *The Journal of Arthroplasty*. August 2016; 31(8): 1641-1644.
- Chan HY, Walker PS, Lerner A, Chaudhary M, Bosco JA. Design of reverse materials resurfacing implants for mild-moderate medial osteoarthritis of the knee. *Journal of Medical Devices*. December 21, 2016; 11(1): 011004-011004-7.
- Chen KK, Hartly JH, Bosco JA. It is a brave new world: alternative payment models and value creation in total joint arthroplasty: creating value for TJR, quality and cost-effectiveness programs. *The Journal of Arthroplasty*. June 2017; 32(6): 1717-1719.
- Clair AJ, Evangelista PJ, Lajam CM, Slover JD, Bosco JA, Iorio R. Cost analysis of total joint arthroplasty readmissions in a bundled payment care improvement initiative. *The Journal of Arthroplasty*. September 2016; 31(9): 1862-1865.
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- Dundon JM, Bosco J, Slover J, Yu S, Sayeed Y, Iorio R. Improvement in total joint replacement quality metrics: year one versus year three of the Bundled Payments for Care Improvement initiative. *Journal of Bone and Joint Surgery*. American Volume. December 2016; 98(23): 1949-1953.
- Elbuluk A, Bosco JA. Private payer bundled payment arrangements. *Seminars in Arthroplasty*. September 2016; 27(3): 201-206.
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- Evangelista PJ, Aversano MW, Koli E, Hutzler L, Inneh I, Bosco J, Iorio R. Effect of tranexamic acid on transfusion rates following total joint arthroplasty: a cost and comparative effectiveness analysis. *Orthopedic Clinics of North America*. April 2017; 48(2):109-115.
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- Iorio R, Clair AJ, Inneh IA, Slover JD, Bosco JA, Zuckerman JD. Early results of Medicare's bundled payment initiative for a 90-day total joint arthroplasty episode of care. *The Journal of Arthroplasty*. February 2016; 31(2): 343-350.
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About Us

Department of Orthopedic Surgery

The Department of Orthopedic Surgery at NYU Langone Health is one of the largest and most accomplished orthopedic programs in the country. Our growing faculty includes more than 200 physician experts dedicated to excellence in orthopedic surgery. Under the leadership of department chair Joseph D. Zuckerman, MD, the Walter A.L. Thompson Professor of Orthopedic Surgery and Surgeon-in-Chief at NYU Langone Orthopedic Hospital, our faculty members provide world-class care in all orthopedic subspecialties, including adult reconstructive surgery, orthopedic trauma, spine surgery, sports medicine, hand surgery, musculoskeletal oncology, shoulder and elbow surgery, pediatric orthopedics, primary care sports medicine, and foot and ankle surgery.

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Shoulder and Elbow Surgery

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Tisch Hospital

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Nader Paksima, MPH, DO

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Veterans Affairs New York Harbor

Healthcare System

Paul J. Ort, MD

For more information about our physicians and locations, visit [nyulangone.org](https://www.nyulangone.org)

Department of Orthopedic Surgery — Center for Quality and Patient Safety

The Department of Orthopedic Surgery's Center for Quality and Patient Safety performs research and provides education on the importance of quality and safety in the delivery of musculoskeletal care.

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For more information on our quality
and outcomes studies, please contact
**Lorraine Hutzler, Associate Program Director,
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at 212-598-6048.**

NYU Langone Health — Quality, Patient Safety, and Patient Experience Leadership

Our department's efforts follow a robust enterprise-wide focus on quality initiatives reinforced by NYU Langone leadership, including our Dean and CEO, Robert I. Grossman, MD, and these leaders:

Fritz Francois, MD

Associate Professor of Medicine
Chief Medical Officer and Patient
Safety Officer

Joan Kelly, MBA

Chief Patient Experience Officer

Michael S. Phillips, MD

Associate Professor of Medicine
Director, Hospital Epidemiology and
Infection Control

Robert A. Press, MD, PhD

Senior Vice President and Vice Dean,
Chief of Hospital Operations

Martha J. Radford, MD

Professor of Medicine and Population Health
Chief Quality Officer

Leadership

New York University

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NYU Langone by the Numbers

1,519 Beds	98 Operating Rooms	172,072 Emergency Room Visits	68,884 Patient Discharges	4,500,000 Outpatient Faculty Practice Visits	9,654 Births	
3,633 Physicians	5,104 Nurses	516 MD Candidates	85 MD/PhD Candidates	263 PhD Candidates	418 Postdoctoral Fellows	1,327 Residents and Fellows
5,087 Original Research Papers	549,707 Square Feet of Research Space	\$359M NIH Funding	\$364M Total Grant Revenue			

*Numbers represent FY17 (Sept 2016–Aug 2017) and include NYU Langone Hospital—Brooklyn

For more information about our physicians, services, and locations, visit nyulangone.org

Produced by: Office of Communications and Marketing, NYU Langone Health
Writer: Robert Fojut
Creative Direction: Ideas On Purpose, www.ideasonpurpose.com
Design: Craig Williams, www.thecraigwilliams.com
Primary Photographer: Karsten Moran
Printing: Allied Printing Services, Inc.



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