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ORTHOPAEDIC
SURGERY
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Patient-
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INITIATIVES

24

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WORLD REPORT



2015

Orthopaedic Surgery

QUALITY AND
OUTCOMES REPORT

The Department of Orthopaedic Surgery at NYU Langone Medical Center

The Department of Orthopaedic Surgery at NYU Langone Medical Center is one of the largest and most accomplished orthopaedic programs in the country. Our department is recognized both nationally and internationally as a center of excellence in orthopaedic clinical care, education, research, and quality. Currently, NYU Langone is ranked #5 nationally in the *U.S. News & World Report* list of “Best Hospitals for Adult Orthopedics.”

Under the leadership of Joseph D. Zuckerman, MD, Walter A.L. Thompson Professor and Chair of Orthopaedic Surgery, our world-class faculty provides care in all orthopaedic subspecialty areas, including adult reconstructive surgery, orthopaedic trauma, spine surgery, sports medicine, hand surgery, musculoskeletal oncology, shoulder and elbow surgery, pediatric orthopaedics, primary care sports medicine, and foot and ankle surgery. With our consistently growing and dedicated faculty (currently over 200 members), our department is committed to pursuing excellence, including maintaining a leadership role in the development and implementation of quality initiatives.

We proudly present our fourth *Quality & Outcomes Report*, which describes our continued efforts in the area of orthopaedic quality and patient safety. This report reflects our belief in the absolute necessity of improving the quality of care in our country, while ensuring the financial sustainability of the healthcare system as a whole. It is dedicated to all the patients who entrust their care to our physicians every year, and who depend on us to provide the best opportunity to lead healthy and productive lives.

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A Message from the Chair and the Vice Chair for Clinical Affairs



The Department of Orthopaedic Surgery at NYU Langone Medical Center has long been dedicated to excellence in patient care and leadership in healthcare quality. The members of our faculty are committed to conducting research and developing innovative care programs to improve patient outcomes, ensure patient safety, and increase patient satisfaction. As part of this commitment, we are honored to present you with our fourth *Quality & Outcomes Report*. In this year's report, we take a special look at recent changes that will impact the future of orthopaedic surgery.

As you know, the healthcare industry is undergoing a dramatic transformation. The public is demanding more value for the healthcare dollar. Government and private insurers are replacing volume-based reimbursement with “value-based” payment. Our mandate is to improve patient outcomes, while doing everything we can to provide affordable care to our entire community.

In the Department of Orthopaedic Surgery, we have been working for more than a decade to pioneer the transition from volume to value in the field of orthopaedic care. In all our efforts, we focus on a handful of key questions.

How can we improve patient outcomes? Our faculty members have conducted extensive research to identify the risk factors that affect patient outcomes and to evaluate the effectiveness of different treatment alternatives. We have also launched many hospital-based initiatives to “hard wire” quality into our organizational culture.

How can we ensure patient safety? The Department of Orthopaedic Surgery has performed many studies aimed at reducing complications. And with our nursing partners, we have implemented several protocols to reduce the incidence of infection and other hospital-acquired conditions.

How can we make the best care available to everyone? NYU Langone is dedicated to improving healthcare access, and we have placed special emphasis on researching healthcare disparities. We are also working to develop strategies for making the best orthopaedic care accessible to all.

None of these issues are easily solved. But one thing is certain—at NYU Langone Medical Center, we are fortunate to work with a team of physicians, nurses, and other caregivers who are unsurpassed in their enthusiasm, creativity, and dedication to making healthcare better. It is thanks to them that the University HealthSystem Consortium (UHC) has ranked NYU Langone number one for overall patient safety and quality for three years in a row. These efforts are also part of a robust Medical Center-wide focus on quality initiatives reinforced by NYU Langone leadership, including our Dean and CEO Robert I. Grossman, MD, and Chief Quality Officer Martha Radford, MD, MA.

On behalf of the entire faculty, we would like to thank you for your interest in our department's work. Our hope is that our findings and experience—combined with the research of colleagues nationwide—will help improve the quality and safety of orthopaedic surgery for patients everywhere.



A stylized, handwritten signature in black ink.

JOSEPH D. ZUCKERMAN, MD

Walter A.L. Thompson Professor
and Chair of Orthopaedic Surgery



A handwritten signature in black ink that reads "Joseph A. Bosco".

JOSEPH A. BOSCO, MD

Vice Chair for Clinical Affairs

PRIMER ON PERFORMANCE MEASURES AND PAY-FOR-PERFORMANCE



Tying Provider Payment to Quality Performance

Pay-for-performance (P4P) reimbursement is a key concept in the healthcare quality movement. The goal is simple—improve healthcare safety, outcomes, and value by tying provider payment to quality performance. The challenge, however, is understanding how to measure quality. The number of healthcare quality measures used by P4P programs has increased dramatically in the last few years. According to the *Wall Street Journal*, the government now collects data on 1,675 quality measures through 33 different federal programs.* At the same time, many physicians and hospital leaders question the accuracy and effectiveness of current performance measurement systems.

While quality measurement can be controversial, it is not going away. The U.S. Department of Health and Human Services has set the goal of tying 90% of traditional Medicare spending to quality or value by 2018. Currently, three Medicare programs are at the forefront of P4P initiatives.

THE MEDICARE TRIPLE THREAT

The Affordable Care Act established three major P4P programs—the Hospital Value-Based Purchasing Program, the Hospital-Acquired Condition Reduction Program, and the Hospital Readmissions Reduction Program. Financial incentives and penalties under these programs have been ramping up for the last several years. In fiscal year 2016, the three programs will collectively place 5.75% of Medicare inpatient reimbursement at risk.

To operate successfully under these P4P programs, healthcare leaders need to understand their mechanisms

for measuring performance and calculating payment.

Hospital Value-Based Purchasing (VBP) Program

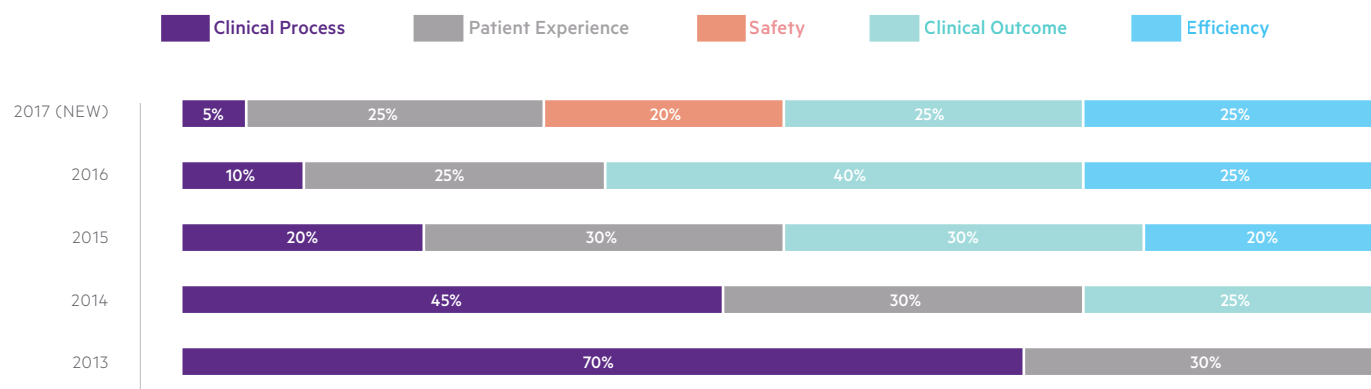
Under the Hospital VBP Program, hospitals receive payment bonuses or reductions based on several performance measures. The program is budget-neutral, so bonuses for high-performing hospitals are funded by payment cuts for low-performing facilities. In fiscal year 2016, the at-risk amount under this program is 1.75% of the base operating diagnosis-related group (DRG) payment. That amount will increase to the program's maximum of 2% in fiscal year 2017.

When the Hospital VBP Program began, clinical process measures were weighted heavily in the total performance score. Over the last three years, process measures have been gradually supplanted by outcomes measures (mortality rates, etc.) and efficiency measures (spending per beneficiary). Reimbursement under the program also depends on patient experience, as measured by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey.

Starting in fiscal year 2017, the program will add a safety domain representing 20% of a hospital's total performance score. Safety measures will include the methicillin-resistant *Staphylococcus aureus* (MRSA) infection rate and the *Clostridium difficile* rate. Beginning in 2019, the safety domain will also encompass the complication rates following elective primary total hip and total knee arthroplasty.

*Beck M. Health policy: Debate heightens over measuring health-care quality. *Wall Street Journal*. January 30, 2015.

Hospital VBP Program: Update to Domain Weights



Hospital-Acquired Condition Reduction Program

Starting last year, Medicare began reducing payments to hospitals with high rates of preventable hospital-acquired conditions (HACs). Hospitals that rank in the highest quartile for HACs are now subject to a 1% payment reduction. The program does not include a bonus opportunity. Several Medicare HACs are of particular concern to orthopaedic surgery, including surgical site infection following spine, neck, shoulder, and elbow procedures and deep vein thrombosis (DVT) or pulmonary embolism (PE) following hip or knee replacement. The program also tracks performance on inpatient falls and retained foreign objects.

Hospital Readmissions Reduction Program

The Hospital Readmissions Reduction Program (HRRP) cuts payments for hospitals with high 30-day readmission rates. Hospitals are evaluated by comparing their readmission performance to national averages. The maximum penalty under the program is now 3% of a hospital's base operating DRG payment amount.

When the HRRP was launched in 2013, it targeted care related to myocardial infarction, heart failure, and pneumonia. Starting last year, the Centers for Medicare & Medicaid Services (CMS) expanded the program to include patients admitted for elective total hip arthroplasty (THA) and total knee arthroplasty (TKA).

VALUE-BASED CARE: NYU LANGONE'S HOSPITAL FOR JOINT DISEASES EXPERIENCE

The Department of Orthopaedic Surgery is committed to identifying strategies and practices that will help hospitals optimize their performance under P4P reimbursement. Our research efforts and clinical initiatives focus on increasing the value of healthcare by controlling costs, minimizing complications, and eliminating disparities in care.

Several of our recent research studies examine the rates and causes of patient readmission following orthopaedic surgery. These studies are helping us develop targeted interventions to reduce rehospitalization rates and improve performance under the government's readmissions reduction program.

We have also launched several initiatives to reduce postoperative infections. In addition, our research projects routinely assess the impact of clinical protocols on thromboembolic events and other avoidable complications. These efforts are delineating strategies for reducing the incidence of hospital-acquired conditions now penalized by Medicare.

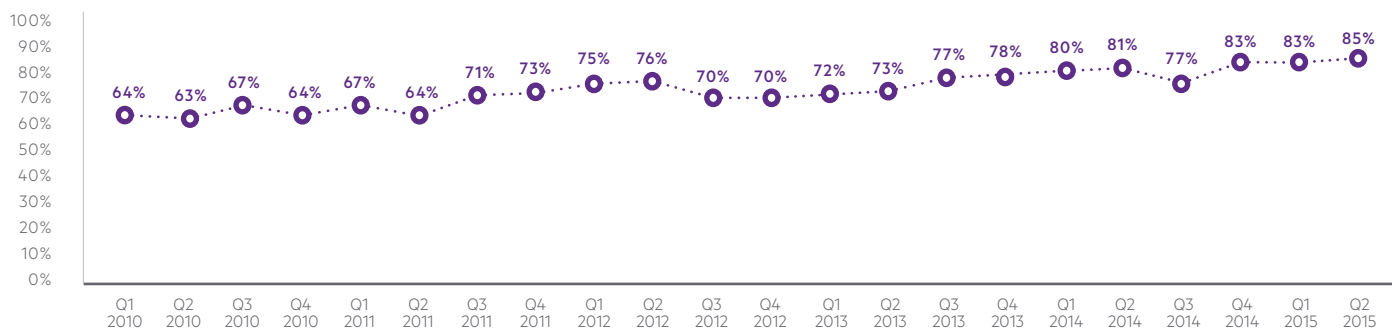
Overall, our research initiatives are improving our understanding of how to maximize safety, minimize complications, and control the cost of care through consistent use of evidence-based medicine and clinical practice guidelines. This total effort is providing the industry with valuable guidance on optimizing performance under value-based payment.

PATIENT EXPERIENCE: THE HCAHPS SURVEY

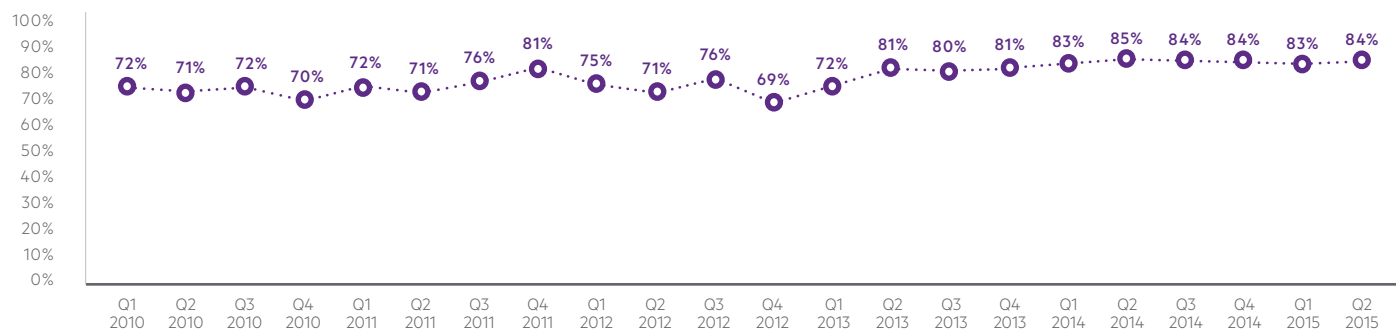
The HCAHPS survey is the first national, standardized, publicly reported survey of patients' perspectives of hospital care.

At NYU Langone's Hospital for Joint Diseases, we are proud of the fact that we fall above the national average in four areas: communication with nurses, the responsiveness of our staff, communication of discharge information to our patients, and likelihood of patients recommending our hospital to their friends and family.

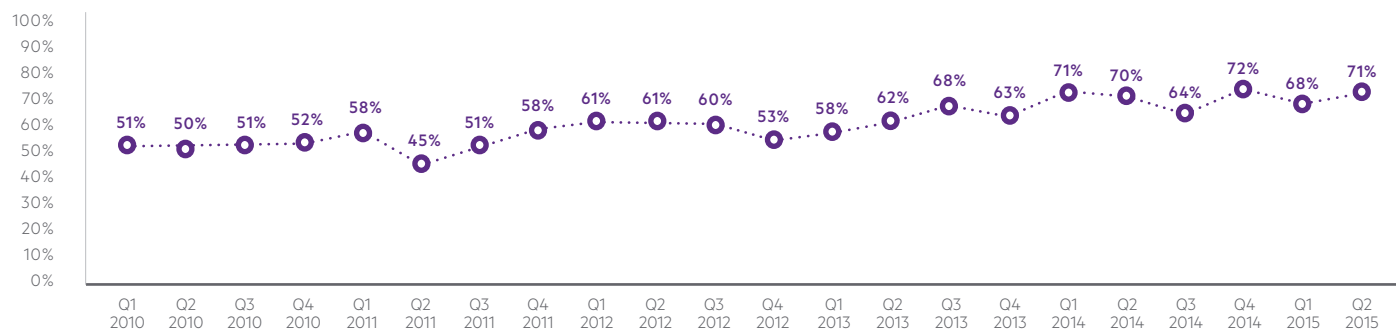
Communication with Nurses



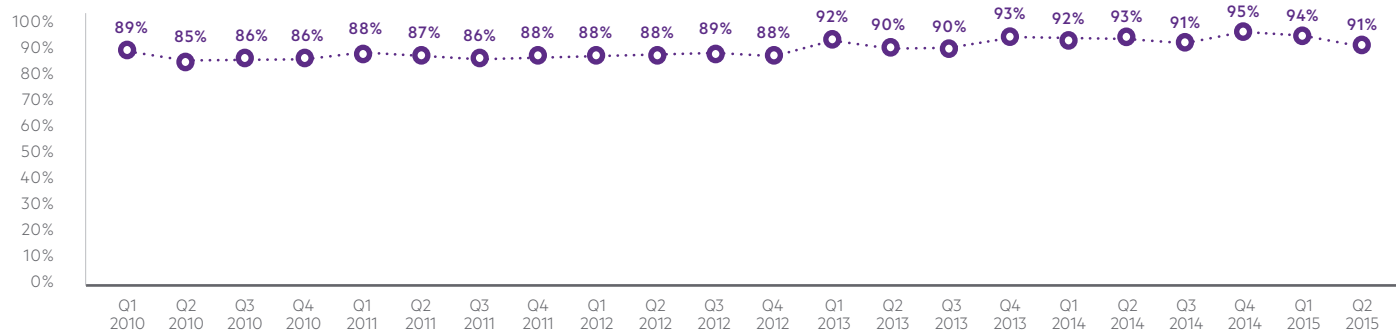
Likelihood to Recommend



Responsiveness of Hospital Staff



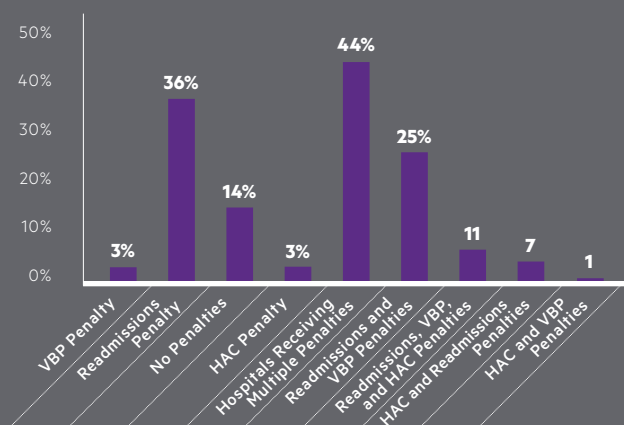
Discharge Information



FEDERAL P4P PROGRAMS: FY 2015 RESULTS

Approximately 3,400 hospitals were included in at least one of the three CMS pay-for-performance (P4P) programs in fiscal year 2015. Of these hospitals, only 14% received no penalties, while 44% received two or more penalties. More than one-third of hospitals (1,202) were penalized for “excess” readmissions. Readmissions are an important indicator of poor outcomes, as any complication is likely to be manifested by a readmission. In many ways, readmissions are a surrogate for surgical site infections, venous thromboembolic events, and other postoperative complications.

Hospitals Receiving Final FY 2015 Penalties



Based on final readmissions, VBP adjustment factors, and final HAC penalties released following FY 2015 IPPS final rule.



QUALITY, OUTCOMES, AND PATIENT SAFETY



Etiology of Improved Outcomes at High-Volume Centers

Research shows that increased procedure volume is associated with improved outcomes for many orthopaedic procedures. For individual surgeons, more experience with a procedure often leads to decreased risk of complications, shorter operative times, decreased length of stay, and other benefits. The same holds true for institutions. Studies show that high-volume hospitals have better outcomes for many procedures, including orthopaedic procedures.

Because of this volume effect, payers are becoming increasingly interested in establishing centers of excellence for high-volume, high-cost procedures such as total joint replacement. However, exactly how hospital volume mediates improved clinical outcomes is not well understood. In the Department of Orthopaedic Surgery, we are using learning theory to model how the volume effect contributes to gains in quality and patient safety.

When performing any new procedure, both individuals and institutions undergo a gradual process of learning. This process can be expressed mathematically as a learning curve. Learning theory states that learning occurs as a result of accumulated experience, not as a function of time. Experience depends not only on the procedure volume, but also on the rate of errors. In order to learn from mistakes, errors must be made. Theoretically, the faster errors are made, the faster one can learn and improve. However, without sufficient repetition or practice, institutional and individual expertise degrades over time. This performance degradation is termed “forgetfulness.” Overall, learning is a continuous process involving both error correcting and forgetting.

These concepts can help guide decisions about ideal procedure volumes. Higher volumes clearly afford more learning opportunities, resulting in decreasing error rates, decreasing complications, and increasing efficiency. With lower volumes, the rate of performance degradation eventually slows and goes to zero. Yet, the error rate may not be high enough to foster performance improvement, as forgetfulness may overtake institutional or individual learning. Minimally, surgeons and hospitals must maintain a volume that is conducive to continuous learning and process improvement.

The institutional learning curve model provides insight into how hospital volume mediates improved clinical outcomes. It can also help quality leaders use volume data to project an expected learning curve for quality improvement and harm reduction projects.



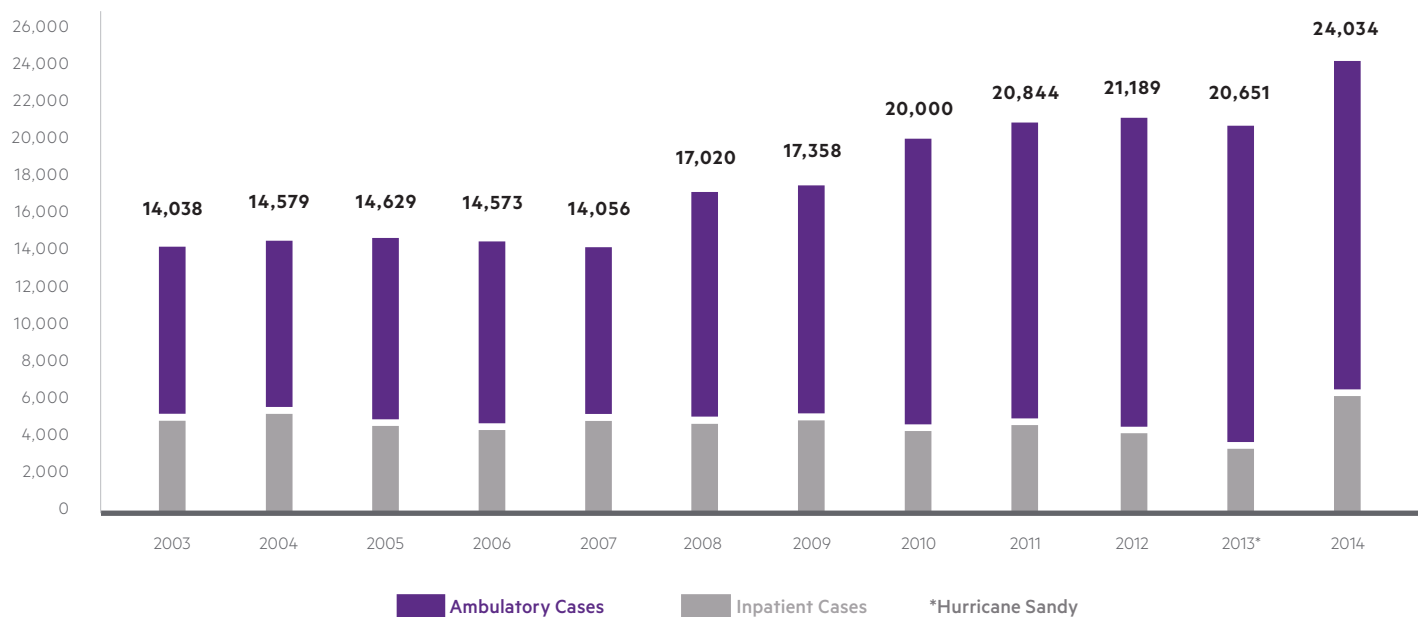
Orthopaedic Procedure Volumes

In the Department of Orthopaedic Surgery, we are committed to taking full advantage of our high patient volumes to reduce costs and improve patient outcomes.

In 2014, department faculty performed more than 24,000 orthopaedic musculoskeletal procedures. Our

procedure volumes have experienced tremendous growth during the last several years. Following the interruption to patient access caused by Hurricane Sandy in 2012, our orthopaedic volumes resumed their upward trend in 2014.

Orthopaedic Surgery Procedures



Research in Quality and Patient Safety

Quality and patient safety research and education are fundamental to the Department of Orthopaedic Surgery’s mission. We have assumed a leadership role in quality and safety, both within our institution and on a national scale. Central to maintaining our leadership role is the dissemination of research information, which allows other clinicians to benefit from our knowledge and initiatives. The following abstracts represent a sample of our department’s recent quality and patient safety research.

THE EFFECT OF SEVERITY OF ILLNESS ON KNEE AND HIP REPLACEMENT COSTS IN NEW YORK STATE: A REVIEW OF 172,738 CASES

Cost variation in total joint arthroplasty poses a challenge to healthcare providers entering into risk-sharing reimbursement contracts. Additionally, cost variation can negatively impact the perceived value of care.

We reviewed 172,738 cases of patients undergoing total hip replacement (THA) or total knee replacement (TKA) in New York State and stratified patients in terms of severity of

illness (SOI). For THAs, the 33,061 patients in the SOI minor group, the 35,566 patients in the SOI moderate group, the 8,109 patients in the SOI major group, and the 1,805 patients in the SOI extreme group had average costs of \$19,072, \$20,542, \$27,159, and \$43,626, respectively (ANOVA $p < 0.001$). For TKAs, the 40,316 patients in the SOI minor group, the 47,117 patients in the SOI moderate group, the 6,254 patients in the SOI major group, and the 510 patients in the SOI extreme group had average costs of \$17,525, \$20,077, \$25,435, and \$47,112, respectively (ANOVA $p < 0.001$).

This trend is persistent for both TKAs and THAs across all three years studied (2009–2011), within each of the seven New York State regions, and occurs irrespective of the hospital’s teaching status, size, or volume. The standard deviation analyzed THA cost was, in order of increasing severity of illness, \$19,396, \$20,492, \$23,560, and \$31,924. For TKA, the standard deviation was, in order of increasing severity of illness, \$16,050, \$22,286, \$24,151, and \$31,407.

Similar to the trend of increase in cost, this increase in standard variation between the minor level patients and extreme level patients is persistent across all three years studied (2009–2011), within each of the seven New York State regions, and occurs irrespective of the hospital’s teaching status, size, or volume. This study shows that TKA and THA costs increase with severity of illness, thus underscoring the need for financial risk stratification based on severity of illness class. It also illustrates the inherent unpredictability in cost forecasting and budgeting for the sickest patients.

HIGH-DOSE GENTAMICIN FOR PERIOPERATIVE PROPHYLAXIS IN ORTHOPAEDIC SURGERY: EVALUATION OF NEPHROTOXICITY

Based on antimicrobial susceptibilities at our orthopaedic hospital, a single high dose of gentamicin with clindamycin or vancomycin is recommended for perioperative prophylaxis for hip arthroplasty and spine fusion in patients under age 65 with creatinine clearance (CrCl) greater than 20 mL/min and actual body weight (BW) under 120 kg. Gentamicin is also used for knee arthroplasty in patients with severe penicillin allergy. As kidney injury is of concern with gentamicin, we evaluated nephrotoxicity in patients who underwent these surgeries.

We examined 4,177 orthopaedic surgeries. The gentamicin group (GG) included 1,590 procedures (926 hip, 600 spine, and 64 knee), and the control group (CG) included 2,587 procedures (980 hip, 902 spine, and 705



Risk of Nephrotoxicity from High-Dose Gentamicin

CHARACTERISTICS	NEPHROTOXICITY <i>n</i> =85 (%)	NO NEPHROTOXICITY <i>n</i> =4092 (%)	UNIVARIATE ANALYSIS ODDS RATIO (95% CI) <i>p</i> -VALUE	MULTIVARIATE ANALYSIS ODDS RATIO (95% CI) <i>p</i> -VALUE
All patients	85	4,092	—	—
Age >65 years	41 (48.2)	1,445 (35.3)	1.7 (1.11–2.63) <i>p</i> =0.019	1.5 (0.94–2.28) <i>p</i> =0.091
Actual BW >20% of ideal BW (obese patients)	65 (76.5)	2,571 (62.8)	1.9 (1.16–3.19) <i>p</i> =0.014	1.6 (0.98–2.75) <i>p</i> =0.06
Diabetes	18 (21.2)	439 (10.7)	2.2 (1.32–3.8) <i>p</i> =0.004	1.95 (1.13–3.35) <i>p</i> =0.016
Hospital stay >1 day before surgery	3 (3.5)	24 (0.6)	6.2 (1.83–21) <i>p</i> =0.017	8.07 (2.25–28.97) <i>p</i> =0.001
Surgery type, hip or knee	76 (89.4)	2,599 (63.5)	4.9 (2.42–9.71) <i>p</i> =0.005	4.7 (2.3–9.48) <i>p</i> =0.0005
Receipt of gentamicin	39 (45.9)	1,551 (37.9)	1.4 (0.9–2.14) <i>p</i> =0.166	1.5 (0.97–2.35) <i>p</i> =0.071
Concurrent vancomycin	2 (2.4)	24 (0.6)	2.5 (0.595–10.54) <i>p</i> =0.203	2.47 (0.56–10.92) <i>p</i> =0.232

All values shown as *n* (%) unless otherwise specified.

knee). BW, serum creatinine (SCr), comorbidities, and surgery duration were similar in GG and CG. GG patients were slightly younger and had slightly higher CrCl. Gentamicin median dose was 4.5 mg/kg of dosing weight. The overall nephrotoxicity rate was 2.5% in GG versus 1.8% in CG (*p* = 0.17). In univariate analysis, nephrotoxicity was higher in GG versus CG for hip surgery (3.2% vs. 1.7%, *p* = 0.05) and spine surgery (1.2% vs. 0.2%, *p* = 0.03) but not knee surgery (1% vs. 3.8%, *p* = 0.8). Most nephrotoxicity was RIFLE class R (67% in GG and 72% in CG, *p* = 0.49). In patients with nephrotoxicity, discharge SCr was \leq 1 g/dL in 77% of GG versus 83% of CG (*p* = 0.7). In logistic regression, independent predictors of nephrotoxicity were hospital stay longer than one day prior to knee or hip surgery, and diabetes. Nephrotoxicity was multifactorial, and SCr elevations were transient.

Our findings suggest that gentamicin is a safe and acceptable option for perioperative prophylaxis in qualified patients.

THE REGIONALIZATION OF TOTAL JOINT ARTHROPLASTY IN NEW YORK STATE: AN ANALYSIS OF 220,000 CASES

Several studies have demonstrated that high-volume surgeons and hospitals have better patient outcomes after

total joint arthroplasty (TJA). Consequently, as patients and referring providers seek higher-quality care, TJA procedure volume may become increasingly centralized in high-volume hospitals. New risk-sharing payment models that incentivize high-value care may also drive the growth of high-volume institutions.

In New York State, TJA patients are dispersed statewide, but TJA procedures are concentrated around a few urban centers—New York City, Buffalo, Rochester, Syracuse, and Albany. To determine whether TJA was becoming more regionalized, we compared growth in TJA volume among high-, medium-, and low-volume hospitals over a three-year period. We also looked at changes in estimated driving distance for TJA patients.

From 2009 to 2012, TJA volume grew 22.82% for high-volume hospitals, 7.07% for medium-volume hospitals, and 8.20% for low-volume hospitals. During the same period, the estimated driving distance for TJA patients increased from 22.78 km (95% CI = \pm 0.41 km) to 24.25 km (95% CI = \pm 0.39 km).

The effect of this increased regionalization remains unclear. Although quality may be increased for patients able to access high-volume hospitals, this progressive trend should be monitored. Care must be taken to ensure that regionalization does not compromise access to care for vulnerable populations.

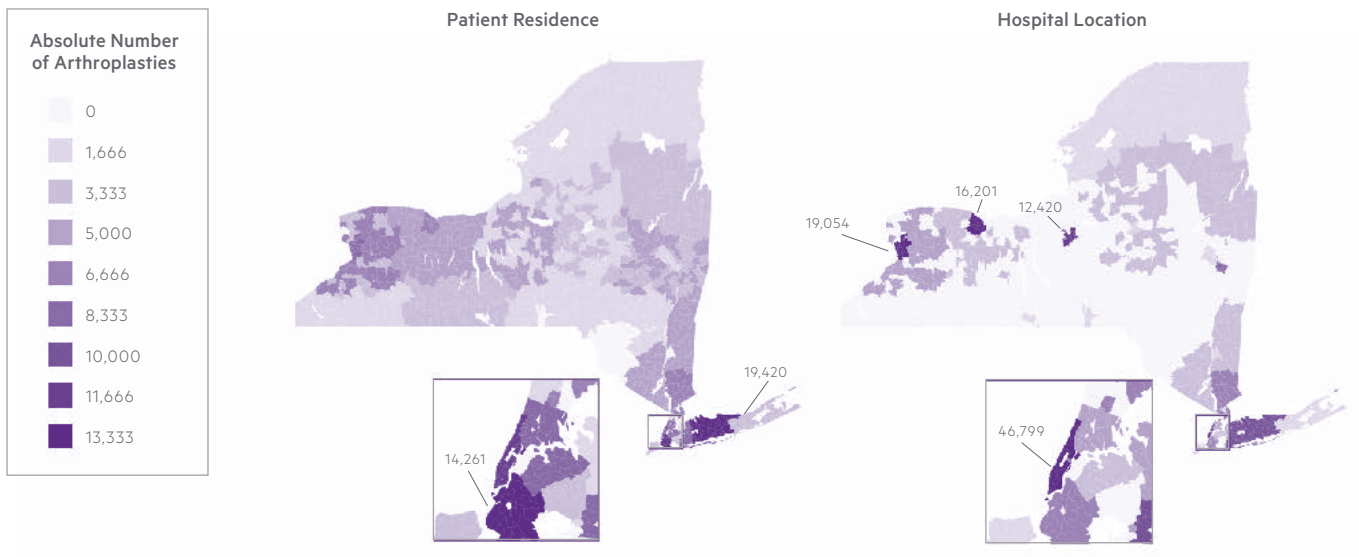
SOCIOECONOMIC STATUS AND PATIENT OUTCOMES

As hospitals aim to improve access, they must still control rising healthcare costs and maximize the value of care. Therefore, it is important to identify patients who may increase resource consumption. One key consideration is sociodemographic status, which includes socioeconomic measures as well as factors such as race and gender.

Lower sociodemographic status is associated with a higher prevalence of risk factors for postsurgical

complications and longer hospital length of stay (LOS), an important marker of resource consumption. The effect is magnified when socioeconomic factors are combined with certain medical comorbidities and intraoperative factors. In particular, combinations of lower socioeconomic status, female gender, advanced age, non-Caucasian race/ethnicity, and certain comorbidities lead to a synergistically elevated risk for longer LOS. As a result, policymakers may need to consider sociodemographic status when allocating resources to hospitals.

Total Joint Arthroplasties in New York State 2009-2012



Cost-Effectiveness Research

The increasing cost of medical care is the source of much concern, both locally and nationally. Cost-effectiveness analysis helps identify therapies that make the best use of healthcare system resources. The Department of Orthopaedic Surgery has a robust cost-effectiveness research program that is helping to define the relationship between costs and outcomes for common orthopaedic procedures and interventions.

EFFECT OF TXA ON TRANSFUSION RATES FOLLOWING TJA: A COST AND COMPARATIVE EFFECTIVENESS ANALYSIS

Tranexamic acid (TXA) is used to reduce blood loss in orthopaedic total joint arthroplasty (TJA) cases. However, the effect of TXA on hospital TJA cost, the incidence of clotting episodes, and blood transfusion rates is unclear.

Total Hip Arthroplasty				
YEAR	TXA	PATIENTS	TRANSFUSION (TOTAL)	COST REDUCTION
2012	No	856	427	—
2013	Yes	1,084	248	\$3,083

Total Knee Arthroplasty				
YEAR	TXA	PATIENTS	TRANSFUSION (TOTAL)	COST REDUCTION
2012	No	969	325	—
2013	Yes	962	121	\$2,582

During 2013, a TXA protocol for TJA patients was introduced at our institution. Both total hip replacement (THA) and total knee replacement (TKA) patients received 1 g of TXA after induction of anesthesia. THA patients received an additional 1 g of TXA prior to initiating closure, and TKA patients received an additional 1 g of TXA prior to releasing the tourniquet. Patients were excluded from the TXA protocol if they had a history of coronary artery disease, stroke, or venous thromboembolic disease (VTED).

For this study, we stratified patients undergoing elective TJA into two cohorts: those who did not receive TXA (year 2012) and those who received TXA (year 2013). We compared the two cohorts in terms of myocardial infarction (MI) or stroke, VTED, length of stay (LOS), hospital and TXA protocol costs, and transfusion rates.

TXA decreased THA transfusions from 22.7% to 11.9% ($p < 0.001$), and it decreased TKA transfusions from 19.4% to 7.0% ($p < 0.001$). Cost reduction between 2012 and 2013 for THA and TKA was \$3,083 and \$2,582 per case, respectively. VTED decreased from 1.7% in 2012 to 0.7% in 2013, and

there was no change in the incidence of MI or stroke.

Implementation of a perioperative TXA protocol significantly reduced the number of blood transfusions in TJA patients in a safe and cost-effective manner.

COST ANALYSIS OF READMISSIONS FOR TOTAL JOINT ARTHROPLASTY PATIENTS IN THE BUNDLED PAYMENT INITIATIVE

The Bundled Payments for Care Improvement (BPCI) initiative is a Centers for Medicare & Medicaid Services (CMS) program designed to promote coordinated and efficient care. Under the program, CMS and participating hospitals agree on a target price for particular episodes of care.

In 2013, our institution began participating in the program for total joint arthroplasty (TJA). Under the agreement, the hospital received a single payment for the entire TJA episode, including costs accrued 72 hours prior to admission, the inpatient stay, postacute care, and any additional costs incurred up to 90 days following discharge, including readmissions.

From January 2013 through December 2013, the hospital admitted 721 patients undergoing either primary knee or primary hip arthroplasty through the BPCI. All patients readmitted to our hospital or outside hospitals (OSH) within 90 days of the index episode were identified through CMS verification. The diagnosis for each readmission was analyzed. The associated costs from our institution were analyzed. OSH cost data were unavailable.

Out of the 721 patients, 70 (10%) were readmitted within 90 days. Forty-six patients were readmitted following THA, accounting for 53 readmissions (66% of all readmissions). Twenty-four patients were readmitted following TKA, accounting for 27 readmissions (34% of all readmissions).

Surgical complications accounted for 54% of THA readmissions and 44% of TKA readmissions. These complications included infection (11), wound complications (8), bleeding (7), periprosthetic fracture (5), dislocation (4), and postsurgical pain (4). The average cost of readmission due to surgical complications was \$36,038 (range, \$6,375 to \$60,137) for THA and \$61,049 (range, \$26,740 to \$186,069) for TKA.

Medical complications of THA and TKA patients included gastrointestinal disease (11), pulmonary disease (8), genitourinary/renal (6), hematologic (6), cardiovascular (3), endocrine disorders (2), syncope (2), rheumatologic (1), lumbago (1), and an open ankle wound (1). The average cost of readmission due to medical complications was \$22,775 (range, \$5,678 to \$82,940) for THA and \$10,283 (range, \$3,306 to \$24,076) for TKA.

Hospital readmissions following THA and TKA are common and costly. Identifying the causes for readmission and assessing the costs will guide quality improvement efforts.

Department Quality and Safety Initiatives

The Department of Orthopaedic Surgery is dedicated to improving the quality and safety of care for our patients. We have launched several initiatives that target the main causes of poor outcomes in orthopaedic surgery. These patient-centered initiatives are helping us continuously improve individual and system outcomes by reducing complications and optimizing patient function.

INITIATIVES TO REDUCE HOSPITAL-ACQUIRED CONDITIONS (HACS)

Beginning in 2008, the Centers for Medicare & Medicaid Services (CMS) stopped reimbursing hospitals for care related to hospital-acquired conditions (HACs) that it considers to be “reasonably preventable” (see sidebar). In addition, starting in October 2014, CMS began reducing Medicare payments to hospitals with high rates of HACs.

NYU Langone Medical Center has developed several initiatives to improve the quality and safety of patient care by reducing HACs.

HEPATITIS C TESTING AND IMPLEMENTATION

Hepatitis C virus (HCV) is the most prevalent chronic bloodborne infection in the United States. It is the most common cause of cirrhosis, hepatocellular carcinoma, and liver transplantation. In addition, surgery patients with HCV infection have an increased risk of a surgical site infection.

Nationwide, an estimated 3% of individuals have HCV infection. Three-quarters of these individuals were born between 1945 and 1965. Most people with HCV have no symptoms, so they do not realize they are infected. Some may eventually develop more serious conditions, even in the absence of symptoms.

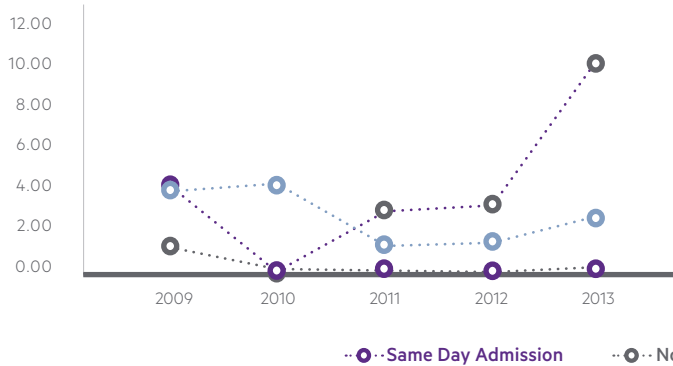
Early identification and treatment of HCV improves clinical outcomes, can reverse liver damage, and reduces the risk of transmission. New direct-acting antiviral agents are revolutionizing HCV treatment, with cure rates that surpass 90% in most patient groups. In addition, new treatments have fewer side effects than previous regimens and require as little as 12 weeks of therapy.

The New York State Department of Health now recommends testing all people born between 1945 and 1965 for HCV infection. The Hospital for Joint Diseases offers HCV testing to all patients; when the results are positive, a physician from one of NYU Langone’s Faculty Group Practices contacts the patient. The physician explains the results and helps the patient make an appointment to see an HCV specialist.

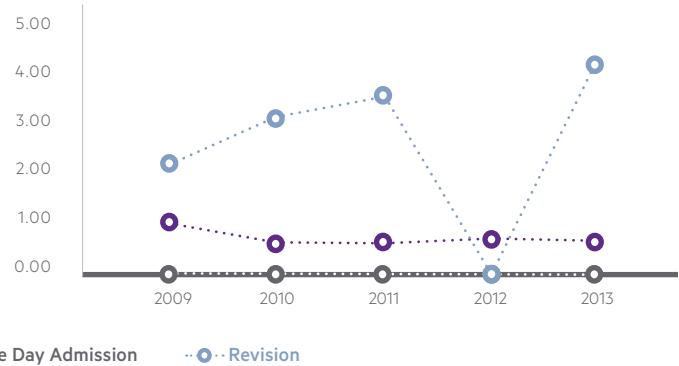
CMS HOSPITAL-ACQUIRED CONDITIONS:

- Foreign object retained after surgery
- Air embolism
- Blood incompatibility
- Catheter-associated urinary tract infection (UTI)
- Pressure ulcer (stages III and IV)
- Vascular catheter-associated infection
- Surgical site infection (following specific procedures)
- Falls and traumas (including fracture, dislocation, intracranial injuries, crushing injuries, and burns)
- Deep vein thrombosis (DVT)/pulmonary embolism (PE) following hip or total knee replacement
- Manifestations of poor glycemic control
- Iatrogenic pneumothorax with venous catheterization

Deep Surgical Site Infection Rate Hip Arthroplasty



Deep Surgical Site Infection Rate Knee Arthroplasty



SURGICAL SITE INFECTION REPORT

Hip

The overall rate of deep surgical site infection (SSI) after same day primary hip arthroplasty has remained low at NYU Langone. However, the SSI rate after hip arthroplasty is increasing for non-same day patients. This increase is occurring while the annual volume of non-same day patients is decreasing, suggesting the selection of highest-risk patients.

Non-same day surgery patients accounted for only 2.4% of primary hip arthroplasty surgery cases in 2013, but 25% of deep SSI. Non-same day patients are more likely than same day patients to:

- Be medically complex (ASA score > 2)—70% versus 30%
- Be older than 65 years—76% versus 42%
- Have a fracture as indication for surgery—65% versus 5%
- Require blood transfusion—24% versus 13%

In addition, non-same day patients are less likely to undergo *Staphylococcus aureus* screening and

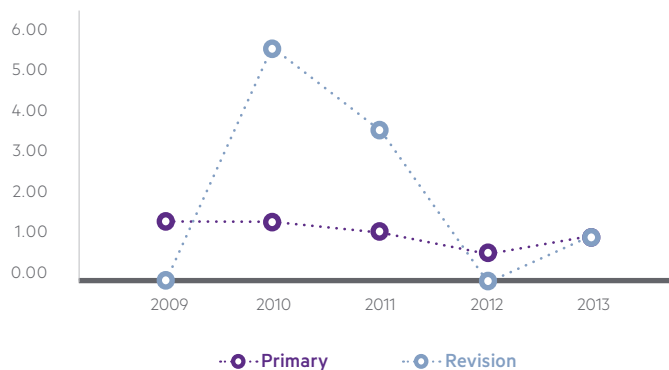
decolonization—20% versus 85%. Of those screened, more non-same day patients are colonized with methicillin-resistant *Staphylococcus aureus* (MRSA)—7% versus 2.5%. There are no other independent risk factors for SSI in non-same day patients. A small number of patients in this group may be hiding a specific factor, but it is more likely that all patients in this group have an elevated risk.

In patients undergoing a revision procedure, *Staphylococcus aureus* colonization and fracture are independent risk factors for SSI. In addition, there is a wide variation in patient risk for SSI among surgeons.

Knee

The overall rate of deep SSI after same day primary knee arthroplasty has remained low at our institution. Independent risk factors for SSI after primary knee arthroplasty are tobacco use, obesity, uncontrolled diabetes mellitus, and *Staphylococcus aureus* colonization. MRSA colonization is more prevalent among patients undergoing revision knee arthroplasty (6.1%) than those undergoing primary surgery (3%). In addition, there is a wide variation in patient risk for SSI among surgeons.

Deep Surgical Site Infection Rate Spine Arthroplasty



Spine

The overall rate of deep SSI after primary and revision spine fusion surgery has decreased at NYU Langone. Independent risk factors for SSI after primary spine surgery are non-same day surgery (interval between admission and surgery is > 24 hours), lumbar surgery, and thoracic surgery. There are no independent risk factors for SSI after revision surgery. However, the proportion of patients receiving blood transfusion is greater for revision surgery (30%) than for primary surgery (7%). Lastly, there is a wide variation in patient risk for SSI among surgeons.

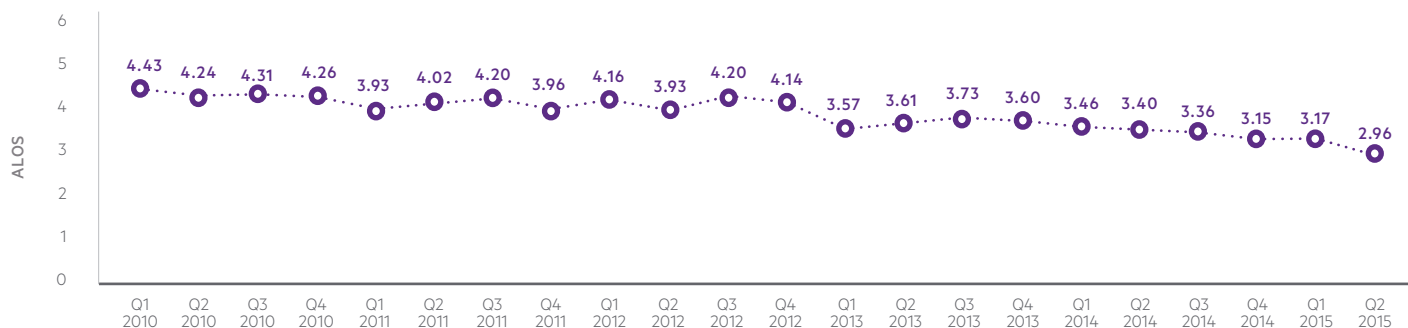
LENGTH OF STAY REDUCTION

The Department of Orthopaedic Surgery has committed significant resources to ensure that patients are discharged as promptly and safely as possible. Reducing length of stay (LOS) helps patients recover faster, decreases the likelihood of many HACs (including infections), and may help reduce healthcare costs. Most important, patients prefer recovering in the comfort of their own home as opposed to the hospital. In order to facilitate a shorter, safer LOS, we developed two innovative programs—Guided Patient Services (GPS) and Rapid Rehab.

The GPS program is a collaboration between the Department of Orthopaedic Surgery and the Department of Social Service. Designed for patients undergoing total joint replacement, this innovative program sets patient expectations regarding the hospital experience and educates patients about discharge planning before they are hospitalized. When the decision for surgery is made, a social worker meets with the patient in the physician's office. Any issues regarding discharge planning are addressed prior to admission, leading to a smoother and more efficient discharge process.

The Rapid Rehab program gives hip or knee replacement patients the opportunity to begin their rehabilitation immediately after surgery, while they are still in the postoperative recovery room. To date, we have observed a one-day decrease in LOS and increased patient satisfaction for patients in the Rapid Rehab program.

Average Length of Stay for Hip and Knee Procedures



QUALITY AND OUTCOMES DATA BY SUBSPECIALTY



Division of Trauma and Fracture Surgery

The Division of Trauma and Fracture Surgery treats a wide spectrum of cases, ranging from simple fractures to patients with multiple life- and limb-threatening musculoskeletal injuries. Under the leadership of Kenneth Egol, MD, the division has developed several databases for tracking clinical outcomes. Every patient treated by division faculty is enrolled in at least one outcomes database.

THE IMPACT OF DIABETES MELLITUS ON SURGICAL QUALITY MEASURES AND COST FOLLOWING ANKLE FRACTURE SURGERY

Payers need accurate risk-adjustment data to design bundled payment and pay-for-performance programs. In addition, providers need to understand patient risk factors to operate under bundled payment models. We examined whether *diabetes mellitus* (DM) increased the risk of poor outcomes and higher costs for patients undergoing ankle fracture surgery.

We queried a large administrative database of hospitalizations for all patients who underwent fixation of an ankle fracture in New York State from 2000 to 2011. Inpatient length of stay, total hospital charges, in-hospital mortality, and Charlson comorbidity index (CCI) were compared between diabetics and non-diabetics. A subgroup analysis compared diabetics with associated complications to those with uncomplicated diabetes.

Of the 58,748 patients undergoing open reduction and internal fixation (ORIF) of an ankle fracture, 7,501 (12.8%) had DM. The DM cohort was significantly older than the non-diabetic (-DM) cohort ($p < 0.01$). Mean length of stay and total hospital charges were significantly greater for

the DM cohort than the -DM cohort ($p < 0.01$). In addition, the DM cohort had greater CCI scores and greater in-hospital mortality than the -DM cohort ($p < 0.01$).

Of the 7,501 diabetic patients, 1,098 had complicated diabetes (C-DM). Patients with C-DM stayed 2.4 days longer and were \$6,895 more costly than those with diabetes alone (DM-A) ($p < 0.01$). C-DM patients also had a significantly higher in-hospital mortality rate than DM-A patients.

These data will help providers better target hospital resources and help payers design risk-adjusted bundled payment and pay-for-performance programs.

UNREPORTED SHARPS EXPOSURES IN ORTHOPAEDIC SURGERY RESIDENTS

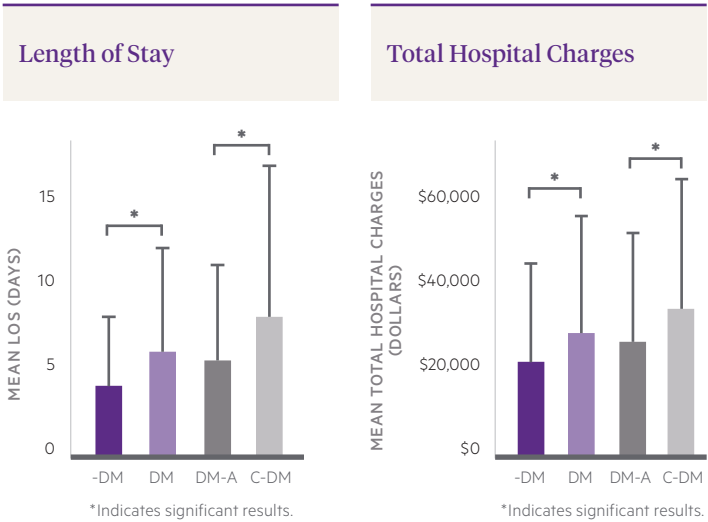
Sharps-related injuries represent a significant occupational hazard to orthopaedic surgeons. At our institution, increased education and the implementation of a “needlestick hotline” have led to improved reporting rates. However, despite increased attention and targeted interventions, anecdotal evidence suggests that the majority of incidents continue to go unreported.

The purpose of this study was to examine the incidence of reported and unreported sharps exposures, and the attitudes and factors that affect exposure reporting among orthopaedic surgery residents at a large academic teaching hospital. The goal was to identify ways to increase reporting rates and design more effective interventions.

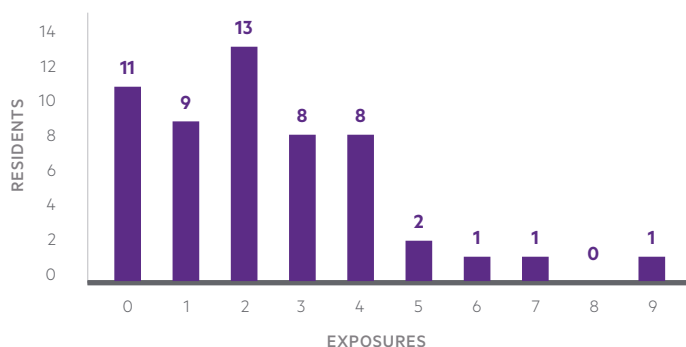
We administered an anonymous, cross-sectional survey regarding intraoperative sharps exposures to current orthopaedic house staff. The response rate was 87% (54 out of 62).

Overall, 76% of survey respondents (41 out of 54) had at least one sharps exposure during residency. The majority of these incidents (55%) were never reported. The most common reason cited for not reporting was a “perception of low risk.” Residents whose exposures were witnessed by others on the surgical team were more likely to report the incident (57% vs. 23%, $p = 0.043$), suggesting that peer pressure acts to improve reporting rates.

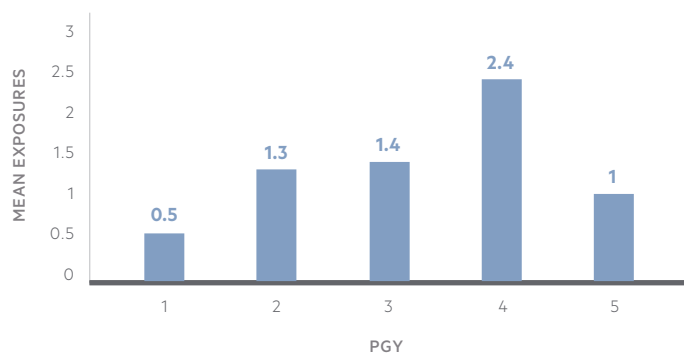
The data suggest that reducing unwitnessed sharps exposures could reduce unreported incidents. More effective interventions could incorporate greater emphasis on surgical team vigilance and positive peer pressure. Specific interventions could include sharps-specific surgical debriefing statements and anonymous tip lines.



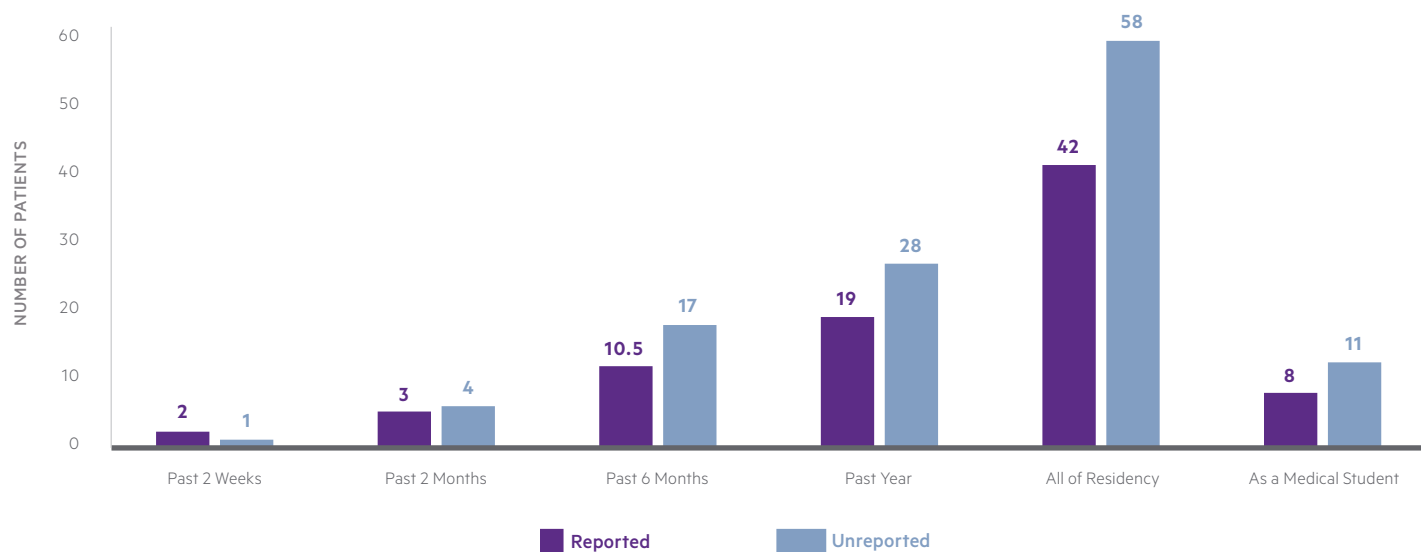
Distribution of Total Sharps Exposures Among Orthopaedic Surgery Residents



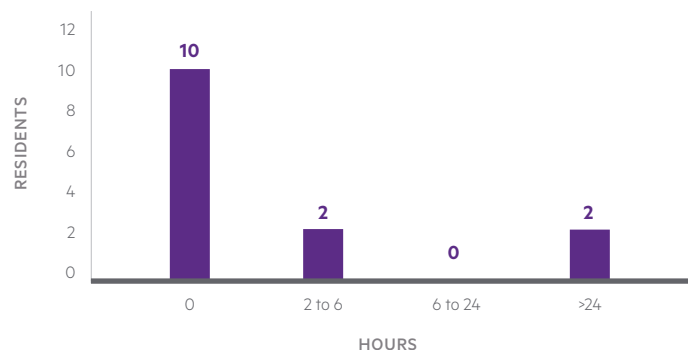
Mean Number of Exposures by Postgraduate Year



Total Number of Sharps Exposures Over Time: Reported vs. Unreported

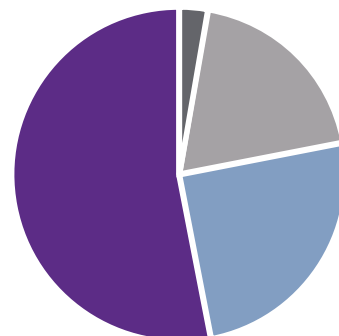


Time to Reporting for Most Recently Reported Exposure



Reason for Not Reporting Most Recent Exposure

- 3% Embarrassed
- 19% Other
- 25% Too Much Hassle
- 53% Perceived Low Risk



Division of Shoulder and Elbow Surgery

The Division of Shoulder and Elbow Surgery covers the full range of conditions affecting the upper extremity, including athletic, traumatic, congenital, and degenerative problems. Faculty members participate in the Shoulder Research Group, which conducts basic science, translational, and clinical studies to better understand upper-extremity disease processes and to advance the treatment of shoulder and elbow ailments.

PERIOPERATIVE OUTCOMES IN DIABETICS UNDERGOING TOTAL SHOULDER ARTHROPLASTY

Since the introduction of total shoulder arthroplasty (TSA) in 1974, indications for this procedure have become numerous and varied. As indications for TSA continue to evolve, proper preoperative patient selection will become increasingly important, particularly in relation to medical comorbidities. The purpose of this study was to evaluate the impact of diabetes on perioperative outcomes following TSA.

We queried the Nationwide Inpatient Sample (NIS) database for all patients with a primary ICD-9-CM procedure code of 81.80 (TSA) during the years 2002 to 2012. We then used previously validated methods to exclude patients undergoing revision surgery.

A total of 47,307 TSA patients were identified. Of this total, 17.8% (8,418) were diabetics and 82.2% (38,889) were non-diabetics. Diabetic patients tended to be older (69.40 vs. 68.57 years, $p < 0.001$) and were more likely to be black (6.8% vs. 3.2%, $p < 0.001$) than non-diabetics. No difference was observed with regard to gender. Diabetic patients undergoing TSA were more likely to be treated in the South or Midwest and to be covered by Medicare or Medicaid than non-diabetic patients. Compared to non-diabetics, diabetic patients demonstrated longer hospital stays (2.46 days vs. 2.25 days, $p < 0.001$), higher associated costs (\$15,362 vs. \$14,498, $p < 0.001$), and a greater rate of non-routine discharge disposition (37.4% vs. 30.3%, $p < 0.001$). There was no reported difference for in-hospital mortality between the two groups (0.1% vs. 0.1%, $p = 0.662$). Diabetic patients demonstrated a greater rate of almost every medical comorbidity reported in the NIS. After performing a multivariate analysis that accounted for these differences, diabetes was determined to be an independent risk factor for postoperative DVT and non-routine discharge.

Although our study demonstrated that diabetes is an independent risk factor for postoperative DVT and non-routine discharge only, we suspect this is due to the limitations of the NIS database, which reports only in-hospital outcomes. Longitudinal studies that follow patient readmissions and complications after discharge are needed to demonstrate the true impact of diabetes within the setting of TSA.

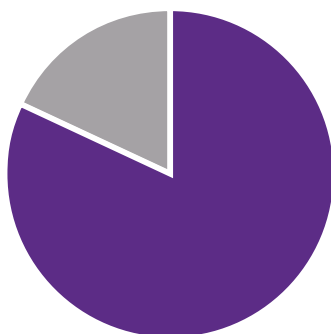
THE INCIDENCE OF SUBSEQUENT SHOULDER SURGERY FOLLOWING ARTHROSCOPIC SLAP LESION REPAIRS

Failure rates following arthroscopic superior labrum anterior-posterior (SLAP) lesion repair may be higher than previously thought.

We reviewed the New York State Department of Health's Statewide Planning and Research Cooperative System (SPARCS) database to identify individuals with an isolated diagnosis of SLAP lesion who underwent arthroscopic SLAP repair between 2003 and 2010. Baseline demographics and all subsequent ipsilateral shoulder procedures were collected for analysis.

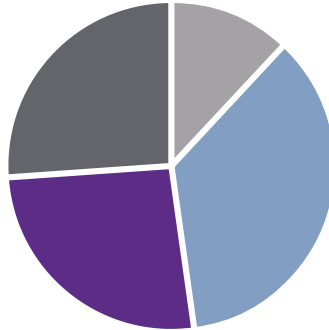
Total Shoulder Arthroplasty Patient Cohorts

17.8% Diabetics
82.2% Non-Diabetics



Most Frequently Performed Shoulder Procedures Following Arthroscopic SLAP Lesion Repair

- 26% Repeat SLAP Repair
- 12% Biceps Tenodesis
- 26% Arthroscopic Debridement
- 36% Subacromial Decompression



Over the eight-year study, 2,803 patients with a primary diagnosis of SLAP lesion underwent arthroscopic SLAP repair. After three to 10 years of follow-up, 9.1% (254 out of 2,803) underwent repeat surgical intervention on the same shoulder as the initial SLAP repair. Repeat shoulder surgery occurred a mean of 24 ± 22 months after the initial procedure. The most frequently performed subsequent procedures were subacromial decompression (36%), arthroscopic debridement (26%), repeat SLAP repair (26%), and biceps tenodesis (12%). Additional surgery on the biceps anchor occurred in 3.6% of patients in the original series. The only factor significantly associated with the need for a subsequent procedure was workers' compensation coverage.

This study identified a 9.1% incidence of repeat surgery following SLAP repair. The reasons for repeat surgery are likely multifactorial and include both surgeon- and patient-related factors. These findings point to the inherent difficulty of diagnosing and treating these lesions.



Division of Sports Medicine

The Division of Sports Medicine provides the highest quality care for athletes competing at the high school, college, and professional levels, as well as recreational athletes in every age group. Members of the faculty perform more than 3,000 procedures annually, including arthroscopic procedures on the knee, shoulder, elbow, and ankle. Faculty members are also involved in athletic injury research and education.

CLINICAL OUTCOMES OF SUBPECTORAL BICEPS TENODESIS WITH CORTICAL BUTTON FIXATION

Subpectoral biceps tenodesis with cortical button fixation is a technique for managing long head of the biceps pathology. This technique allows for the creation of a smaller proximal humeral tunnel, potentially reducing fracture risk and the incidence of postoperative “Popeye” deformity caused by lack of thread contact with the transposed tendon. The purpose of this study was to evaluate pain, function, and patient satisfaction following subpectoral biceps tenodesis with cortical button fixation.

We identified 95 patients (77 male, 18 female) who underwent open subpectoral biceps tenodesis with cortical button fixation between 2012 and 2013 and who had a minimum six months of follow-up. Mean patient age was 51.6 years (range, 19–74 years), and the mean follow-up was 14.76 months (range, six–30 months). Of these 95 patients, 61 were available for both preoperative and postoperative assessment using clinical outcome measures, including physical examination and validated questionnaires.

For the 61 patients studied, the mean Oxford Shoulder Score increased from 27.2 ± 12.5 to 42.8 ± 7.7 ($p < 0.01$). The mean ASES Score increased from 37.0 ± 21.2 to 81.1 ± 22.6 ($p < 0.01$). The mean DASH score decreased from 45.9 ± 26.0 to 14.7 ± 20.1 ($p < 0.01$). Of the 61 patients, 58 (95.1%) stated that they would have the surgery again if necessary.

Subpectoral biceps tenodesis with cortical button fixation is a safe and reproducible technique for managing the long head of the biceps pathology, leading to significant improvement with respect to pain, function, and satisfaction.

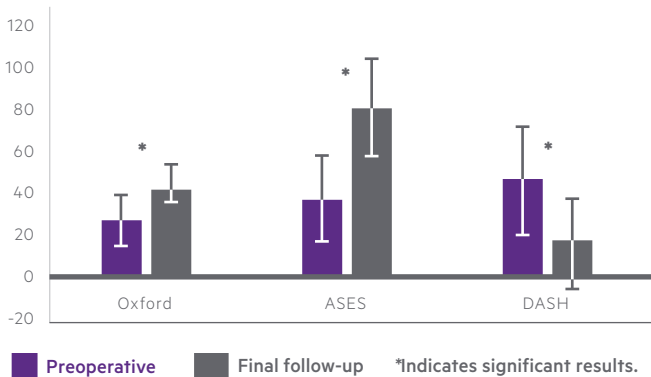
CLINICAL OUTCOMES OF ACL RECONSTRUCTION WITH TIBIALIS ANTERIOR ALLOGRAFT USING AN ANATOMIC ANTEROMEDIAL PORTAL APPROACH

The purpose of this study was to evaluate clinical outcomes following primary ACL reconstruction with tibialis anterior allograft using an anatomic anteromedial portal approach.

We retrospectively evaluated all patients undergoing this procedure at our institution during a three-year period. Patients with a minimum one year of follow-up were contacted and asked to return for an assessment of their clinical outcomes. The assessment was performed using the International Knee Documentation Committee (IKDC), Lysholm, Tegner, Kujala, and Single Assessment Numeric Evaluation (SANE) scoring systems, in addition to a physical examination including KT-1000 arthrometer testing.

Of the 100 patients identified, four were diagnosed with clinical failures (4%). Fifty-eight patients with a mean age of 44.8 years (range, 18.4 to 69.7 years) were available for a follow-up assessment at a mean of 26 months (range, 12 to 45 months). Among patients in the follow-up group, significant improvements over baseline values were noted for all assessed parameters. The mean IKDC score improved from 34.59 to 86.07 ($p < 0.005$). The mean Lysholm score improved from 38.98 to 90.83 ($p < 0.005$). The mean Tegner score decreased from 6.01 to 5.32. The mean Kujala score improved from 49.40 to 91.22 ($p < 0.005$). The mean follow-up SANE score was 85.60. KT-1000 arthrometer testing demonstrated a mean 0.44 mm side-to-side difference compared to the contralateral side with maximal manual stress applied. Subjectively, 55 of the 58 patients (94.8%) reported that they would have the same procedure and same graft again if necessary.

Assessment Results



Division of Adult Reconstructive Surgery

The Division of Adult Reconstructive Surgery is composed of 29 surgeons with diverse areas of expertise and interest. The size of the division allows us to address the entire range of adult reconstructive problems and offer innovative solutions to complex issues. Division faculty performed more than 2,700 joint replacement procedures in 2014, including primary hip and knee replacements as well as complex revisions and reconstructions.

THE ETHICS OF PATIENT RISK MODIFICATION PRIOR TO ELECTIVE JOINT REPLACEMENT SURGERY

There are multiple risk factors for complications following elective total joint replacement (TJR) surgery. Certain risk factors, including operating time, implant choice, component positioning, and intraoperative difficulties (e.g., fracture, nerve, and vascular damage), are related to the surgeon’s experience and decision-making and are not patient-dependent. However, many risk factors for complications after TJR are patient-dependent. Bacterial colonization, diabetes control, body mass index (BMI), smoking status, fall risk, narcotic and/or alcohol dependence, physical conditioning, neurocognitive disorders, nutritional status, cardiovascular status, non-genetic thromboembolic risk, and anemia all represent potentially modifiable factors that increase the risk of complication with TJR.

Orthopaedic surgeons routinely perform TJR on

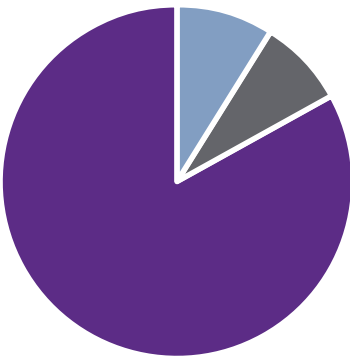
patients who have one or more of the above-mentioned risk factors. However, this is elective surgery, and some of these risk factors are modifiable prior to surgery. As a result, ethical questions arise. Should patients address these risk factors prior to undergoing TJR, and to what extent should the physician, payer, and healthcare institution require the patient to do so? Furthermore, should payers and healthcare institutions require that surgeons and patients attempt to modify risk factors prior to these interventions that improve quality of life? If modification of risk is in the best interest of both the patient and the healthcare delivery system, two things remain unclear—what constitutes sufficient patient participation and what should be done for patients unable to accomplish sufficient risk modification.

It is also unclear who should pay for risk factor modification and how to incentivize surgeons and patients to maximize patient health status prior to surgery. For example, heavy smokers and patients with uncontrolled diabetes have good reason to improve their health status before surgery. However, is there a moral obligation to ensure that the patient makes every attempt (or even a minimal attempt) to modify his or her risk factors, even if this means delaying surgery? Must a certain threshold of acceptable risk be met to deem a patient eligible for surgery?

Patients should be expected to take a more active role in decreasing the risks for complication prior to elective TJR surgery. In addition, patients, physicians, and

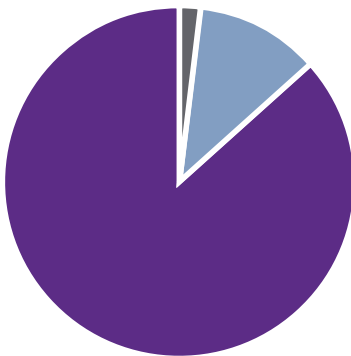
2014 Total Hip Procedure Volumes

- 97 Bilateral Total Hip Arthroplasty
- 115 Revision Total Hip Arthroplasty
- 1,047 Primary Total Hip Arthroplasty



2014 Total Knee Procedure Volumes

- 32 Bilateral Total Knee Arthroplasty
- 176 Revision Total Knee Arthroplasty
- 1,324 Primary Total Knee Arthroplasty



healthcare administrators must begin to see themselves not just as individuals involved in decisions regarding TJR surgery, but rather as part of a system that administers healthcare within a larger societal context. It is simply unsustainable for surgeons and hospitals to perform elective surgery in higher-risk patients with modifiable risk factors without increasing efforts to reduce these risk factors. However, this concept must be balanced by the ethical principles of autonomy, beneficence, and nonmaleficence.

IS ROUTINE ANTIBIOTIC PROPHYLAXIS PRIOR TO DENTAL PROCEDURE COST-EFFECTIVE FOR TOTAL JOINT REPLACEMENT PATIENTS?

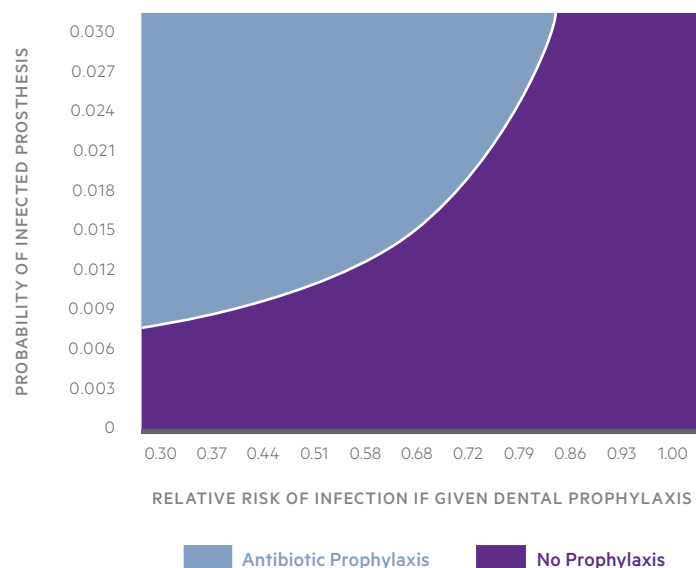
The need for antibiotic prophylaxis prior to dental procedures for patients with existing total joint replacements remains controversial. Antibiotic prophylaxis can reduce the incidence of bacteremia with dental procedures, thus theoretically decreasing the likelihood of late hematogenous infections of a total joint prosthesis. However, the true risk associated with dental procedures is unknown, the ability of prophylaxis to decrease the risk of these infections is not clearly established, and significant adverse drug reactions associated with antibiotic use can occur.

We used a decision model to evaluate the cost-

effectiveness of routine antibiotic prophylaxis prior to dental work in patients with total joint replacement. The results demonstrate that if the risk of an infected prosthesis is less than 0.75%, then antibiotic prophylaxis will not be cost-effective no matter how much the risk is reduced by the antibiotics. If the risk of an infected prosthesis is 0.012, or 1.2%, then it will be cost-effective to administer prophylactic antibiotics if they reduce that risk by 42% (creating relative risk of 0.58) or more. If the risk of an infected prosthesis is 0.021, or 2.1%, then it will be cost-effective to administer prophylactic antibiotics if they reduce that risk by only 25% (creating relative risk of 0.75) or more.

The routine use of antibiotic prophylaxis prior to dental procedures for patients with total joint prostheses may not be cost-effective when the risk of infection is low. However, specific data quantifying the risk and impact of prophylactic antibiotics is needed. This analysis provides guidelines for the probabilities that would need to exist to make this practice cost-effective. Patients and physicians should consider antibiotic use on an individual basis and weigh the risks of infection and adverse drug reaction when making treatment decisions. Further analysis should be performed of higher-risk populations with immunosuppression who may benefit from prophylaxis before dental procedures.

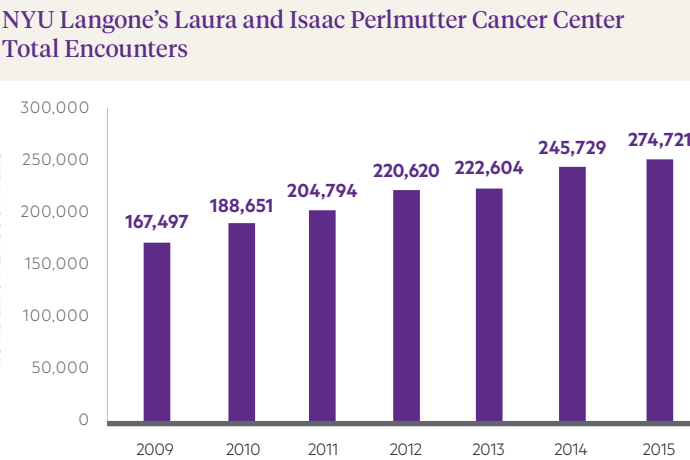
Cost-Effectiveness for Varied Probabilities of Infecting a Prosthesis with Dental Work and Relative Risk of Infection if Given Prophylactic Antibiotics



Division of Orthopaedic Oncology

The Division of Orthopaedic Oncology and NYU Langone's Laura and Isaac Perlmutter Cancer Center care for patients with a broad spectrum of neoplastic processes involving the musculoskeletal system. Our orthopaedic surgeons work with their colleagues in medical oncology, pediatric oncology, radiation oncology, pathology, and radiology to evaluate and manage benign and malignant tumors of the bone and soft tissue. Multidisciplinary care ensures that patients with complex musculoskeletal cancers receive an accurate diagnosis and are cared for using the best available treatments.

Through close collaboration with the Perlmutter Cancer Center, the Division of Orthopaedic Oncology continued to grow its clinical and surgical volume in 2014. With the addition of new faculty in Pediatric Oncology and Medical Oncology, we have further developed our ability to provide multidisciplinary care in a fully integrated manner.

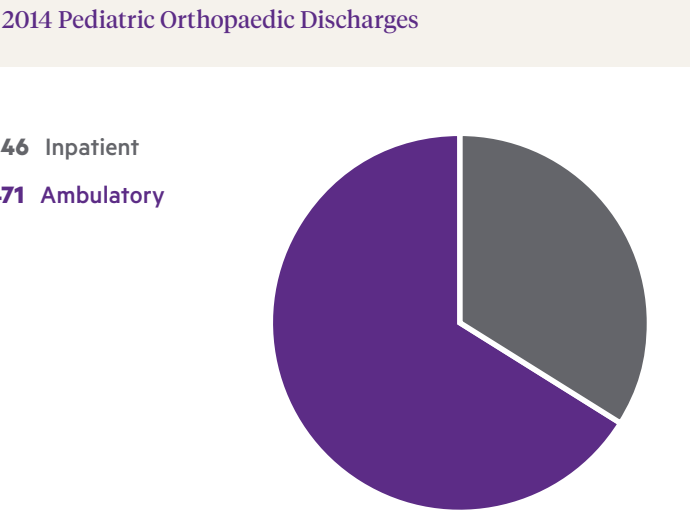


Division of Pediatric Orthopaedic Surgery

DIVISION OF PEDIATRIC ORTHOPAEDIC SURGERY

The Division of Pediatric Orthopaedic Surgery treats children with a variety of diagnoses, including hip dysplasia, limb deformity and shortening, clubfoot, scoliosis, and cerebral palsy. The division offers a multidisciplinary approach to treating the most complex orthopaedic problems in children. Faculty members have a special interest in quality-of-life research, and division researchers are now using tablet technology to collect patient/parent-reported outcomes for various interventions.

Division faculty members provide care within the Center for Children, which offers outpatient care to children with musculoskeletal conditions. Over the last four years, patient volume at the center has nearly tripled. Surgical volume continues to grow as the Division of Pediatric Orthopaedic Surgery adds new faculty.



EQUINOVALGUS DEFORMITY CORRECTION IN CHILDREN AND ADOLESCENTS: FUNCTIONAL AND RADIOLOGICAL OUTCOMES AFTER MODIFIED EVANS PROCEDURE

The modified Evans procedure is the surgery of choice for equinovalgus deformity (flexible flat feet with tight heel cord). However, little outcomes data exist for this procedure in the pediatric population. The purpose of this study was to evaluate functional and radiographic outcomes in pediatric patients with equinovalgus deformity following the modified Evans procedure.

In this retrospective study, we evaluated 24 symptomatic equinovalgus feet in 17 patients who were corrected with a calcaneal lengthening osteotomy described by Evans and modified by Mosca. The modified Evans procedure incorporates calcaneal lengthening osteotomy, peroneus brevis lengthening, percutaneous tendo-Achilles lengthening (Hoke or Strayer procedure), advancement of tibialis posterior tendon, talonavicular capsule, and spring ligament imbrication. Patients had persistent pain and had failed conservative treatment. Patients with hyperlaxity syndromes, ankle valgus, neuromuscular disorders, and tarsal coalitions were excluded. We evaluated patients postoperatively with the Oxford Ankle Foot Questionnaire for Children (OxAFQ-C), a validated outcomes instrument for assessing the foot and ankle in the pediatric population. Radiologically, patients were evaluated by comparing pre- and post-operative standing radiographs, including the measurement of Hibbs angle, Kite's angle, calcaneal pitch, Meary's angle, and talar head coverage.

Of the 17 patients (24 feet) with a mean age of 13.3 years (range, 10–19 years), nine (53%) were females and eight (47%) were males. Seven (41%) had bilateral correction. The mean length of follow-up was 28 months (range, 11–66 months). Average OxAFQ-C scores for the physical, school and play, and emotional domains were above 80. Scores on the footwear question were the lowest, with an average of 53.8. Based on comparison to similar cohorts from the literature, the scores for the physical and emotional domains were higher for children in this study group than children with clubfoot treated surgically. Satisfactory radiographic correction of all components of the deformity of the hindfoot and midfoot was achieved in all but the most severely deformed feet. Talar head coverage improved in the majority of feet, with average coverage increasing from 81% to 97%. Near normal correction was achieved in 86% of feet.

EFFECTIVENESS OF TENSION BAND PLATING FOR THE TREATMENT OF ANGULAR DEFORMITIES AND LIMB LENGTH DISCREPANCIES

We performed a retrospective radiographic review of 120 consecutive patients who underwent epiphysiodesis or hemiepiphysiodesis with tension band plating from 2007 to 2013. Inclusion criteria were coronal angular deformity or limb length discrepancy (LLD), treatment with proximal tibia (PT) or distal femur (DF) tension band plating without associated osteotomies, and complete preoperative and postoperative limb length films. Eighteen patients (30 limbs) with angular deformities and 15 patients (18 limbs) with LLD met all inclusion criteria. Patients were divided into two groups, those who had tension band plating in PT and those who had it in DF. Patients who had a hemiepiphysiodesis were also grouped on the basis of presence of varus or valgus deformity.

Of patients with LLD, 7 had plating in PT (mean age 11.1 years) with a mean tibial length discrepancy of 17.7 mm, and 11 had plating in DF (mean age 12.4 years) with a mean femoral length discrepancy of 13.1 mm. This was significantly different ($p = 0.045$). The mean rate of correction (mm/year) was significantly greater for DF than PT plating (9.4 vs. 3.8, $p = 0.023$). Mean length of follow-up was 24.8 months.

Of patients with angular deformities, 19 had plating in PT (mean age 12.1 years) and 11 had plating in DF (mean age 12.4 years). The mean rate of correction (degrees/year) of medial proximal tibial angle (MPTA) or mechanical lateral distal femoral angle (mLDFA) was significantly greater for DF than PT (8.3 vs. 4.0, $p = 0.014$). The mean rate of mechanical axis deviation (MAD) correction (mm/year) was significantly greater for DF than PT (34.4 vs. 15.6, $p = 0.001$).

Comparison of patients with varus ($n = 10$, mean age 13.0 years) and valgus ($n = 20$, mean age 11.8 years) demonstrated no significant difference in mean rate of correction of either joint angle (MPTA or mLDFA) (6.6 vs. 5.0, $p = 0.400$) or MAD (24.6 vs. 21.5, $p = 0.627$). The mean length of follow-up was 14.1 months.

Division of Foot and Ankle Surgery

The Division of Foot and Ankle Surgery, one of the oldest foot and ankle faculties in the United States, offers a complete array of operative and nonoperative treatments, ranging from simple interventions to the most complex surgical procedures. Faculty members have a special interest in sports-related injuries and serve as consultants to several professional sports teams. The division has an active research program focused on ankle replacement as well as complications related to diabetes.

Division faculty members provide care within the Center for Ankle Arthritis, which offers cutting-edge treatment for patients afflicted with debilitating arthritis of the ankle. Treatment options include bracing, injections, and reconstruction. Surgical alternatives include minimally invasive arthroscopic debridement, distraction, fusion procedures, and ankle replacement.

Faculty members also provide care within the Diabetes Foot and Ankle Center, a tertiary referral center specializing in limb salvage. The center's mission is to prevent amputations in patients with diabetes. Orthopaedic surgeons, podiatrists, plastic surgeons, physiatrists, vascular surgeons, and prosthesis/orthotic specialists manage complications such as ulcers, infections, and Charcot deformities. An endocrinologist and a nurse practitioner provide overall diabetes management.



IMPLEMENTATION OF PRE-ADMISSION INTERVENTIONS TO REDUCE LOS FOR DIABETIC PATIENTS HAVING SURGICAL PROCEDURES

The Diabetic Foot and Ankle Center (DFAC) implemented a pre-admission intervention project to reduce length of stay (LOS) for diabetic patients with planned surgical admissions and chronic osteomyelitis. We have identified several factors that influence LOS, including waiting for in-hospital finalization of OR cultures, arranging for postdischarge antibiotic infusion, and facilitating safe discharge to the most appropriate environment. The goal of the initiative was to address the factors that extend LOS by improving coordination with postdischarge service vendors.

The intervention begins at the time a patient is identified as a surgical candidate during the outpatient appointment. Based on anticipated medical and surgical needs, providers work with the patient and his or her family to identify care preferences and set up expected postdischarge care services prior to admission. The aim is to establish and execute both surgical preparation and a projected plan of care before the patient is admitted.

From May 2014 to May 2015, 112 patients took part in this intervention project. For this population, LOS has been reduced from an average of 6.1 days for Medicare patients and 5.5 days for commercial patients to a combined average LOS of 2.14 days. No patients who participated in the initiative were readmitted. Patient satisfaction outcomes were also positive. Participants took a patient satisfaction survey at their first postoperative appointment. Average satisfaction ratings were “very good to good” for pre-surgery preparation at the outpatient center, in-hospital stay, and services provided after returning home.

Connecting patients with their postdischarge care vendors prior to admission improves the care transition process, resulting in lower LOS, and enhances the patient experience.

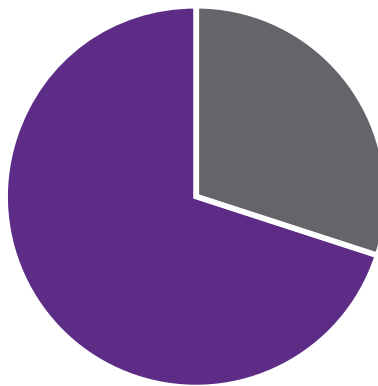
Division of Spine Surgery

The Division of Spine Surgery provides comprehensive treatment of adult and pediatric spine disorders, including degenerative spine conditions, complex spinal growth disorders, neuromuscular disorders, traumatic injuries, and revision surgeries. The division is committed to an evidence-based, patient-centered approach to the management of spinal disorders. Faculty researchers focus on optimizing patient care by utilizing cutting-edge techniques in the analysis of clinical outcomes.

FY 2014 Spine Division Discharges

1,398 Inpatient

603 Ambulatory



NYU LANGONE LAUNCHES COMPREHENSIVE SPINE CENTER

In late 2015, NYU Langone formalized a longtime collaboration between its spine specialists in the Departments of Orthopaedic Surgery and Neurosurgery. The center leverages the skills of both departments to provide across-the-board spinal care. Patients with spine problems call a single referral number and are then directed to the appropriate NYU Langone specialist.

USE OF FULL-BODY, THREE-DIMENSIONAL IMAGING TO IDENTIFY MUSCULOSKELETAL COMPENSATORY MECHANISMS IN SAGITTAL SPINAL DEFORMITY

A thorough assessment of sagittal spinal deformity (SSD) should include both the drivers of sagittal deformity and any compensatory mechanisms triggered by the musculoskeletal system to counteract the spinal sagittal malalignment. Head-to-foot radiographic evaluation of SSD patients can be used to understand the regional and global musculoskeletal mechanisms of compensation.

One of the main drivers of sagittal spinal deformity is the degenerative loss of lumbar lordosis, which eventually leads to positive sagittal malalignment (the inability to stand upright). Patients recruit compensatory mechanisms to maintain an erect posture and horizontal gaze. Compensation typically begins in the spine, with mechanisms such as lumbar spine extension and thoracic hypokyphosis. As SSD progresses, patients may recruit more musculoskeletal components such as pelvic retroversion and knee flexion.

We performed a single-center retrospective chart review of 435 adult SSD patients who underwent stereoradiography at NYU Langone Medical Center's Center for Musculoskeletal Care between November 2012 and November 2013. Head-to-toe stereoradiography was performed using the EOS imaging system (EOS Imaging, Paris, France), a full-body, low-dose X-ray system that provides good anatomic detail. Subjects were categorized based on the progressive magnitude of SSD. Compensatory mechanisms were analyzed and compared between the deformity groups. Further sub-analysis compared the recruitment of compensatory mechanisms between two age groups (< age 65 and > age 65).

Imaging analysis elucidated the chain of compensatory mechanisms triggered by SSD. Overall, the gradual increase of sagittal deformity is accompanied by a steady transfer of compensation from the spine toward the lower limbs. Older patients demonstrated more pelvic and lower-limb involvement and less thoracic spine adaptation. The dynamic relationship between the spine and other components of the musculoskeletal system indicates the value of using full-axis evaluation of the spine, hips, and lower limbs to elucidate the primary pathology and compensatory mechanisms in the setting of spinal deformity.



UNPLANNED HOSPITAL READMISSION FOLLOWING SURGICAL TREATMENT OF COMMON LUMBAR PATHOLOGIES: RATES AND CAUSES

With the implementation of pay-for-performance and bundled payment compensation models, there is a growing emphasis on containing costs by decreasing the number of unplanned readmissions following surgery. To help reduce readmissions, we evaluated readmission rates and causes of readmission following surgical treatment of common degenerative lumbar pathologies.

We identified 1,306 patients who underwent surgery for various lumbar pathologies at NYU Langone Medical Center's Hospital for Joint Diseases from 2012 to 2014. A total of 70 readmissions were captured in the hospital administrative database. Coding errors accounted for 13 of these readmissions. Of actual readmissions, 14 were planned and 43 were unplanned. Unplanned readmission rates varied between 2.1% and 7.1%, depending on pathology. The overall 90-day readmission rate was 3.3%. Surgical site infection (SSI) and wound complication were the two most common reasons for readmission, accounting for 75% of all readmissions during the 90-day postoperative period. Index length of stay (LOS), discharge disposition, severity of illness scores, and surgical approach were factors that had an effect on readmission.

Our results indicate that readmission rates following surgical treatment of common degenerative lumbar pathologies at our institution are relatively low. The data provide information that can be used to counsel patients on the readmission risk associated with lumbar degenerative spine surgery.

CERVICAL DISC ARTHROPLASTY VERSUS ANTERIOR CERVICAL DISCECTOMY AND FUSION: ANALYSIS OF PERIOPERATIVE OUTCOMES AND TRENDS IN UTILIZATION

Cervical disc arthroplasty (CDA) has recently been introduced as an alternative to anterior cervical discectomy and fusion (ACDF) for the surgical treatment of single-level degenerative disc disease (DDD). CDA offers the potential advantage of preserving intersegmental motion and preventing adjacent segment degeneration. We performed a retrospective review of national data from a large administrative database to compare patient characteristics, utilization trends, perioperative outcomes, and costs of CDA and ACDF.

An estimated 2,003 CDAs and 699,289 ACDFs were performed in the United States from 2005 to 2010. On average, patients undergoing CDA were younger and had fewer comorbidities than those undergoing ACDF. In terms of complications, CDA was associated with less postoperative dysphagia, hematoma, acute anemia secondary to intraoperative blood loss, and acute respiratory distress syndrome. ACDF was associated with fewer cardiac, peripheral vascular, and device-related complications. Average length of stay (LOS) was 0.5 days lower for CDA patients than for ACDF patients. CDA was associated with lower total charges (\$39,563 for CDA vs. \$43,477 for ACDF). Mortality was 21% lower after CDA than after ACDF ($p = 0.01$).

The data suggest that CDA might be safer and associated with lower mortality, lower hospital costs, and shorter LOS compared to ACDF. This information provides a rationale for future cost-effectiveness studies and further research to develop evidence-based paradigms for surgical management of cervical DDD.

Division of Hand Surgery

The Division of Hand Surgery is one of the largest academic and clinical divisions of its type in the nation. The faculty includes more than 20 board-certified and fellowship-trained hand surgeons who provide comprehensive evaluation and treatment for problems that affect the hand and upper extremities.

The division’s rich history begins with its founder, Emanuel B. Kaplan, MD, who helped lay the groundwork for the specialty of hand surgery. For the past 30 years, the division has been led by Martin Posner, MD. Recognized as a leader in the hand surgery field, Dr. Posner has trained more than 90 fellows during his time as division chief.

A DOUBLE-BLINDED, PROSPECTIVE, RANDOMIZED, CONTROLLED TRIAL COMPARING DEXAMETHASONE VERSUS KETOROLAC INJECTIONS FOR THE TREATMENT OF TRIGGER FINGER

This ongoing clinical trial compares local corticosteroid (dexamethasone) injections to local NSAID (ketorolac) injections to determine whether there is equal or better reduction of symptoms for common inflammatory upper-extremity disorders. Inflammatory disorders that afflict many orthopaedic patients seen in our clinics include De Quervain’s Tenosynovitis, trigger finger, and lateral epicondylitis (tennis elbow).

Between 2012 and 2014, we prospectively enrolled 42 patients, age 18 years or older, who were diagnosed with trigger finger and indicated for a local therapeutic injection. Subjects were randomized to receive a single peritendinous soft tissue injection of either dexamethasone (1 mL of 4 mg/mL) or ketorolac (1 mL of 30 mg/mL), with a second injection of the same medication permitted once as the subject desired at 4- or 8-week follow-up. Baseline and postinjection data were collected at initial, 4-week, 8-week, 12-week, and 6-month visits. Primary outcomes included quickDASH, EQ-5D, and visual analog pain scores. Secondary outcomes included physical exam findings based on the Quinnell grading system. Endpoints included resolution of objective triggering with resolution of tenderness at the A1 pulley, and decision to receive surgery.

There were no serious adverse events in any subjects. Our preliminary analysis showed no difference in change of Quinnell grade, quickDASH, and EQ-5D at 4-week follow-up. However, there was a larger decrease in visual analog pain scores in the dexamethasone group at 4-week follow-up compared to the ketorolac group (-2.29 vs. -0.08, $p = 0.012$).

As we continue to enroll more subjects and provide further long-term follow-up, we anticipate describing the relative safety and efficacy of these two medications for these common inflammatory disorders.

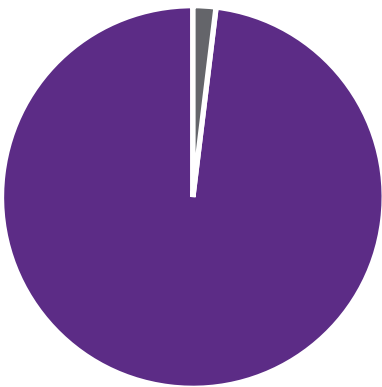
Three Most Common Hand Procedures in FY 2014

- 92 Per Nerve Adhesiolys NEC
- 140 Operative Fixation Distal Radius Fracture
- 325 Carpal Tunnel Release



FY 2014 Primary Hand Procedures

- 52 Inpatient
- 2,376 Outpatient



MONOFILAMENT TESTING TO DETECT SUBCLINICAL NEUROPATHY FOLLOWING BRACHIAL PLEXUS BLOCKADE: A PROSPECTIVE STUDY

Ultrasound-guided brachial plexus blocks are commonly used for anesthesia in upper-extremity surgical cases. Clinically evident neuropathy following nerve blocks is very rare. We used Semmes-Weinstein monofilament testing, a fine evaluation of sensory alterations, to investigate whether blocks could cause postoperative subclinical neuropathy compared to the nonoperative hand and also compared to the hands of a general anesthesia cohort.

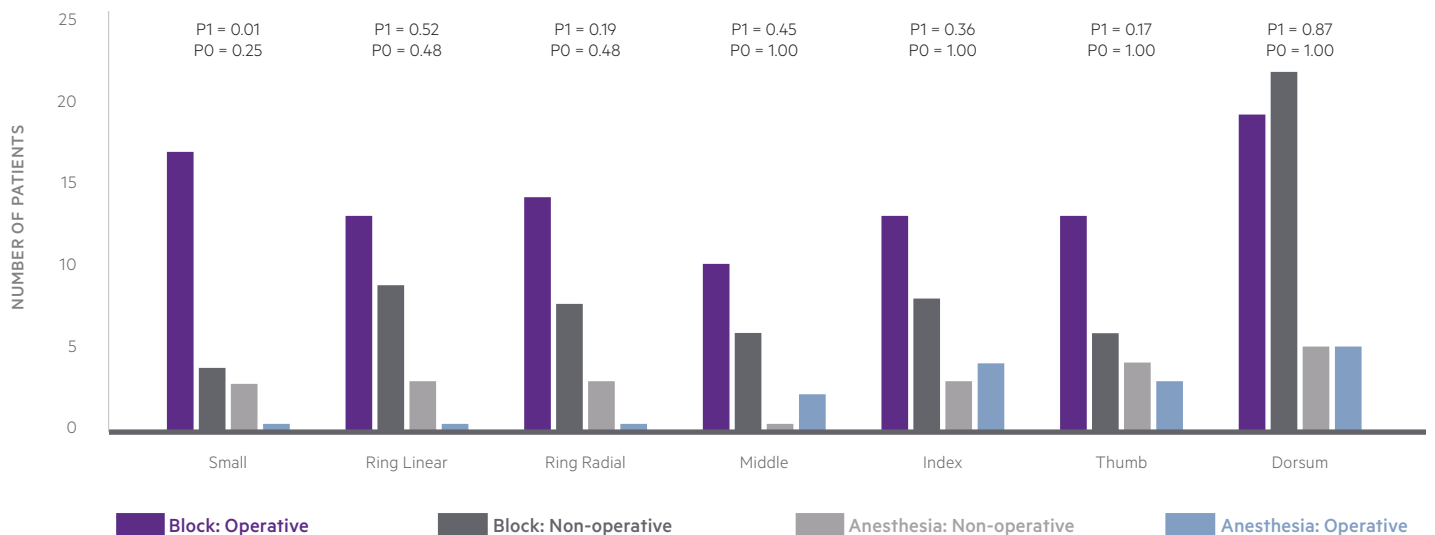
A total of 128 hand surgery patients with a mean age of 46 were prospectively enrolled in this study. Patients undergoing nerve-related procedures and patients with preoperative clinical nerve deficits were excluded. Ninety-three patients underwent brachial plexus blockade preoperatively, with 70 receiving infraclavicular blocks and 23 receiving supraclavicular blocks. Thirty-five patients underwent general anesthesia. Semmes-Weinstein monofilament testing was performed on each patient on both the operative and the nonoperative extremities. Testing was performed preoperatively and at a mean of 14 days postoperatively. Sensation was tested in seven different areas of the hand encompassing the ulnar,

median, and radial nerve distributions. Monofilament testing was not repeated at subsequent office visits; however, routine neurovascular testing was performed at these visits, with a mean follow-up time of six weeks. Pre- and postoperative monofilament testing scores were compared.

There were no recorded neurologic complications in either the block group or the general anesthesia group. McNemar's two-sided chi-square analysis revealed that within the block group there was a statistically significant decrease in postoperative sensation in the small finger of the operative hand compared to the nonoperative hand ($p = 0.01$). There were no statistically significant differences between pre- and postoperative testing in any distribution in the general anesthesia group. At final follow-up, there were no clinically significant nerve deficits found in any patients.

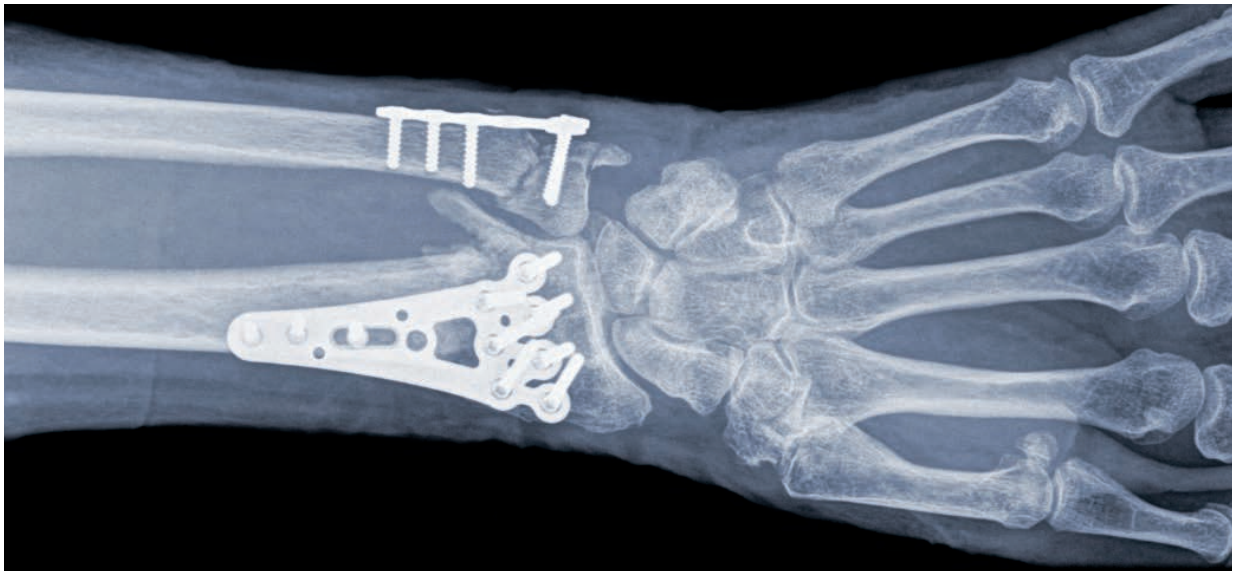
Brachial plexus blockade may cause subtle and sub-clinical decreases in sensibility in the small finger at short-term follow-up. This may be related to increased susceptibility of the medial cord. However, this decrease in sensation did not have any clinically relevant manifestations. Therefore, we continue to believe that brachial plexus blockade is a safe method for upper-extremity anesthesia.

Patients Demonstrating Decreased Light Touch Sensation Postoperatively



P1 = p -value for brachial plexus block patients comparing operative to non-operative hand.

P0 = p -value for general anesthesia patients comparing operative to non-operative hand.



EVALUATION OF PRONATOR QUADRATUS REPAIR INTEGRITY USING DYNAMIC ULTRASONOGRAPHY FOLLOWING VOLAR PLATE FIXATION FOR DISTAL RADIUS FRACTURES

The purpose of this ongoing study is to quantitatively assess the quality of pronator quadratus (PQ) repair following volar plate fixation of distal radius fractures using dynamic musculoskeletal ultrasonography. We hypothesized that PQ repair results in a low rate of failure and that there is no difference in functional outcomes between failed and intact repairs.

We retrospectively reviewed charts of patients who underwent volar plate fixation by three hand surgeons from January 2013 to January 2015. Patients aged 18 to 90 years with a minimum postoperative follow-up of three months were included. The included patients underwent bilateral wrist ultrasonography by a single musculoskeletal radiologist. The primary outcome was whether the repair was intact on dynamic ultrasound. Secondary outcomes included bilateral PQ volume, distance between volar plate and flexor pollicis longus (FPL) tendon, wrist/forearm range of motion, grip strength, VAS pain scores,

and DASH scores. Age, gender, occupation, mechanism of injury, hand dominance, complications, and date of surgery were obtained for all subjects.

Twelve patients underwent bilateral wrist ultrasonography. On preliminary analysis, all repairs of the PQ were intact. The volar plate was covered by the PQ in 50% (six of 12) of the operative wrists. Mean PQ volume was 13,546 mm³ in the operative wrist and 16,546 mm³ in the nonoperative wrist. In two cases, the FPL tendon was observed making direct contact with the volar plate, though the subjects reported no discomfort with thumb motion or tenderness over the FPL tendon.

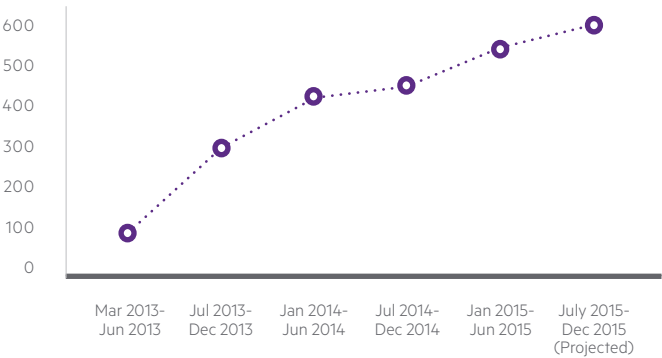
The use of musculoskeletal ultrasound in this study may provide a unique advantage over radiographic methods described by other authors, as ultrasonography provides detailed characterization of soft tissues of the flexor compartment in relation to the volar plate. As our study continues, one goal will be to describe how frequently the FPL tendon makes contact with the volar plate and whether this makes a difference in functional outcomes.

Division of Primary Care Sports Medicine

The Division of Primary Care and Sports Medicine provides non-surgical orthopaedic care to athletes of all ages and at all levels of participation. The faculty collaborates with musculoskeletal radiologists, physical therapists, exercise physiologists, nutritionists, and psychologists to treat and prevent injuries that affect athletes and their performance.

Division faculty members helped establish the Concussion Center, which provides comprehensive care for this complex injury. The Center has experienced exponential growth recently. In addition, the Concussion Center provides multiple educational programs for the public and an annual CME course that attracts more than 400 attendees.

Number of Concussion Center Evaluations



USING MOBILE TECHNOLOGY TO STUDY CONCUSSION

NYU Langone's Concussion Center has also teamed with the Medical Center's Information Technology Department to develop an app for the Apple iPhone and Apple Watch that allows newly diagnosed concussion patients and their doctors to monitor symptoms and activity levels. The Concussion Tracker app, built using Apple's Research Kit software platform, is being utilized in a Concussion Center research project launched in late 2015, in which patients use their smart phones to complete three daily tasks – a five-question survey of symptoms, a six-minute walk, and a concentration test in which they input a set of digits in reverse order – plus a weekly 22-question assessment. Results are then integrated into the Medical Center's electronic medical records system. The app includes a dashboard that presents daily results in graph form, as well as an educational component.

A free version of the app will also be available to members of the general public who have been diagnosed with a concussion and wish to use it in collaboration with their treating physician. Results from the NYU Langone study and from public users will be compiled in two separate data banks.

Integrated Quality and Safety Initiatives

GRADUATE AND UNDERGRADUATE MEDICAL EDUCATION

Efforts to improve patient safety call for the participation of all stakeholders. At an academic medical center, that means it is essential to involve residents and medical students in the quality and safety process.

Decentralizing quality and patient safety achieves two goals. First, it helps us build a culture of safety by making sure every member of the care team feels comfortable reporting safety issues without fear of retribution. Since residents and medical students are traditionally in subordinate positions, it is important to overcome their reluctance to speak up about patient safety.

Second, involving students and residents allows us to teach the importance of quality and patient safety to a new generation of physicians. We regularly lecture both medical students and residents on key topics in safety and quality. We have also designed a program to instill our residents and students with a strong sense of their obligation to enhance patient safety.

QUALITY AND PATIENT SAFETY CONCENTRATION

Our unique Quality and Patient Safety Concentration gives medical students insight on the quality and safety issues associated with patient care, with a focus on musculoskeletal care.

This concentration includes five components—patient safety, patient satisfaction, quality indicators, public policy initiatives, and strategies for improvement. Students gain an understanding of the impact of musculoskeletal diseases on society. They also study strategies and mechanisms for planning, implementing, and measuring quality and patient safety initiatives. In addition, all students in this concentration are required to submit a research abstract on a quality/safety topic.

Since its inception three years ago, more than 25 medical students have participated in the Quality and Patient Safety Concentration.

GRADUATE MEDICAL EDUCATION (GME)

One of the best ways to teach safety and quality concepts to new physicians is to involve them in research. Over the past few years, the Department of Orthopaedic Surgery

has involved residents in more than 60 research projects related to patient safety and quality.

In addition, the department collaborates with leaders from across NYU Langone Medical Center to develop new strategies for improving the teaching of patient safety and quality. Department faculty participate actively in the medical center's Task Force on GME Patient Safety and Quality Curriculum. This committee is responsible for ensuring a strong quality/safety core curriculum across education programs and departments.

ONGOING NURSING QUALITY AND SAFETY PROJECTS

The award-winning Magnet® nursing staff at NYU Langone actively partners with the Department of Orthopaedic Surgery to offer the highest quality and safest care for our patients. We and our nursing partners have collaborated on initiatives to increase medication safety, minimize postoperative complications, reduce length of stay, improve pain control, and enhance patient satisfaction.

FALL PREVENTION INITIATIVE

Nursing leaders were instrumental in efforts to reduce patient falls at the Hospital for Joint Diseases (HJD). The department led an interdisciplinary team that examined the causes of falls at our institution. They identified areas of focus, and then implemented several changes aimed at fall prevention.

Now, nurses across HJD use a standardized “falls bundle” of interventions for patients at risk because of surgery, polypharmacy, or other factors. The bundle includes yellow identification bracelets for at-risk patients, hourly rounding, and placement of patients in yellow “safety zones” near nursing stations.

When a fall does occur, the care team holds a post-fall “huddle” to analyze the event, identify contributing factors, and suggest process improvements. Staff examine root causes weekly during the “Falls Friday” review. When a nursing unit reaches 100 days without a fall, the milestone is celebrated with a “Moment of Excellence” email bulletin to recognize the unit's accomplishment.

These strategies have made a difference. In the fourth quarter of 2014, HJD's total fall rate was -0.91 per 1,000 patient days, well below the National Database of Nursing Quality Indicators benchmark of 0.05. Falls with injury were also below benchmark at -0.64 per 1,000 patient days.

Presentations and Publications Focused on Quality and Safety

PODIUM AND POSTER PRESENTATIONS

American Academy of Orthopaedic Surgeons Annual Meeting (New Orleans, March 12, 2014)

- Patients' Perception of Care Correlates with Quality of Hospital Care: A Survey of 4,605 Hospitals
- Readmission Burden of 30-Day Readmissions Following Total Joint Replacement Among Medicare Beneficiaries
- A Comparison of 30-Day Readmissions Following Orthopaedic Procedures and Medical Admissions
- The Effect of Discharge Disposition on Readmission Rates Following Total Joint Arthroplasty
- Does Malnutrition in Patients Presenting with Fractures Predict Lower Quality Measures?
- Risk Factors for Infection After Hip Arthroplasty: Preventable vs. Non-Preventable Infection
- Risk Factors for *Staphylococcus aureus* Nasal Colonization in Spinal Fusion or Joint Arthroplasty Patients
- Demonstrating Quality in Orthopaedic Surgery, Value-Based Purchasing: Past, Present, Future
- Principles of Antibiotic Stewardship in Orthopaedic Surgery
- Patient Modifiable Risk Factors for Infection After Hip Arthroplasty

MEDNAX Medical Directors Meeting (San Diego, March 27, 2014)

- Creating Value in Orthopaedic Surgery

American College of Medical Quality Annual Meeting (Alexandria, Va., March 27, 2014)

- Physician Specific Correlation Between Discharge Disposition, Cost, Readmission, and Length of Stay Following Total Hip and Knee Replacement: An Analysis of 1,777 Cases
- The Effect of Discharge Disposition on Readmission Rates Following Total Joint Arthroplasty: An Analysis of 3,533 Patients
- A Comparison of 30-Day Readmission Following Orthopaedic Procedures and Medical Admissions
- Geographic Differences in Hospital Charges and Surgical Site Infections for Total Hip Replacement in New York State
- The Relationship of Hospital Charges and Volume to Surgical Site Infection After Total Hip Replacement (THR)

National Patient Safety Foundation 16th Annual Patient Safety Congress (Orlando, May 14, 2014)

- Risk Factors for Postoperative Venous Thromboembolism in Orthopaedic Spine Surgery, Hip Arthroplasty, and Knee Arthroplasty Patients
- The Relationship of Hospital Charges and Volume to Surgical Site Infection After Total Hip Replacement (THR)

2014 Scientific Program and Sir Robert Jones Lecture (New York City, May 15, 2014)

- Geographic Differences in Hospital Charges and Infection Rate for Total Hip Replacement in New York State

- The Relationship of Hospital Charges and Surgical Volume to Surgical Site Infection After Total Hip Replacement
- Implant Waste at a Single Orthopaedic Institution

American Orthopaedic Association Annual Meeting (Montreal, June 18, 2014)

- Readmission Burden of 30-Day Readmissions Following Total Joint Replacement Among Medicare Beneficiaries
- The Standard One Gram Dose of Vancomycin Is Not Adequate Prophylaxis for MRSA

National Association for Healthcare Quality 39th Annual Education Conference (Nashville, September 7, 2014)

- Physician Specific Correlation Between Discharge Disposition, Cost, Readmission, and Length of Stay Following Joint Replacement
- The Effect of Discharge Disposition on Readmission Rates Following Total Joint Arthroplasty
- Hospital Readmissions: Results of a Retrospective Cohort Study Comparing Readmissions Between Orthopaedic and Medical Patients
- The Relationship of Hospital Charges and Volume to Surgical Site Infection After Total Hip Replacement (THR)

Eastern Orthopaedic Association 45th Annual Meeting (Amelia Island, Fla., October 22, 2014)

- Implant Cost Reduction Initiative in Spine Surgery
- The Effect of Severity of Disease on Cost Burden of 30-Day Readmissions Following Total Joint Arthroplasty (TJA)
- The Standard One Gram Dose of Vancomycin Is Not Adequate Prophylaxis for MRSA
- Patients' Perception of Care Correlates with Quality of Hospital Care

United Hospital Fund 25th Annual Symposium on Healthcare Services in New York: Research and Practice (New York City, November 19, 2014)

- Risk Factors for Infection Following Total Knee Arthroplasty (TKA)

New York Presbyterian Healthcare System 2014 Quality Symposium (Pelham Manor, N.Y., November 21, 2014)

- A Customized Antibiotic Program Reduces Surgical Site Infections in Spine and Arthroplasty Patients

American Academy of Orthopaedic Surgeons Annual Meeting (Las Vegas, March 24, 2015)

- Changes in Charges by DRG Severity of Illness Level for the Top Ten Medicare Procedures

2015 Scientific Program and Sir Robert Jones Lecture (New York City, May 14, 2015)

- Expanded Gram-Negative Antimicrobial Prophylaxis (EGNAP) Reduces Surgical Site Infections in Hip Arthroplasty and Spine Fusion Patients

- End Tidal Carbon Dioxide Measurements for Predicting Pulmonary Embolism in Postoperative Orthopaedic Patients
- Comparison of Perioperative Times at an Ambulatory Surgery Center and an Outpatient Hospital: Where Does the Difference Lie?

The Society for Healthcare Epidemiology of America Annual Conference (Orlando, May 14, 2015)

- Expanded Gram-Negative Antimicrobial Prophylaxis Reduces Surgical Site Infections in Hip Arthroplasty and Spine Fusion Patients

American Orthopaedic Association Annual Meeting (Providence, R.I., June 24, 2015)

- The Regionalization of Total Joint Arthroplasty in New York State: An Analysis of 220,000 Cases
- Risk Factors for Infection Following Total Knee Arthroplasty (TKA)

Eastern Orthopaedic Association 46th Annual Meeting (Maui, June 18, 2015)

- Cost Analysis of Total Joint Arthroplasty Readmissions in a Bundled Payment Care Initiative
- The Effect of Tranexamic Acid on Transfusion Rates Following Total Joint Arthroplasty: A Cost and Comparative Effectiveness Analysis

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If you need further information or have questions about our quality and outcomes studies, please contact Lorraine Hutzler, Associate Program Director of the Center for Quality and Patient Safety, at 212-598-6048.

Locations

As of December 2015

Located in the heart of Manhattan, with additional facilities throughout the New York City area, NYU Langone Medical Center consists of five hospitals and a growing outpatient network that brings our world-class medical services directly to the communities where our patients live and work.

NYU Langone's Department of Orthopaedic Surgery cares for patients throughout the NYU Langone campus, including five flagship facilities:

Hospital for Joint Diseases
New York, NY

This 157-bed hospital is the premier inpatient facility of the Department of Orthopaedic Surgery and the cornerstone of its patient safety and quality initiatives.

NYU Langone Medical Center
New York, NY

A variety of inpatient and outpatient orthopaedic services are provided at NYU Langone's 725-bed, flagship acute care hospital, including emergency orthopaedic services in the Ronald O. Perleman Center for Emergency Services.

Center for Musculoskeletal Care
New York, NY

With 110,000 square feet of state-of-the-art space, NYU Langone's premier facility for outpatient musculoskeletal care encompasses orthopaedics, rheumatology, rehabilitation, musculoskeletal radiology, and pain management.

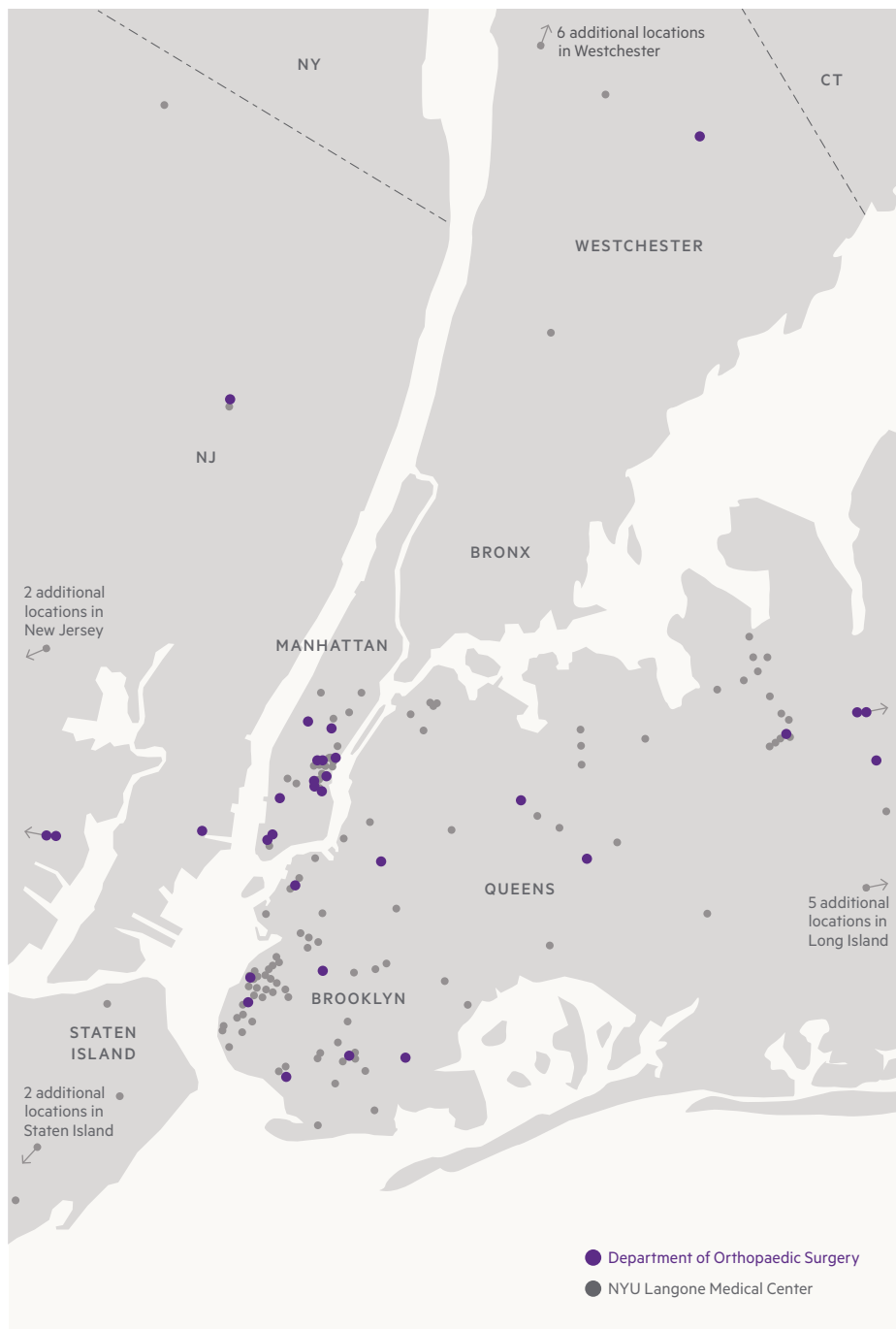
Outpatient Surgery Center
New York, NY

NYU Langone's 22,000-square-foot cutting-edge facility focuses on ambulatory orthopaedic procedures, including shoulder, elbow, wrist, and hand surgeries, knee and ankle arthroscopies, ACL reconstruction, rotator cuff repair, and fracture fixation, among others.

NYU Lutheran Medical Center
Brooklyn, NY

Affiliated with NYU Langone since April 2015 and merged as of January 2016, NYU Lutheran offers Brooklyn residents convenient access to high-quality healthcare.

For more information about our locations, visit, nyulangone.org/locations



About the Center for Quality and Patient Safety

The Department of Orthopaedic 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.

The center conducts an array of research projects, patient education initiatives, and professional development consulting programs in the areas of quality and patient safety, including:

- Development of quality and patient safety initiatives
- Development and implementation of dashboards and scorecards
- Readmission reduction initiatives
- Surgical site infection prevention and protocol implementation
- Venous thromboembolism prevention and safety protocol implementation
- Training in the TeamSTEPPS® patient safety system
- Patient satisfaction improvement
- Optimization for value-based purchasing and bundled payments

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