Orthopaedic Surgery

LARGEST RESIDENCY PROGRAM IN THE COUNTRY

TOP 5 IN U.S. NEWS & WORLD REPORT

REDEFINING QUALITY AND PATIENT SAFETY
Contents

1 MESSAGE FROM THE CHAIR

2 FACTS & FIGURES

4 NEW & NOTEWORTHY

8 CLINICAL CARE & RESEARCH
  9 Personalized Approach to Joint Replacement
  11 Ultra-Low Dose CT Reduces Risk
  13 Complex Case: Scheuermann’s Kyphosis
  14 Regenerative Medicine
  16 New Momentum For Wide-Awake Hand Surgery
  18 Robot and Computer-Assisted Surgery
  20 Quality and Safety Initiatives
  22 Bone and Cartilage Regeneration Research
  24 Complex Case: Pelvic Osteosarcoma

26 ACADEMIC ACTIVITIES

34 LOCATIONS

36 FACULTY & LEADERSHIP
Message from the Chair

Dear Colleagues and Friends:

From simple to complex cases, NYU Langone Medical Center’s Department of Orthopaedic Surgery aims to provide each patient we see with the very best in individualized care.

In 2016, I’m proud to report considerable headway toward that goal with exciting growth in our educational, clinical, and research capabilities. Among the most significant steps forward, the five-year Orthopaedic Surgery Residency Program’s expansion to 70 residents now makes this program—one of the country’s most diverse—the largest of its kind. Likewise, we expanded the department’s fellowship program to include 21 post-graduate clinical fellows. As you’ll read in the pages of this update, our highly skilled surgeons continue to blaze new trails and solve complex cases in collaboration with Neurosurgery, Plastic Surgery, and other departments. An exciting partnership with the Department of Radiology has demonstrated the mettle of low-dose CT scans in diagnosing joint fractures, and we’ve presented promising results on using shockwave therapy to treat refractory tendinitis.

Meanwhile, our bench-to-bedside approach is embodied in several additional clinical care advances. We’re among the first medical centers in the United States to provide dedicated space and resources for wide-awake hand surgery, and we’ve expanded our same-day joint replacement options to include hip, knee, and shoulder arthroplasty. After leading the way in robotic and sensor-assisted partial knee and total hip replacements, our expanded suite of surgical options now includes total knee replacements. In the Joint Preservation and Arthritis Center, an impressive roster of personalized options, including less-invasive surgical alternatives, help patients retain their joints for as long as possible. Our synovial fluid repository and new Joint Preservation Registry II also are providing a rich vein of potential biomarkers that may help us measure osteoarthritis risk, disease progression, and therapeutic response.

Finally, our vibrant research portfolio continues to pay big dividends. Multiple collaborative projects are pointing the way toward promising bone and cartilage regeneration options that may help patients recover from fractures, joint injuries, and other tissue-damaging conditions more quickly. The new Center for Regenerative Medicine is rigorously testing the merits of injectable biologics, such as stem cells derived from platelet-rich plasma to delay, or even avoid, the need for knee replacement surgery.

Our safety and quality research projects are suggesting how to improve patient outcomes while boosting efficiency—complementary goals as medicine moves toward bundled payments. We are clarifying how to reduce the danger of pre- and post-surgical risk factors, using simulations to improve how surgeons communicate with patients, and sharing information with other medical centers to help reduce care disparities. Some of our studies are underscoring how simple changes might significantly influence the operating room turnover time for hand surgery, enable discharges to patients’ own homes, and enhance tissue repair after shoulder surgery. Together, these insights will enable us to allocate our resources where they can do the most good.

With this flurry of activity, we are laying the groundwork for an ever-stronger push toward innovative explorations at the bench, interventions at the bedside, and improvements in the daily lives of our patients.
# Department of Orthopaedic Surgery

## TOP 5
in the country for orthopedics in U.S. News & World Report’s “Best Hospitals” for four consecutive years.

## Faculty and Students

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Fellows</th>
<th>Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>227</td>
<td>21</td>
<td>61</td>
</tr>
</tbody>
</table>

## Patient Volume: Top Procedures

<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>Total Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hip Replacements</td>
<td>1,901</td>
</tr>
<tr>
<td>Total Knee Replacements</td>
<td>1,725</td>
</tr>
<tr>
<td>Knee Arthroscopies</td>
<td>4,263</td>
</tr>
</tbody>
</table>

## Patient Volume: By Division

<table>
<thead>
<tr>
<th>Division</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Reconstructive</td>
<td>5,775</td>
</tr>
<tr>
<td>Hand</td>
<td>2,711</td>
</tr>
<tr>
<td>Foot and Ankle</td>
<td>709</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>523</td>
</tr>
<tr>
<td>Spine</td>
<td>2,269</td>
</tr>
<tr>
<td>Shoulder and Elbow</td>
<td>797</td>
</tr>
<tr>
<td>Sports</td>
<td>4,343</td>
</tr>
<tr>
<td>Trauma</td>
<td>797</td>
</tr>
<tr>
<td>Tumor</td>
<td>142</td>
</tr>
</tbody>
</table>

Numbers represent FY16 (Sept 2015–Aug 2016)
NYU Langone Medical Center

Adult Reconstructive: Average Length of Stay

3.8 3.5 3.0 2.7
2013 2014 2015 2016

Research

351 ARTICLES PUBLISHED in academic journals

200,000+ PATIENTS ENROLLED in patient-reported outcomes database

#10 IN THE NATION
BEST HOSPITALS
and nationally ranked in 12 specialties, including top 10 rankings in Orthopaedics, Geriatrics, Neurology & Neurosurgery, Rheumatology, Rehabilitation, Cardiology & Heart Surgery, and Urology. Nationally ranked in Cancer, Diabetes & Endocrinology, Ear, Nose, & Throat, Gastroenterology & GI Surgery, and Pulmonology

#11 IN THE NATION
BEST MEDICAL SCHOOLS FOR RESEARCH
and an innovative leader in medical education including accelerated pathways to the MD degree

LEADER IN QUALITY CARE AND PATIENT SAFETY
and recognized for superior performance as measured by Vizient’s nationwide 2016 Quality and Accountability Study
Assessing the Impacts of Intra-Wound Antibiotics and Antiseptics on Wound and Tissue Healing

The application of intra-wound antibiotics and dilute antiseptics in the surgical wound is emerging as a clinical practice that may decrease the postoperative infection rate. “The efficacy of these strategies has been shown clinically in nonrandomized clinical studies,” says Mandeep S. Virk, MD, assistant professor of orthopaedic surgery. “However, the effect of these agents on host cells participating in tissue repair is not known. It’s possible that these agents might have a toxic effect on cells participating in tissue healing—including bone, tendon, ligament, and skin.”

To help understand the potential effects of intra-wound application of these antibiotics and antimicrobial agents on the host cells, Dr. Virk and colleagues are studying the process in vitro. The researchers apply different concentrations of antibiotic and antiseptic solutions to fibroblast, myoblast, and osteoblast, assessing the impact on proliferation, migration, and survival of these cells.

“Our hope is to pick up a concentration that would be least toxic to host cells, but would still be efficacious against the bacteria,” says Dr. Virk.

A Year of Expansion in Education and Training

LARGEST RESIDENCY IN THE NATION. The department’s educational and training programs experienced notable growth in 2016. Among the highlights: The ACGME recognized the history of excellence in the Orthopaedic Surgery Residency Program by allowing it to expand from 60 to 70 residents per year. The five-year program, already highly ranked in the nation, is now also the largest with 14 residents accepted every year.

NEW FELLOWSHIPS IN HAND SURGERY AND ARTHROPLASTY. With expansions in hand surgery and arthroplasty, the department broadened its fellowship programs to include 20 postgraduate clinical fellows across six divisions. As leaders in educational innovation, the residency and fellowship programs both continued their novel use of direct observation to evaluate the clinical skills of trainees.

HEALTH POLICY CERTIFICATE FOR RESIDENTS. In 2016, the department also established a unique one-year certificate program with the Robert F. Wagner Graduate School of Public Service that allows one resident per year to receive a health policy certificate. Based on coursework and involvement in both state and national health lobbying organizations, the certificate program offers special training in leadership and policy development—skills increasingly in demand among orthopaedic surgeons.
New Shockwave Therapy Unit Takes Aim at Intractable Tendinitis

Shockwave therapy has long been used as an effective treatment to fragment kidney stones and gallstones. Over the past few years, evidence has mounted that the therapy’s directed pulses of mechanical energy also can help treat chronic tendinopathy cases that haven’t responded well to other therapeutic options. The therapy is showing early promise in treating patients with refractory tendinitis since debuting at NYU Langone in September 2016.

“It’s a safe intervention with the potential for excellent results,” says Dennis A. Cardone, DO, associate professor of orthopaedic surgery and chief of Primary Care Sports Medicine. The division’s new shockwave therapy unit is still a relative rarity at academic medical centers in the United States. With its arrival, however, Dr. Cardone says the cutting-edge technique will help him and his colleagues initiate new studies, collect valuable long-term data, and potentially expand its use to treat a range of painful conditions, including rotator cuff and hamstring injuries, frozen shoulder, Achilles tendinitis, calcific tendinopathy, and plantar fasciitis.

Insufficient blood flow, Dr. Cardone says, may be a major reason why some chronic tendinopathies are extremely difficult to heal. Although the physiological mechanisms underlying shockwave therapy aren’t fully understood, studies have suggested that its success may stem from its ability to promote revascularization of the affected tendons.

Patients at NYU Langone typically receive the treatment once a week for three weeks. Data on long-term outcomes are still pending; in the interim, however, Dr. Cardone is encouraged by early signs that the repeated treatments are bringing enduring relief.
New & Noteworthy

Improving Outcomes and Efficiency Through Better Blood Management

As part of an institution-wide initiative, NYU Langone’s Value-Based Management team partnered with the Department of Orthopaedic Surgery to reduce the high rate of blood transfusions performed beyond the scope of medical indications. Unnecessary or inappropriate blood transfusions have been associated with higher inpatient mortality and excess costs.

Thanks to a rigorous effort to change practice, faculty members increased the percentage of blood transfusion orders that complied with national guidelines from 57 percent to more than 90 percent throughout the institution, and the Department of Orthopaedic Surgery improved more than any other department. “We’re still doing well after the initial push. That’s the real test of any major change like this,” says Claudette M. Lajam, MD, assistant professor of orthopaedic surgery, and departmental representative for the Medical Center-wide initiative.

From national guidelines based on hemoglobin concentration and other medical factors, the team, led by hospitalist Frank M. Volpicelli, MD, assistant professor of medicine, constructed a dashboard that linked each transfusion indication with the associated blood counts, and helped surgeons compare their progress to that of their peers. A computerized order entry system also helped the doctors think about a transfusion’s necessity while avoiding “alarm fatigue.” The success also relied on regular communications with the physicians and reinforcement of positive trends to help them change their habits.

A similar approach has helped reduce the unnecessary use of cell saver machines to salvage a patient’s blood during surgery. After reviewing the frequency of use and examining the outcomes, the department adopted new guidelines about when the technique should and shouldn’t be used. “We’ve brought our wasteful cell saver usage nearly down to zero,” Dr. Lajam says.

A third project, led by James D. Slover, MD, associate professor of orthopaedic surgery, has assessed the preoperative use of tranexamic acid, or TXA, to prevent major bleeding associated with hip and knee arthroplasty. For institutions with baseline transfusion rates below 25 percent, the research suggested that TXA is not cost-effective. The potential for savings, however, increases above the 25 percent threshold due to TXA’s rising potential to help reduce transfusion rates.
New Leadership and Growth in Pediatrics

NYU Langone added three new faculty members to its Pediatric Orthopaedic Division this year, including a new chief, Pablo Castañeda, MD.

Dr. Castañeda comes to New York from Mexico City, where he has specialized in treating hip disorders in children and adolescents. His practice focuses on improving outcomes for children with developmental dysplasia of the hip, Legg-Calvé-Perthes disease, and slipped capital femoral epiphysis. He currently serves on the medical advisory board of the International Hip Dysplasia Institute and serves on the board of the Mexican College of Orthopaedics and Traumatology, and is past president of the Mexican Society of Pediatric Orthopaedics.

Also joining the Pediatric Orthopaedic Division are Mara Karamitopoulos, MD, clinical assistant professor of orthopaedic surgery, who previously was the co-director of pediatric orthopaedics at Maimonides Medical Center, and Jody Litrenta, MD, clinical assistant professor of orthopaedic surgery, who joins NYU Langone following a pediatric orthopaedic fellowship at Children’s National Medical Center.

NYU Langone Affiliation with Winthrop-University Hospital Brings Expanded and Enhanced Healthcare Networks to Long Island

NYU Langone Medical Center and Winthrop-University Hospital on Long Island have reached an agreement to affiliate the institutions’ extensive healthcare networks.

NYU Langone, with more than 150 ambulatory sites throughout the region, will complement Winthrop-University Hospital’s main campus, multiple ambulatory sites, and network of 66 faculty and community-based practices in more than 140 locations extending from eastern Long Island to Upper Manhattan.

The affiliation will further expand NYU Langone’s presence on Long Island, while enhancing Winthrop’s inpatient and outpatient services with improved access to NYU Langone’s wide range of medical and surgical specialties.

“This agreement publicly confirms our confidence that an affiliation will allow both of our institutions to collaborate and share best practices to better meet the healthcare needs of the communities we serve,” says Robert I. Grossman, MD, the Saul J. Farber Dean and CEO of NYU Langone. Pending regulatory approval, the institutions are aiming to complete their affiliation in spring 2017.
Combining expertise, novel research findings, and the latest techniques, technology, and facilities, the Orthopaedic Team at NYU Langone provides individualized care for patients with common conditions or the most complex clinical needs.
Personalized Solutions Preserve and Replace Joints Based on Patient Profile

For some patients with joint-related problems, a total knee or hip replacement may restore mobility and relieve pain, while others may achieve reduced symptoms and restored function through less-invasive alternatives. Stratifying these patients by risk and likelihood of improvement is a major aim of NYU Langone.

“We want the right operation or intervention for the right patient at the right time,” says Richard Iorio, MD, the Dr. William and Susan Jaffe Professor of Orthopaedic Surgery and chief of the department’s Adult Reconstructive Division. Solutions may eventually need to be as individualized as the “arthritis fingerprints” that determine a patient’s risk, progression, and therapeutic response, Dr. Iorio says. A host of recent departmental initiatives are helping to make that personalized approach a reality.

BIOMARKERS ENHANCE RISK PREDICTION

As they sort through the many factors that may determine disease risk and therapeutic success, the department’s researchers are increasingly looking to biomarkers. “Part of our mission is to avoid joint replacements and big surgeries in people who don’t need them, and biomarkers may help us identify who those patients are,” Dr. Iorio says. The department’s well-curated synovial fluid repository is already enabling researchers to test biomarkers that may predict which young athletes who sustain knee injuries are likely to subsequently develop osteoarthritis (OA), and when older patients with OA are likely to require a joint replacement. From roughly three dozen potential biomarkers initially isolated from the repository, researchers are extensively analyzing a set of 10, according to Thorsten Kirsch, PhD, professor of orthopaedic surgery and cell biology and vice chair of research.

In addition, department faculty are partnering with NYU Langone radiologists to develop new imaging methods that can detect early OA changes and other methods that could complement biomarkers in predicting surgical outcomes and disease progression.

The newly launched Joint Preservation Registry II is supporting these efforts with an ambitious plan to collect knee, hip, and shoulder joint synovial fluid from 1,000 OA patients, as well as matched blood and urine samples and patient-reported outcome scores. Ultimately, Dr. Iorio says, validated biomarker profiles may help doctors and patients determine whether replacement surgery or joint preservation procedures are likely to meet their needs. “It’s going to be an important decision tool,” he says.

AVERTING HIP REPLACEMENTS FOR AVASCULAR NECROSIS

Most patients diagnosed with avascular necrosis or osteonecrosis of the hip are relatively young, which means that any therapies doctors recommend to help them avoid a hip replacement procedure—with a likely later revision—carries considerable long-term benefits. To that end, Thomas A. Einhorn, MD, professor of orthopaedic surgery, director of clinical and translational research and co-director of the Osteonecrosis Center, has helped to formalize a program that uses mesenchymal stem cells to treat early osteonecrosis.

“The idea is that in avascular necrosis of the hip, or osteonecrosis, there’s dead bone in the head of the femur,” Dr. Einhorn says, “and when that bone dies it will eventually collapse and the patient would need a hip replacement.” Bone marrow stem cells injected directly into the femoral head through a minimally invasive method can interrupt this process, helping to regenerate, rejuvenate, and restore living bone to prevent a collapse of the joint and subsequent OA.

The bone marrow aspirate concentrate (BMAC) procedure has drawn patients to NYU Langone from
NYU Langone also is personalizing treatment options for total knee or hip arthroplasty with a new model that stratifies candidates based on their preexisting surgical risk factors and provides options to mitigate those factors, which may lead to poor outcomes. Dubbed Perioperative Orthopaedic Surgical Home, or POSH, the model is aimed at identifying and reducing risk in eight main categories.

POSH, a collaboration with NYU Langone’s Rusk Rehabilitation and Department of Population Health, matches patients with the programs that will best meet their risk-reduction needs. Those who smoke or are morbidly obese, for example, can be enrolled in smoking cessation or weight loss programs. “Patients could even avoid a joint replacement if they modify these risk factors sufficiently,” Dr. Iorio says.

The department also is incorporating the POSH model into a broader commercial effort known as the Lifetime Initiative for the Management of Arthritis, or LIMA. This unique website provides comprehensive information, peer support from other patients, advice from an arthritis coach, and evidence-based self-evaluations to help patients determine their risk of progression and the best course of action. If patients find out they’re in a very low-risk category, for example, conservative measures such as arthritis-friendly exercises and over-the-counter pain medications might be enough to help them manage their condition.

SAME-DAY JOINT REPLACEMENT PROGRAM EXPANDS

For the right patients, same-day discharge following joint replacement can lead to better outcomes and higher satisfaction. Since Roy I. Davidovitch, MD, assistant professor of orthopaedic surgery, performed the first same-day hip replacement in New York City in 2015, NYU Langone has worked to bring the benefits of the approach to more patients.

The same-day hip replacement program has expanded to include knee and shoulder replacements; a same-day discharge group with faculty from both the Adult Reconstructive and Shoulder and Elbow divisions collaborate to apply same-day hip replacement protocols and best practices to the other procedures.

Surgeons decide which patients are good candidates and how their pain and therapy needs will be safely and efficiently met in the hours, days, and weeks after the surgery. Regional nerve blocks and medication cocktails, for example, can help provide smooth transitions for patients in the first 24 postoperative hours. “Our foremost priority is to ensure that this strategy is safe and that patients will have adequate pain control at home,” says Mandeep S. Virk, MD, assistant professor of orthopaedic surgery. “They should have a responsible adult with them, and all of the necessary resources so that they can go home and sleep in their own bed without being deprived of necessary, immediate postsurgical care.”

↑ Roy I. Davidovitch, MD
Ultra-Low Dose CT Reduces Risk in Joint Injury Diagnosis

Computed tomography scans, among the most common imaging methods in medicine, have raised public health concerns over an increased cancer risk linked to the scans’ ionizing radiation. A collaborative effort between NYU Langone’s Orthopaedic Surgery and Radiology Departments has yielded an effective new imaging method that may help to dramatically reduce that risk.

“We have been seeking ways to minimize radiation exposure for both patients and physicians,” says Kenneth A. Egol, MD, professor of orthopaedic surgery and chief of the department’s Trauma and Fracture Division.

A recent study by medical center researchers found that CT scans that use computer-based enhancements to preserve image quality and use only one-fourteenth the standard radiation level can still accurately detect joint fractures. Among a cohort of 50 patients, researchers correctly identified a typical fracture with 98 percent sensitivity and 89 percent specificity—rates comparable to those achieved by a standard CT scan. The technique lowered the average radiation from 0.43 mSv to 0.03 mSv, akin to the dose of a routine chest X-ray.

“We have taken a frequently used and necessary imaging test and made it safer,” says the study’s lead author Sanjit R. Konda, MD, assistant professor of orthopaedic surgery. Dr. Konda’s team developed the REDUCTION protocol (Reduced Effective Dose Using Computed Tomography In Orthopaedic Injury) in conjunction with radiologists led by Soterios Gyftopoulos, MD, assistant professor of radiology.
EARLY SIGNS OF IMAGING SUCCESS

The collaborative effort began when Dr. Konda introduced the idea of using CT scans to diagnose traumatic arthrotomies of the knee. The telltale detection of air in the knee joint had previously relied on the saline load test, which requires injections of an intra-articular saline solution. “You could imagine that it is likely an invasive, painful procedure for a patient. It also takes time,” Dr. Egol says.

Dr. Konda, however, noticed that CT scans of open fractures around the knee commonly revealed air within the joint, and follow-up research confirmed that the method could diagnose traumatic arthrotomies as well. The promise of the approach, however, came with a new challenge: how to reduce the patients’ radiation exposure. “We worked with our radiology colleagues on cadavers to see if we could develop an imaging protocol that would help us detect the air in the joint and minimize the radiation,” Dr. Egol says.

Based on their success in assessing open knee wounds with the low-dose CT strategy, the researchers asked whether the method also could help diagnose extremity fractures. “We applied this low-dose technology to all the different areas of the body that would normally get CT scans, comparing it to standard-dose radiation CT scans, and found that we really didn’t lose any accuracy in diagnosis,” Dr. Egol says.

Subsequent research confirmed that the team’s strategy didn’t adversely impact patient outcomes. The results are now prompting a multidepartmental collaboration between the Departments of Radiology and Emergency Medicine to reduce radiation exposure for patients with orthopaedic trauma and for the physicians involved in their care. “Patients who undergo a traumatic injury or suspected fracture have enough to worry about,” Dr. Egol says. “Our research makes radiation exposure among the least of their concerns.”
Collaboration in Atypical Case of Scheuermann’s Kyphosis and Spinal Cord Herniation

The strong collaboration between the orthopaedic surgeons and neurosurgeons at NYU Langone’s Spine Center recently enabled a complex corrective spine surgery following a rare diagnosis.

Traditionally, the realm of orthopaedic spine surgeons was mainly bone issues, while spinal neurosurgeons dealt with neural structures. “But over the last 20 years or so, these two specialties have become less distinct and more collaborative,” says Thomas J. Errico, MD, professor of orthopaedic surgery and neurosurgery and co-director of NYU Langone’s Spine Center.

PRESENTATION

The benefits of such collaboration were in full view when Adam White, 20, a former lineman on his Pennsylvania high school football team, requested a surgical evaluation in May 2015 to address intense pain between his shoulder blades that had worsened progressively over an eight-month period. In addition, he experienced numbness and tingling that radiated from his fingers to his biceps and from his toes to his knees. Sudden movements, especially sneezing, caused severe and shooting pain that was nearly unbearable, even with medication.

With an MRI, Noel I. Perin, MD, associate professor of neurosurgery, discovered that White was suffering from a rare T5 through T7 spinal cord herniation. It was an interesting intersection with another uncommon diagnosis the young man had received previously at NYU Langone: a pronounced curvature of his thoracic spine due to Scheuermann’s kyphosis, found by radiologists on scoliosis X-rays. “I’ve never before seen both in a single patient,” Dr. Perin says.

SURGICAL PLAN

Dr. Perin developed a comprehensive surgical plan in consultation with Dr. Errico. Each specialty “brings a little extra to the table,” says Dr. Errico, and that additive effect has been highly beneficial for complex cases such as White’s.

During the 13-hour surgery that followed, Dr. Perin first addressed his patient’s spinal-cord hernia and myelopathy with a laminectomy, laminoplasty, and cord decompression. Following a durotomy, he explored the intradural spinal cord with an operating microscope, released adhesions of the cord to the anterior dura, and repositioned it in the center of the canal by dividing the dentate ligaments.

Dr. Errico took over and performed radical facetectomies to decompress the spinal nerves and harvest bone material for subsequent grafting. He then corrected White’s spinal curvature and stabilized the spine by fusing T2 to L1, with 24 pedicle screws and two-foot-long titanium rods.

Finally, Dr. Perin completed the thoracic laminoplasty and screwed miniplates to the vertebral laminae and adjacent lateral mass to prevent a recurrence of the hernia. The surgeons then carefully placed the allografts over the posterior elements of White’s decorticated vertebrae, to aid bone regeneration.

RESULTS

Following the surgery, the patient felt immediate relief upon waking in the post-anesthesia care unit. “No numbness, no pain—just like that,” White recalls. After recovering from the surgery, he remained pain-free, returning to golf and other favorite activities.
Tailoring and Testing New Treatment Options through Regenerative Medicine

Over the past few years, sports medicine has benefitted enormously from the use of injectable biologics to delay or even avoid the need for knee replacement surgery. Among the growing list of promising therapeutic options, NYU Langone is using growth factors derived from platelet-rich plasma and stem cells from bone marrow aspirate to treat osteoarthritis (OA) and testing the treatments on a range of other conditions.

“Biologics will certainly play a major role in the future in the management of patients with musculoskeletal disease,” says Laith M. Jazrawi, MD, associate professor of orthopaedic surgery and chief of the Division of Sports Medicine. Dr. Jazrawi is leading plans for the department’s Center for Regenerative Medicine that would include a dedicated procedure room for injectable therapeutics.

NYU Langone researchers are conducting multiple projects to help determine which biologics may have the brightest future. For one multicenter randomized controlled trial, investigators are comparing the effectiveness of platelet-rich plasma to dry needling for treating patellar tendinopathy. Other researchers are pursuing a randomized controlled trial in collaboration with Birmingham, Alabama-based NuTech Medical, Inc., to compare the effectiveness of the company’s ReNu™ amniotic stem cell allograft to a hyaluronic acid injection or saline control for treating knee OA. A third study is examining whether hyaluronic acid injections improve the symptoms of patients with the earliest stages of OA, compared with physical therapy alone.

Although preliminary, Dr. Jazrawi says the clinical trials’ results have been encouraging so far. Pending FDA approval, he and his colleagues also hope to investigate the OA-treating potential of adipose tissue-derived stem cells, which could be harvested from liposuctions in collaboration with the Plastic Surgery Department. The cells, Dr. Jazrawi says, might even help reestablish cartilage in an OA-affected knee.

RESEARCH SYNERGY WITH SYNOVIAL FLUID REGISTRY

The current and upcoming clinical research projects, he says, fit well with the work of the department’s Joint Preservation and Arthritis Center. Synovial fluid samples collected as part of the Joint Preservation Registry, for instance, are helping to match patients’ therapeutic responses to unique biomarkers. “We're beginning to tailor our medical care toward a specific patient profile,” Dr. Jazrawi says. In this case, he notes, the biomarker-based profile can help determine which patients will respond best to which cellular therapy.

“There may be a specific cohort of patients that has better regenerative potential,” he says. Asking why they improve with stem cell injections while others do not can lead to a better alignment of treatments based on patients’ molecular characteristics identified via blood, urine or joint fluid samples. “Getting that information, it will help us determine if a patient will benefit more from an
injection, from physical therapy, or by going right to total knee replacement,” he says.

Departmental researchers led by Eric Strauss, MD, associate professor of orthopaedic surgery, accurately predicted OA severity based on levels of the synovial fluid biomarkers MCP-1 and IL-6. A separate line of collaborative research led by Philip Band, PhD, research professor of orthopaedic surgery and biochemistry and molecular pharmacology, found that higher levels of a proprietary protein marker called TSG-6 may reflect a more urgent need for knee replacement.

Finally, researchers are collecting fluid from patients undergoing knee arthroscopy to likewise help determine who is more likely to do well or poorly. The decision-aiding information, in turn, can prevent treatment delays and streamline patient care. “They’re getting the best treatment possible for them, not for all patients in general,” Dr. Strauss says. “So we’re looking for this tailored, personal medicine concept based on the data from this registry to help us answer some of these questions.”

SUPERIOR RESULTS WITH SUPERIOR CAPSULAR RECONSTRUCTION

NYU Langone’s expanding use of a new procedure called superior capsular reconstruction is helping patients with a deficient and non-repairable rotator cuff injury avoid a traditional reverse shoulder replacement and its complications.

“The concept of a superior capsular reconstruction—using a dermal allograft, anchoring it into the glenoid and then re-attaching it to the humeral head at the rotator cuff insertion—has provided significant pain relief to select patients with irreparable rotator cuff tears and has improved shoulder function,” says Andrew S. Rokito, MD, associate professor of orthopaedic surgery and chief of the Shoulder and Elbow Division. This procedure, which offers an alternative to shoulder replacement, represents an “exciting” change in the field of orthopaedics, especially within sports medicine.
A Dedicated Space and New Momentum for Wide-Awake Hand Surgery

Hand surgery without tourniquets, sedation, or general anesthesia—once unthinkable—is in the midst of a remarkable renaissance thanks to a burst of recent research demonstrating the safety, efficacy, and benefits of a technique once limited by misconceptions.

Wide-aware hand surgery with only local anesthesia—first championed by Canadian surgeons—has been implemented by a few U.S. institutions, and is becoming a growing topic of discussion among hand surgeons. NYU Langone will become one of the first centers in the country to formalize a wide-aware hand surgery program, with a dedicated check-in area and surgery room at its Outpatient Surgery Center opening in January 2017. “One key advantage of the technique is the ability to dispense with general anesthesia and sedation that can lead to negative side effects and complications for the patient,” says S. Steven Yang, MD, MPH, clinical associate professor of orthopaedic surgery, who led the launch of the center.

REMOVING THE EPINEPHRINE SAFETY BARRIER

Anesthesia is currently administered routinely to counteract the intense discomfort of sustained tourniquet pressure—up to 200 to 250 mm Hg—used to provide a bloodless field for hand and arm surgery. As a vasoconstrictor, epinephrine limits bleeding and prolongs the anesthetic effect by delaying its dissipation through the blood stream, but was thought to be hazardous. “We were always taught that we shouldn’t use epinephrine,” Dr. Yang says, based on the mistaken belief that an overwhelming vasoconstrictive effect in the fingers’ small vessels could lead to ischemia and necrosis. But recent studies now suggest that the true culprit of epinephrine-related complications was likely impurities in the anesthesia formulations, lending the concept of wide-aware hand surgery a major boost by eliminating the tourniquet.

Based on this new insight, doctors are using a large dose of local anesthetic such as lidocaine, mixed with epinephrine, to numb the surgical site and constrict the blood vessels. The high volume of incoming medication offers a secondary benefit by reducing bleeding via the tamponade effect. “Almost like inflating a balloon inside the arm or the hand, it pinches off the blood vessels,” Dr. Yang says. “The combination of those features enables us to do the surgery without a tourniquet. And if we don’t use the tourniquet, we don’t need to give the sedation or general anesthesia drugs.”

“If you don’t need to give the drugs, you don’t have to have patients doing all of this preoperative testing, which is costly and inconvenient for patients,” adds Dr. Yang.

CONFIRMING SURGICAL EFFICACY IN REAL TIME

Although a wide variety of surgeries may prove amendable to the surgical technique, the department is beginning by offering the approach for smaller procedures, such as releases of carpal tunnel, trigger finger, De Quervain’s, and wrist tendinitis, as well as excisions of ganglions and cysts around the wrist.

Beyond improved safety, efficiency, and cost savings, patients who remain awake during the procedures can provide constructive feedback to their surgeons. Dr. Yang says. After surgery to release a patient’s trigger finger, for example, he can ask the patient to make a fist and slowly straighten out the affected finger to determine whether the tendon is still catching. Likewise, for patients who have had tendon lacerations repaired, surgeons can ask them to move their hands and fingers to assess the strength and quality of the repairs and determine whether more work is required. “We can actually check patients’ movements while they’re on the operating table, where the hand is still open,” Dr. Yang adds. “There is obviously a significant advantage there.”

In conjunction with the surgical program’s official launch, Dr. Yang and colleagues are initiating several prospective studies to assess patient satisfaction, clinical outcomes, and potential cost savings of wide-aware hand surgery. For patients, he says, the eventual payoff could be a safe and effective procedure that makes hand surgery akin to going to the dentist for a filling.
Recent advances in robotic and sensor technology have expanded their application in joint replacement surgeries, from partial knee to total hip, and NYU Langone is one of the first medical centers to offer a robot-assisted surgical option for total knee replacements.

The evolution of such robot-assisted orthopaedic surgeries has been spurred by a combination of cutting-edge tools, technical expertise, evidence-based pain management, and rapid recovery protocols. As a result, surgeons can employ minimally invasive techniques, reduce errors, prevent complications, and increase their precision in ways that preserve more bone and tissue. Indeed, the new option for total knee replacement is poised to boost the accuracy, outcome, and patient satisfaction of an increasingly in-demand surgery that already accounts for about 85 percent of all knee arthroplasties.

Patrick A. Meere, MD, clinical associate professor of orthopaedic surgery, says the advances have actually benefitted each of the main approaches for total knee arthroplasty. “Within the last five years, two things have happened: Robots have become the champions of the measured resection-alignment school of thought, and sensors have come into play in the balancing school,” Dr. Meere says.

**Robotics Meet Resection**

The measured resection approach, which places greater emphasis on precise anatomical cutting of bone and less on soft tissue alignment, has benefitted from MAKOplasty®, a robot-assisted technique that uses CT scans to create three-dimensional preoperative templates. NYU Langone surgeons have successfully used MAKOplasty for partial knee and unicompartmental knee replacements over the past five years, and for total hip replacements over the past three years.

With MAKOplasty, surgeons can match landmarks in a patient’s body to those in the 3D model; a 1:1 registration match then allows the robot to create a virtual space that guides each surgical cut. “Once you have that, you can achieve a level of accuracy that has been unsurpassed to date, both for partial knee replacements and for hip replacements,” Dr. Meere says.

The MAKO system, which offers preoperative imaging capabilities and the highest levels of accuracy, is one of two robotics-assisted systems used at NYU Langone. The other is NAVIO, an image-less, handheld computer wand that follows the contours of a patient’s bones and creates accurate cut guides based on mathematical models. “Because it doesn’t depend on a preoperative CT scan, the NAVIO alternative is more nimble and less expensive, and reduces the patient’s radiation exposure,” says Jonathan Vigdorchik, MD, assistant professor of orthopaedic surgery.

In addition to his research using robotics in total knee replacement, Dr. Vigdorchik is exploring how robotic-assisted surgery can be used to help customize the total hip replacement. By using the department’s EOS full-body low-dose X-ray machine to take images of patients in various functional positions, surgeons can help guide a personalized and optimized position for the components in a hip replacement to decrease the risk of complications such as dislocation and improve wear and longevity.

**Finding a Better Balance**

The balancing approach to knee arthroplasty, which places more emphasis on balancing the ligaments and soft tissue of the knees, initially benefitted from computer navigation tools that improved the consistency in knee alignment when it came online more than a decade ago. Yet patient satisfaction scores following those surgeries still lagged behind those of total hip replacement patients.

Now, newer sensors in the tibia liners, in regular use at NYU Langone, offers greater balancing guidance by measuring pressure rather than alignment. “They have sensors embedded in the trial components, so surgeons
can verify the equal distribution of pressure on the inside and outside of the knee,” says Dr. Meere. The sensors also leave an imprint on the point of contact to the tibia, to help surgeons see patterns associated with excessive laxity or tightness.

**EXPANDING APPLICATIONS, ENHANCING OUTCOMES**

The Medical Center is concurrently focused on using robotics to assist in surgeon training and to reduce variability in outcomes—ultimately raising patient satisfaction scores for knee replacement surgery. Because the knee joint is so complex and subjected to such unpredictable forces, Dr. Meere says, knee arthroplasty was a challenging skill to teach in the absence of technology. “It’s a fantastic learning tool for the residents because it provides a live picture of your action instead of a theoretical one—you do a surgical correction and see the immediate results,” he says.

To further integrate the robotics technology with balancing sensors in clinical practice, NYU Langone’s Advanced Arthroplasty Research Lab is conducting both bench-top and clinical research. “The integration and use of robotics will be tracked with our very efficient tools of patient-reported outcomes before and after surgery so we can clearly validate the superiority of robotic surgery versus conventional surgery,” says Dr. Vigdorchik. Although this type of research takes many years to complete, early clinical results are already showing promising success.

Likewise, patient-reported measures can help demonstrate whether the robotics-sensor combination offers the best possible outcome. “That’s the future,” he says. “The natural evolution is to merge the two together.”

NYU LANGONE IS 1 of 8 WORLDWIDE REFERENCE CLINICS THAT ARE PART OF THE INTERNATIONAL SOCIETY FOR COMPUTER-ASSISTED ORTHOPAEDIC SURGERY FELLOWSHIP.
Quality and Safety Initiatives
Aid Outcomes While Boosting Value

Multiple studies examining orthopaedic quality and patient safety have highlighted the many improvements that NYU Langone has made to clinical practice. One major study, recently published in the *Journal of the American Academy of Orthopaedic Surgeons* and based on data from more than 16,000 patients, found that a bacterial screening and prophylaxis eliminated much of the post-surgical infection risk.

Before every joint or spine procedure over a nearly 10-year period, the department’s doctors swabbed each patient’s nose for pathogens and applied topical antibiotics to the nares to eradicate Staphylococcus species. Roughly one-third of patients carry the bacterium and an estimated two to three percent carry MRSA. “Our research has shown that those patients are at increased risk of developing infection after surgery, so we screen and eradicate it,” says Joseph A. Bosco, MD, professor of orthopaedic surgery and vice chair for clinical affairs.

The new study found that the preoperative procedure decreased the infection rate in a cost-effective manner, though it did not drive the risk to baseline levels. Now the researchers are collaborating with infectious disease and epidemiology experts at NYU Langone to identify the remaining risk factors and eliminate them if possible. In the meantime, Dr. Bosco says, surgeons can discuss the infection risk with patients prior to surgery to help them make a more informed decision about whether to proceed with the surgery.

The department also is using physician-specific HCAPS scores to identify opportunities for improvement, and is developing a comprehensive educational program for physicians who may need more help. One key element of the program is a peer-to-peer simulation, developed in conjunction with the New York Simulation Center for the Health Sciences (NYSIM), which uses simulated patient encounters to help physicians prepare for difficult situations.
NEW INSIGHTS ON MITIGATING SURGICAL RISK AND IMPROVING ACCESS

In another quality and safety initiative, the department is tapping large national databases to examine how depression, substance abuse, smoking, and other risk factors affect patient outcomes after joint arthroplasty. One emerging point is that such risks are best addressed preoperatively. Dr. Bosco and colleagues also have found that patients with a lower socioeconomic status have worse outcomes. “They tend to have fewer resources available to them and less access to care,” he says. “And they tend to come to the process later, so they’re sicker.”

Although high-volume medical centers like NYU Langone yield better outcomes, Dr. Bosco says, poorer individuals have reduced access to such centers. Even relatively small increases in a patient’s distance to a major center, he notes, can be prohibitive to those who don’t own a car and whose lack of mobility makes public transportation difficult.

The department’s research suggests that as joint replacement surgeries have increased at high-volume centers over the past decade, they have decreased at low-volume centers. To address the growing gap in access, the department is sharing lessons learned, clinical pathways, and specific protocols—such as antibiotic prophylaxis—with lower-volume medical centers. “We have to be cognizant of the fact that high-volume centers increase health care disparities by attracting greater numbers of patients, and share our knowledge with low-volume centers to decrease that disparity,” Dr. Bosco says.

BUNDLED PAYMENTS YIELD MULTIPLE BENEFITS IN JOINT REPLACEMENT SURGERY

In January 2013, NYU Langone became an early entrant in Medicare’s Bundled Payments for Care Improvement initiative, which sets a fixed reimbursement price for a hospitalization and the 90-day period after discharge, known as an “episode of care.” Four years later, the Medical Center is boosting patient outcomes after joint replacement surgery at significant cost savings through the bundled payments program, and developing infrastructure and expertise that could similarly aid a host of other procedures.

Upon their discharge, joint replacement patients are typically transferred to relatively costly inpatient facilities such as skilled nursing facilities or rehabilitation centers. NYU Langone researchers found that patients who were sent home instead, however, fared better and at a lower average cost of care. “The readmission rate was less, the infection rate was less, and the patient satisfaction was greater,” says Dr. Bosco. “Not only did discharge home save money, but it also improved outcomes—and that came as a surprise.”

In a recent *Journal of the American Academy of Orthopaedic Surgeons* study, Dr. Bosco and colleagues documented 16 percent savings on bundled payments for lower extremity joint replacement. Most of the savings, they found, came in the post-acute phase. “It’s all about making sure that there’s a smooth transition between the hospital and home, that they have the resources at home to be successful, and that we keep a close eye on them,” he says.

Prior to all joint replacement surgeries, clinical care coordinators help patients understand what to expect following discharge. They also use a newly developed tool called RRAT, or the Readmission Risk Assessment Tool, to identify those at greatest risk for readmission or discharge to a nursing home. The risk stratification, Dr. Bosco says, helps the care team identify and allocate the resources necessary to reduce readmissions.

After discharge, coordinators and other staff closely monitor the patients, employing telemedicine, visiting nurses, and therapists to smooth the transitions. Dr. Bosco and colleagues are sharing their lessons learned with other departments and institutions as the bundled payment methodology becomes mandatory in multiple areas of medicine. The added knowledge and tools are driving efficiencies in non-bundled conditions as well. “We were fortunate to develop an infrastructure and expertise for our institution through our voluntary participation, which will help us apply these practices to other areas in the future,” Dr. Bosco says.
New Advances in Bone and Cartilage Regeneration Research

NYU Langone’s musculoskeletal tissue regeneration research, led by Philipp Leucht, MD, assistant professor of orthopaedic surgery and cell biology, and Thorsten Kirsch, PhD, professor of orthopaedic surgery and cell biology and vice chair of research, is simultaneously pursuing several major research projects to enable more effective bone-healing treatments and strategies for cartilage repair.

ENHANCING BONE HEALING FUNCTION IN OLDER PATIENTS

One line of NIH-funded research is focusing on the Wnt signaling pathways, which induce the differentiation of bone-forming cells from osteoprogenitor cells. The number and potency of skeletal stem cells decreases significantly with aging; boosting endogenous Wnt signals, then, may be one way to reclaim the lost function and help older patients more quickly recover from bone fractures.

Dr. Leucht and colleagues are optimizing an approach—tested in mice, rabbits, and human cells—that delivers the Wnt 3A protein via liposomes to help boost a patient’s bone-healing potential. “If we use it in a young animal, we’re able to increase bone formation by about 350 percent,” he says. In older animals or those with major defects, the strategy can restore the osteogenic potential back to that of a healthy young animal.

RE-CODING SKELETAL STEM CELLS

A second study is examining whether removing an embryonic signal called the Hox code can enable the body’s skeletal stem cells to be more adaptable when introduced to new locations. Bones above the neck’s hyoid lack a Hox code, whereas all other bones include it. “The code basically imprints a function onto the cell, and the cells are limited by that,” Dr. Leucht says. “If you put them into a different environment, they recognize that it’s not their home, are confused by that and don’t do the right thing.”

As Dr. Leucht has found, the Hox code may have critical clinical implications because stem cells derived from code-lacking craniofacial bones are far better at regenerating broken or injured bones in mice than are cells from code-constrained bones such as the tibia.

Surgeons cannot use facial bones for bone grafts, so Dr. Leucht and his team hope to introduce the same plasticity into stem cells isolated from the pelvis or other long bones. Based on RNA sequencing, his team has...
found more than 2,000 gene expression differences in Hox-positive versus Hox-negative cells. Follow-up studies now underway may help identify the true drivers of the latter cells’ regenerative powers.

Another project is looking at the role of chronic low-level inflammation on skeletal stem cells. This chronic inflammation slowly increases with age, raising the risk of cancer and Alzheimer’s disease and potentially interfering with bone healing due to its negative impact on the number and osteogenic potential of the remaining pool of bone marrow stem cells.

Dr. Leucht found that one-year-old mice—equivalent to 55 to 65-year-old humans—showed elevated signs of inflammation associated with aging, or “inflammaging.” Remarkably, however, his team suppressed such inflammation and restored the skeletal stem cells’ bone-healing potential with low doses of nonsteroidal anti-inflammatory drugs. In essence, the treatment seemed to reverse the aging process and restore the cells’ osteogenic potential.

“By reducing the inflammation, these cells can recognize and recover from a senescence pathway and turn back into an active progenitor cell pool that can be used if there’s an injury in these animals,” he says. Dr. Leucht and colleagues are now trying to clarify the underlying pathway.

STUDYING THE ROLE OF ANTIDEPRESSANTS IN FRACTURE HEALING

For a fourth project, the lab is conducting bench-to-bedside research to better understand whether commonly prescribed selective serotonin reuptake inhibitor antidepressants such as fluoxetine might interfere with fracture healing. The project began when Dr. Leucht noticed that roughly 25 to 30 percent of his patients with nonunions were on SSRIs, compared to about 10 percent of the general population.

In mice, his team showed that chronic antidepressant users were indeed impaired in their fracture healing: their osteoblasts survived and proliferated normally, but could not differentiate properly. The researchers are now planning to look prospectively at patients with fractures, document those who are taking SSRIs, and determine which develop nonunions. “This may be something that’s very clinically relevant and may be actually translatable within a year or two if we can finish the clinical trials,” Dr. Leucht says.

NEW PEPTIDE GREATLY ENHANCES CARTILAGE REPAIR

Other NYU Langone researchers led by Dr. Kirsch have made strides in cartilage regeneration, including the recent identification of a peptide that seems to stimulate cartilage repair. The peptide, which binds to hyaluronan in the cartilage matrix, has proven effective when combined with high molecular weight hyaluronan. Although the mechanism remains unclear, “it is possible that the peptide together with high molecular hyaluronan might provide a stem cell niche where the cells can attach and build new cartilage,” says Dr. Kirsch. The researchers have filed for a patent on their discovery and are actively investigating the peptide’s potential role in recruiting stem cells to repair musculoskeletal tissues.

COLLABORATION WITH ENGINEERS

The Department of Orthopaedic Surgery is expanding its collaboration with the NYU Tandon School of Engineering, moving two labs to the school’s facilities with the aim of further stimulating interactions between engineers and orthopaedic surgeons.
Every year, doctors in the United States diagnose about 800 people with osteosarcoma—many of them adolescents or young adults who contract the cancer for unknown reasons during growth spurts.

**PRESENTATION**

In 2013, Sara Morales, 32, had been treated at NYU Langone for an osteosarcoma above her right shin that had required resection and a knee replacement. When she returned in 2014 with increasingly intense pain in her left hip, an MRI revealed a new tumor growing in her pelvic bone near the sacroiliac joint.

Morales faced a new round of chemotherapy and removal of the diseased bone, but the osteosarcoma’s hard-to-reach location deep in the pelvis, along with the need to maintain pelvic integrity to allow for weight-bearing, complicated the procedure. Full excision might require removing up to half of her pelvis and permanently confining her to a wheelchair.

**SURGICAL PLAN**

To preserve her ability to walk, the surgeons devised an alternate strategy, employing sophisticated 3D tools more commonly associated with head and neck surgery. Timothy R. Rapp, MD, associate professor of orthopaedic surgery and chief of the Division of Orthopaedic Oncology, had previously removed Morales’s initial tumor above her shin. He developed the new tumor resection plan in partnership with plastic surgeon Pierre B. Saadeh, MD, associate professor and chief of plastic surgery at Bellevue Hospital Center. Instead of reaching the pelvis through her abdomen and performing an internal amputation, the surgeons concluded that accessing and resecting her tumor from the back would cause less damage and allow for a more accurate resection. Equally important, this approach also would provide the exposure needed for reconstruction. To stabilize the pelvis after cutting out a nearly three-inch segment of bone, they opted to use part of her left fibula to bridge the gap. In order to keep the fibula alive during and after surgery, the fibula’s blood supply was brought with the bone and reconnected to local vessels in the pelvis using an operating microscope.

The complex operation would have to be extensively planned, and standard anatomy diagrams failed to provide the sufficient resolution the team needed to map the surgical site. Dr. Rapp and Dr. Saadeh turned to BioDigital Human®, an augmented reality program, to create a highly detailed interactive map.

In collaboration with a 3D virtual surgery engineer at 3D Systems in Colorado, the team created custom 3D-printed jigs that they could temporarily secure to the pelvic and fibula bones to precisely guide a surgical saw. “The pelvis is a curved bone,” Dr. Rapp says, “so it’s much more difficult to anticipate the angles of the cuts, even if you have the best anatomical mind in the world.”

The virtual surgical plan converted CT scans into exact copies of Morales’s bone anatomy, permitting the surgeons to practice the surgical procedure beforehand. “This would be the first time part of a fibula would be inserted into a pelvis with the aid of 3D technology, but using the models, we felt confident that it could work,” Dr. Rapp says.

The strategy sounded so futuristic, Morales recalls. “But these men had saved my life before, and I’d seen what they were capable of. I trusted them,” she says.

**RESULTS**

After a carefully devised chemotherapy regimen to shrink the tumor, Dr. Rapp and Dr. Saadeh led a seven-hour surgery at Tisch Hospital in February 2015. Dr. Rapp excised Morales’s tumor while Dr. Saadeh removed the matched fibula fragment. They slotted in the replacement bone, performed microsurgery to attach the veins and arteries, and inserted titanium plates at both sites to stabilize the bone while it healed.

Six months later, a cancer-free Morales was able to put weight on her left leg and stand up unassisted. A year after the surgery, she began walking on her own—and reclaiming her future. “There’s so much I want to do now,” she says. “I want to get my life started.”
SELECTED PUBLICATIONS


Capriccioso CE, Zuckerman JD, Egol KA. Initial varus displacement of proximal humerus fractures results in similar function but higher complication rates. Injury. 2016; 47: 909–913.


Subscapularis—Richard J. Friedman, MD, Pierre-Henri Flurin, MD, Thomas W. Wright, MD, Joseph D. Zuckerman, MD, Christopher Roche, MD

Comparison of Outcomes with Reverse Total Shoulder Arthroplasty in Patients With and Without Scapular Notching—Joseph D. Zuckerman, MD, Lynn A. Crosby, MD, Pierre-Henri Flurin, MD, Thomas W. Wright, MD, Christopher Roche, MS, MBA

Reverse Shoulder Outcomes with Scapular Deformities: Augmented Glenoid Baseplates vs. Bone Grafting—Thomas W. Wright, MD, Richard B. Jones, MD, Pierre-Henri Flurin, MD, Joseph D. Zuckerman, MD, Christopher Roche, MD

Incidence of Unplanned Admission from an Outpatient Orthopaedic Surgery Center—Michael S. Day, MD, Germaine Cuff, PhD, RN, Hersh Shroff, MD, Lorraine Hutzle, BA, Samir Kendale, MD, Jeanna D. Blitz, MD

Comparison of Perioperative Times at an Ambulatory Surgery Center and an Outpatient Facility Andrew D. Rosenberg, MD, Joseph A. Bosco III, MD

Improvement in TJAA Quality Metrics: Year One vs. Year Three of the Bundled Payment for Care Initiative—Richard Iorio, MD, Joseph D. Zuckerman, MD, Joseph A. Bosco III, MD, James D. Slover, MD, Stephen Yu, MD, John M. Dundon, MD, Yousuf Sayeed, MS, MD

Joint Replacement Surgical Home: Impact of Patient Characteristics and Comorbidities on Length of Stay—Ran Schwarzkopf, MD, Kyle S. Ahn, MD, Joseph B. Rinibert, MD, Maxime Cinnansonn, Zeek Kain, MD, MBA

Ultra Low Dose Computed Tomography Scanning: A Reliable Modality with an Improved Patient Safety Profile—Sanjit R. Konda, Abraham M. Goch, Philipp Leucht, MD, Anthony V. Christiano, Soterios Gyftopoulos, Kenneth A. Egel, MD

Inpatient Rehabilitation Following Hip Fracture: Recent Trends and Implications for Post-Acute Care Reform—Arthur Manoli III, MD, Sanjit R. Konda, MD, Christian A. Pean, MS, Kenneth A. Egel, MD

The Effect of Severity of Illness on Spine Surgery Costs Across New York State Hospitals—Ian Kaye, MD, Lorraine Hutzle, BA, Joseph A. Bosco III, MD

Risk Factors for Subsequent Surgery after ACL Reconstruction: A Population-Based Study—Sidharth A. Mahure, MD, Brian Capogna, MD, Brent Mollon, MD, FRSCS, Orillia, Ontario, Canada, Andrew S. Rokito, MD

Discrepancies in Planned Sagittal Alignment and Age-Adjusted Ideals: Implications of Over- or Under-Correction—Jensen Henry, BA, Matthew A. Spiegel, BA, Jonathan H. Oren, MD, Isaac Gammal, BA, Cyrus Jalai, BA, Themistocles S. Protopsaltis, MD, Thomas J. Errico, MD, Virginie Lafage, PhD

Chain of Relaxation: How Sagittal Correction Affects Spine-Pelvic, Lower Limb, and Global Alignment—Jonathan H. Oren, MD, Shaleen Vira, MD, Barthelemy Liabaud, MD, Bassel Diebo, MD, Matthew A. Spiegel, BA, Renaud Lafage, Thomas J. Errico, MD, Frank J. Schwab, MD, Virginie Lafage, PhD

Age-Adjusted Alignment Goals Have the Potential to Reduce Proximal Juxtaepicondylar Kyphosis—Frank J. Schwab, MD, Renaud Lafage, Steven D. Glassman, MD, Robert S. Bess, MD, Robert A. Hart, MD, Douglas C. Burton, MD, Han Joo Kim, MD, Virginie Lafage, PhD

Defining the Role of Lower Limbs in Compensating for Sagittal Malalignment—Renaud Lafage, Barthelemy Liabaud, MD, Bassel Diebo, MD, Jonathan H. Oren, MD, Shaleen Vira, MD, Themistocles S. Protopsaltis, MD, Thomas J. Errico, MD, Frank J. Schwab, MD, Virginie Lafage, PhD

Unlocking TJ Pelvic Angle’s Clinical and Sagittal Significance by Analyzing Its Relation on Length of Stay—Ran Schwarzkopf, MD, Kyle S. Ahn, MD, Joseph B. Rinibert, MD, Maxime Cinnansonn, Zeek Kain, MD, MBA

Reliability of Intraoperative Prone Lateral Radiographs in Predicting Postoperative Standing Sagittal Alignment—Wesley Bronson, MD, Themistocles S. Protopsaltis, MD, Barthelemy Liabaud, MD, Gregory M. Mundis, MD, Jeffrey Gumm, MD, Douglas C. Burton, MD, Frank J. Schwab, MD, Virginie Lafage, PhD

Reliability of Intraoperative Prone Lateral Radiographs in Predicting Postoperative Standing Sagittal Alignment—Wesley Bronson, MD, Themistocles S. Protopsaltis, MD, Barthelemy Liabaud, MD, Gregory M. Mundis, MD, Jeffrey Gumm, MD, Douglas C. Burton, MD, Frank J. Schwab, MD, Virginie Lafage, PhD

Reliability of Intraoperative Prone Lateral Radiographs in Predicting Postoperative Standing Sagittal Alignment—Wesley Bronson, MD, Themistocles S. Protopsaltis, MD, Barthelemy Liabaud, MD, Gregory M. Mundis, MD, Jeffrey Gumm, MD, Douglas C. Burton, MD, Frank J. Schwab, MD, Virginie Lafage, PhD

Brushing Up On Your Test-Taking Skills—Joseph Bosco

Adult Spinal Deformity: Surgical Planning and Complications—Thomas Errico, MD, Themistocles Protopsaltis, MD, Robert Bess, MD

Hospital Specific Hip Arthroplasty Surgical Site Infection Rates Do Not Correlate with Other Procedure SSI Rates—Ravi Vaswani, BS, Raj Karia, MPH, Naifeh Hamza, MD, Prasanna Virdi, MD, Joseph A. Bosco III, MD

Regional Anesthesia Only for Clavicle Fracture Open Reduction Internal Fixation is Safe and Effective—Devin J. Ryan, BA, Kenneth A. Egel, MD

Total Shoulder Arthroplasty for Proximal Humerus Fracture is Associated with Increased Hospital Charges—Arthur Manoli III, MD, Sanjit R. Konda, MD, Christina Capriccioso, BS, Kenneth A. Egel, MD

Development of a Preoperative ASD Frailty Index that Correlates to Common Quality and Value Metrics—Amit Jain, MD, Daniel Sciubba, MD, Baltimore, Maryland, Khaled Kebabish, MD, Brian J. Neuman, MD, Robert S. Bess, MD, Christopher Ames, MD

When Does Compensation for Lumbar Stenosis Become a Clinical Sagittal Plane Deformity?—Aaron Buckland, FRACS, MD, Shaleen Vira, MD, Jonathan H. Oren, MD, Renaud Lafage, Bassel Diebo, MD, Themistocles S. Protopsaltis, MD, Frank J. Schwab, MD, Virginie Lafage, PhD, John A. Bendo, MD

Center Variability in Surgical Technique and Outcomes in Adult Spinal Deformity—Thomas Cheriyann, Munish C. Gupta, MD, Renaud Lafage, Justin S. Smith, MD, Robert S. Bess, MD, Robert A. Hari, MD, Richard A. Hostin, MD, Virginie Lafage, PhD

Clinical Outcomes of Hip Arthroscopy in Patients Over 60—Brian Capogna, MD, John Begly, MD, Michael Ryan, MD, Kristofer E. Chenard, MD, Rajkeshen Narayanan, MS, Thomas Youm, MD

Adult Lumbar Scoliosis: State-of-the-Art Treatment (Operative and Nonoperative)—Themistocles Protopsaltis

The Management of Meniscal Pathology: From Partial Meniscectomy to Transplantation—Eric Strauss, MD, Laith Jazrawi, MD

Adult Lumbar Disc Herniation: Treatment, Complications, Outcomes, and Evidence-Based Data for Patient and Health Professional Counseling—Peter Passias MD

Realignment Planning in Adult Spinal Deformity: The Newest Tools, Formulas, and Techniques to Get it Right—Robert S. Bess, MD, Themistocles Protopsaltis, MD

Preoperative Optimization of Total Joint Arthroplasty Surgical Risk—Richard Iorio, MD, Moderator

Cardiovascular Disease and Stroke Prevention—James D. Slover, MD

Joint Preservation Techniques for the Knee in 2016—Technical pearls for performing combined cartilage restoration, meniscal transplantation, ligament reconstruction, and/or realigning osteotomies—Eric Strauss, MD

Is It the Back or the Hip? Differentiating Lumbar Spine from Hip Pathologies: Key Points of Evaluation and Treatment—Ashin Razi, MD, Moderator

Degenerative hip disorders or painful total hip replacement with back pain—James D. Slover, MD

Challenges in spinal deformity and hip arthritis—Aaron Buckland, FRACS

Ask An Expert: Shoulder and Elbow—Joseph Zuckerman, MD

Fitness Tracking Devices: Applications in Orthopaedics—Dalibel M. Bravo, MD, Stephanie Svensen, MD, Claudette M. Lajam, MD

Knee Society/AHKS: Minimizing TKA Complications—Richard Iorio, MD

Hip Society/AHKS: Complex Primary THA: Case-Based Discussion on the State of the Art—Richard Iorio, MD

International Society for the Advancement of Spine Surgery: Hype and Marketing—Jeffrey Goldberg, MD

Knee Society/AHKS Session V: Highlights—W.N. Scott, MD

Posters/Video/Multimedia Presentations

3D-MRI versus 3D-CT in the Evaluation of Osseous Anatomy in Femoroacetabular Impingement and Hip Dysplasia—Jonathan Vigoorchich, MD, Nima Efekharchy, MD, Ayner Yemin, MD, Roy Davodovich, Michael C. Bloom, Soterios Gyftopoulos, MD

Establishing a Pragmatic Knee Preservation Registry to Follow Patients with Degenerative Joint Disease—Stephen Yu, MD, Alessandra Szulc, MA, Elisha Lee, Xiang Zhou, PhD, Raj Karia, MPH, Eric J. Strauss, MD, Laiith M. Jazrawi, MD, Richard Iorio, MD, Philip Band, MD

Knee Arthroscopy in the Setting of Degenerative Arthritis—Jason P. Hochfelder, MD, Jiho Han, W.N. Scott, MD, William J. Long, MD

Biomechanical Evaluation of Four Internal Fixation Constructs for Scaphoid Fractures—Bryan Beutel, MD, Eitan Melamed, MD, Richard M. Hinds, MD, Michael B. Gottschalk, MD

Eid Tidal Carbon Dioxide (ETCO2) Predicts Pulmonary Embolism in Postoperative Orthopaedic Patients—Austin Ramme, MD, PhD, Alana E. Sigmund, MD, Eduardo Iuturate, MD, Lorraine Hutzle, BA, Ezra E. Dweck, David J. Steiger, MD, Joseph A. Bosco III, MD

Psychiatric Conditions Impact 90-Day Hospital Readmission Rates Following Total Joint Surgery
Awards & Recognition

Edward M. Adler, MD
New York Metro Area’s Top Doctors, Castle Connolly

O. Alton Barron, MD
New York Metro Area’s Top Doctors, Castle Connolly

John A. Bendo, MD
New York Metro Area’s Top Doctors, Castle Connolly

Joseph A. Bosco, MD
New York Metro Area’s Top Doctors, Castle Connolly

Louis W. Catalano, MD
New York Metro Area’s Top Doctors, Castle Connolly

Cary B. Chapman, MD
New York Metro Area’s Top Doctors, Castle Connolly

Roy I. Davidovitch, MD
New York Metro Area’s Top Doctors, Castle Connolly

Kenneth A. Egol, MD
New York Metro Area’s Top Doctors, Castle Connolly

Thomas J. Errico, MD
America’s Top Doctors, Castle Connolly

Steven Z. Glickel, MD
America’s Top Doctors, Castle Connolly

David H. Godfried, MD
New York Metro Area’s Top Doctors, Castle Connolly

Jeffrey A. Goldstein, MD
America’s Top Doctors, Castle Connolly

Salil Gupta, MD
New York Metro Area’s Top Doctors, Castle Connolly

Richard Iorio, MD
Frank Stinchfield Research Award, The Hip Society • Richard Kilfoyle Award, Winning Manuscript, New England Orthopaedic Society • Chairman, Advanced APM Development Committee, American Association of Hip and Knee Surgeons • Chairman, Advocacy Committee, American Association of Hip and Knee Surgeons • New York Metro Area’s Top Doctors, Castle Connolly

Laith M. Jazrawi, MD
New York Metro Area’s Top Doctors, Castle Connolly

Patrick A. Meere, MD
Thomas Errico, MD, and Anthony Frempong-Boadu, MD

Yong H. Kim, MD
New York Metro Area’s Top Doctors, Castle Connolly

William L. King, MD
New York Metro Area’s Top Doctors, Castle Connolly

Vijay John Mani, MD
New York Metro Area’s Top Doctors, Castle Connolly

Patrick A. Meere, MD
America’s Top Doctors, Castle Connolly • Best Podium Presentation, Conference for Computer Assisted Orthopaedic Surgery International

Robert J. Meislin, MD
New York Metro Area’s Top Doctors, Castle Connolly

Nader Paksima, DO, MPH
New York Metro Area’s Top Doctors, Castle Connolly

Martin Posner, MD
Lifetime Achievement Award, New York Society for Surgery of the Hand (NYSSH)

Andrew E. Price, MD
New York Metro Area’s Top Doctors, Castle Connolly

Craig S. Radnay, MD
New York Metro Area’s Top Doctors, Castle Connolly

Timothy B. Rapp, MD
New York Metro Area’s Top Doctors, Castle Connolly

Keith B. Raskin, MD
America’s Top Doctors, Castle Connolly

Michael E. Rettig, MD
New York Metro Area’s Top Doctors, Castle Connolly

Donald J. Rose, MD
New York Metro Area’s Top Doctors, Castle Connolly

Anthony Sapienza, MD
Member, ER Committee, American Society for Surgery of the Hand (ASSH)

Ran Schwarzkopf, MD
The Lawrence D. Dorr Surgical Techniques & Technologies Award, American Association of Hip and Knee Surgeons

W. Norman Scott, MD
Lifetime Achievement Award, Arthritis Foundation

Steve Sheskier, MD
New York Metro Area’s Top Doctors, Castle Connolly

Jeffrey M. Spivak, MD
Leon L. Witte Research Award, International Society for the Advancement of Spine Surgery • America’s Top Doctors, Castle Connolly

Jonathan R. Stieber, MD
New York Metro Area’s Top Doctors, Castle Connolly

Eric J. Strauss, MD
Traveling Fellow, American Orthopaedic Association’s American-British-Canadian (ABC)

Steven A. Stuchin, MD
America’s Top Doctors, Castle Connolly

Nirmal C. Tejwani, MD
Board member, Orthopaedic Trauma Association (OTA)

Jonathan Vigdorchik, MD
Insall Knee Traveling Fellowship

Peter S. Walker, PhD
Best Podium Presentation, Conference for Computer Assisted Orthopaedic Surgery International

S. Steven Yang, MD, MPH
New York Metro Area’s Top Doctors, Castle Connolly

Thomas Youm, MD
New York Metro Area’s Top Doctors, Castle Connolly

Joseph D. Zuckerman, MD
America’s Top Doctors, Castle Connolly • Most Impactful Chairs of Last 20 Years, Academic Orthopaedic Consortium
As of December 2016

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 190-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 705-bed, flagship acute care hospital, including emergency orthopaedic services in the Ronald O. Perelman 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
Faculty & Leadership

Department Leadership

Joseph D. Zuckerman, MD
Walter A.L. Thompson Professor of Orthopaedic Surgery; Chair of the Department of Orthopaedic Surgery
Phone: 212.598.6674
Email: Joseph.Zuckerman@nyumc.org

Joseph A. Bosco, MD
Vice Chair of Clinical Affairs
Phone: 646.501.7042
Email: Joseph.Bosco@nyumc.org

Gail S. Chorney, MD
Vice Chair for Professional Practice
Director, Center for Musculoskeletal Care; Director, Hospital for Joint Diseases Ambulatory Care Services
Phone: 646.501.7171
Email: Gail.Chorney@nyumc.org

Kenneth A. Egol, MD
Vice Chair of Education and Chief of the Division of Trauma & Fracture
Phone: 212.598.3889
Email: Kenneth.Egol@nyumc.org

William L. Jaffe, MD
Vice Chair
Phone: 212.598.6796
Email: William.Jaffe@nyumc.org

Thorsten Kirsch, PhD
Vice Chair of Research
Phone: 212.598.6589
Email: Thorsten.Kirsch@nyumc.org

Thomas R. Lyon, MD
Vice Chair, NYU Lutheran
Phone: 718.630.7000
Email: Thomas.Lyon@nyumc.org

Dennis A. Cardone, DO
Chief, Primary Care Sports Medicine Division

Pablo Castañeda, MD
Chief, Pediatric Orthopaedic Division

Thomas J. Errico, MD
Chief, Spine Division

Richard Iorio, MD
Chief, Joint Replacement and Adult Reconstructive Division

Laith M. Jazrawi, MD
Chief, Sports Medicine Division

Toni M. Mclaurin, MD
Clinical Site Chief, Bellevue Hospital Center

Kenneth J. Mroczek, MD
Chief, Foot and Ankle Division

Paul J. Ort, MD
Clinical Site Chief, Manhattan Veterans Affairs (VA) Medical Center

Nader Paksima, DO, MPH
Clinical Site Chief, Jamaica Hospital Medical Center

Martin Posner, MD
Chief, Hand Division

Timothy B. Rapp, MD
Chief, Oncology Division

Andrew S. Rokito, MD
Chief, Shoulder and Elbow Division

James D. Slover, MD
Clinical Site Chief, Hospital for Joint Diseases

Nirmal C. Tejwani, MD
Clinical Site Chief, Tisch Hospital

↑ Joseph A. Bosco, MD, and Joseph D. Zuckerman, MD
Full Faculty List

Adult Reconstructive

Richard Iorio, Chief
Edward Adler
Alan J. Dayan
Ajit J. Deshmukh
Thomas A. Einhorn
Joseph Feliccia
Ivan Fernandez-Madrid
Philip A. Fontanetta
Robert S. Goldstein
James Gurtowski
William L. Jaffe
Michael N. Kang
Claudette M. Lajam
Justin G. Lamont
Peter R. Langan
Nachum Levin
John C. L’Insalata
William J. Long
Vijay J. Mani
Scott E. Marwin
Patrick A. Meere
Robert L. Michaels
Gregory Montalbano
Paul J. Ort
Mukund R. Patel
Parthiv Rathod
Steven J. Ravich
Hank Ross
Ran Schwarzkopf
W. Norman Scott
Ernesto D. Seldman
Jeffrey Shapiro
James D. Slover
Steven Struhi
Steven A. Stuchin
Vladimir Tress
Jonathan Vigdorchik
Raymond B. Walsh
Oskar Weg
Lori G. Weiser
Arnold B. Wilson
Thomas Youn
Joseph D. Zuckerman

Spine

Thomas J. Errico, Chief
Roger Antoine
John A. Bendo
Aaron J. Buckland
Alexandre B. De Moura
Joseph W. Dryer
Leon K. Eisen
Jason M. Gallina
Michael C. Gerling
Jeffrey A. Goldstein
Yong H. Kim
Jeffrey D. Klein
Angel E. Macagno
Ronald Moskovich
Jonathan H. Oren
Peter G. Passias
Carl B. Paulino
Jeffrey Perry
Anthony M. Petrizzo
Themistocles Protopsaltis
Josef S. Pyun
Martin Quirino
Afshin E. Razi
Mark A. Rieger
Jeffrey M. Spivak
Jonathan R. Stieber

Sports Medicine

Laith M. Jazrawi, Chief
Michael J. Alaia
Joseph A. Bosco
Kirk A. Campbell
Craig M. Capecci
Adam B. Cohen
Andrew J. Feldman
Joshua B. Frank
Calogero Gambino
Ramesh H. Gidumal
Guillem Gonzalez-Lomas
Stuart J. Hershon
James M. Kipnis
Jerry Lubliner
Robert J. Meislin
David S. Menche
David S. Pereira
Andrew S. Rokito
Donald J. Rose
Mehul R. Shah
Orrin H. Sherman
Jonathan J. Silver
Marc Silverman
Stuart Springer
Drew A. Stein
Eric J. Strauss
Bradley R. Wasserman
David S. Weiss

Pediatric Orthopaedic Surgery

Pablo Cano Chief
David H. Godfried, Director,
Center for Children
Gail S. Chorney
Alice Chu
David S. Feldman
Jenny M. Frances
Samara Friedman
Mara Karabatopoulos
David Y. Lin

↑ Alice Chu, MD
Primary Care Sports Medicine

Dennis A. Cardone **Chief**
Bret C. Jacobs
Warren K. Young

Shoulder And Elbow

Andrew S. Rokito **Chief**
Laith M. Jazrawi
Young W. Kwon
Robert J. Meislin
Timothy G. Reish
Mandeep S. Virk
Jean S. Yun
Joseph D. Zuckerman

Trauma And Fracture

Kenneth A. Egol **Chief**
Roy I. Davidovitch
Sanjit R. Konda
Philipp Leucht
Frank A. Liporace
Thomas R. Lyon
Toni M. McLaurin
Nirmal C. Tejwani
Aldo Vitale

Orthopaedic Oncology

Timothy B. Rapp **Chief**

Foot And Ankle

Kenneth J. Mroczek **Chief**
Cary Chapman
Craig S. Badnay
Steven Sheskier

Hand

Martin Posner **Chief**
Steven Green **Assoc. Chief**
Nader Paksima **Assoc. Chief**
Omri B. Ayalon
Alton O. Barron
John T. Capo
Louis W. Catalano
Stuart Elkowitz
Steven Z. Glickel
Steven M. Green
Salil Gupta
Jacques H. Hacquebord
William L. King
Salvatore Lenzo
Eitan Melamed
Mukund R. Patel
Vipul P. Patel
Francis R. Pelham
Keith B. Raskin
Michael E. Retting
Anthony Sapienza
Steven A. Stuchin
S. Steven Yang

Research

Thorsten Kirsch **Chief**
Philip Band
Marco Campello
Aleshia Castillo
Mary Cowman
Sally R. Frenkel
Manny Halpern
Raj J. Karia
Oran Kennedy
Philipp Leucht
Chuanju Liu
Smita Rao
Ali Sheikhzadeh
Peter S. Walker
Shira Weiner
Sherri Weiser-Horwitz
Xiang Zhou

Emeritus

Arnold T. Berman
L. Paul Brief
Enrique Ergas
Victor Frankel
Vladimir Golyakovsky
Alfred D. Greisman
John E. Handelsman
Wallace B. Lehman
Lester Lieberman
Margaret A. Nordin
Jacques Serge Parisien
Mark Pitman
Paul Post
Lawrence Schulman
Kenneth E. Seslowe
Joseph A. Suarez
N. Noel Testa

Academic Appointments

Marc H. Apple
Dan Atar
Andrew N. Bazos
Adam Bernstein
Alvin M. Bregman

Joel S. Buchalter
William Burman
Winshilh Chang
Jack Choueka
Douglas J. Fauser
Colleen M. Fay
Lawrence G. Foster
Alfred Garofalo
Mark A. Gurland
James Gutowski
Ronald H. Israeli
Kevin Kaplan
Victor Khabie
Steven Klein
Frank J. Liggio
Raphael S.F. Longobardi
Stephen G. Maurer
Morteza Meftah
Seth Miller
Roy M. Nuzzo
Andrew M. Peretz
Jeffrey Richmond
Philip Robbins
Jeffrey E. Rosen
Roy W. Sanders
Victor Sasson
Philipp Schrank
Susan C. Scott
Jordan A. Simon
Michael G. Soojian
Adam D. Soyer
Stuart T. Styles
Bradley D. Wiener
Jamie Wisser
John Zeller
Leadership

New York University

William R. Berkley
Chair, Board of Trustees

Andrew Hamilton, PhD
President

Robert Berne, MBA, PhD
Executive Vice President for Health

NYU Langone Medical Center

Kenneth G. Langone
Chair, Board of Trustees

Robert I. Grossman, MD
Saul J. Farber Dean and Chief Executive Officer

Steven B. Abramson, MD
Senior Vice President and Vice Dean for Education, Faculty, and Academic Affairs

Dafna Bar-Sagi, PhD
Senior Vice President and Vice Dean for Science, Chief Scientific Officer

Andrew W. Brotman, MD
Senior Vice President and Vice Dean for Clinical Affairs and Strategy, Chief Clinical Officer

Michael T. Burke
Senior Vice President and Vice Dean, Corporate Chief Financial Officer

Richard Donoghue
Senior Vice President for Strategy, Planning, and Business Development

Annette Johnson, JD, PhD
Senior Vice President and Vice Dean, General Counsel

Grace Y. Ko
Senior Vice President for Development and Alumni Affairs

Kathy Lewis
Senior Vice President for Communications and Marketing

Joseph Lhota
Senior Vice President and Vice Dean, Chief of Staff

Vicki Match Suna, AIA
Senior Vice President and Vice Dean for Real Estate Development and Facilities

Nader Mherabi
Senior Vice President and Vice Dean, Chief Information Officer

Robert A. Press, MD, PhD
Senior Vice President and Vice Dean, Chief of Hospital Operations

Nancy Sanchez
Senior Vice President and Vice Dean for Human Resources and Organizational Development and Learning

NYU Langone By the Numbers*

<table>
<thead>
<tr>
<th>Count</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,519</td>
<td>Beds</td>
</tr>
<tr>
<td>100</td>
<td>Operating Rooms</td>
</tr>
<tr>
<td>145,907</td>
<td>Emergency Room Visits</td>
</tr>
<tr>
<td>68,602</td>
<td>Patient Discharges</td>
</tr>
<tr>
<td>3,850,000</td>
<td>Outpatient Faculty Practice Visits</td>
</tr>
<tr>
<td>9,649</td>
<td>Births</td>
</tr>
<tr>
<td>3,584</td>
<td>Physicians</td>
</tr>
<tr>
<td>4,899</td>
<td>Nurses</td>
</tr>
<tr>
<td>574</td>
<td>MD Candidates</td>
</tr>
<tr>
<td>80</td>
<td>MD/PhD Candidates</td>
</tr>
<tr>
<td>233</td>
<td>PhD Candidates</td>
</tr>
<tr>
<td>397</td>
<td>Postdoctoral Fellows</td>
</tr>
<tr>
<td>1,472</td>
<td>Residents and Fellows</td>
</tr>
<tr>
<td>4,381</td>
<td>Original Research Papers**</td>
</tr>
<tr>
<td>550,500</td>
<td>Square Feet of Research Space</td>
</tr>
<tr>
<td>$334M</td>
<td>NIH Funding</td>
</tr>
<tr>
<td>$328M</td>
<td>Total Grant Revenue</td>
</tr>
</tbody>
</table>

*Numbers represent FY16 (Sept 2015–Aug 2016) and include NYU Lutheran
**Calendar year 2015