

HSS is...



Annual Report

Table of Contents

Culture of Innovation	2
Talent of Today and Tomorrow	12
Patient Experience	18
2015 Annual Report	26





is...

...a one-of-a-kind organization dedicated to musculoskeletal health, with a culture that reflects the passion and commitment of all members of the HSS family. At its core, it is the world's largest academic medical center dedicated to orthopedics, rheumatology and related specialties with a unique patient-centered care delivery model. Each and every day we earn our leadership position in research, teaching, innovation, outcomes, patient experience and value.

Now, HSS is extending its expertise to deliver the most innovative care, services and products — all related to musculoskeletal health — to meet the growing needs of a global marketplace. Our clinicians and researchers are collaborating to develop breakthrough science, technologies and care delivery innovations that advance the field of musculoskeletal healthcare.

While HSS is headquartered in Manhattan, home to our flagship Hospital for Special Surgery, we are extending our reach and impact across the region, the country and the world.

As people live longer and more active lives, and healthcare value becomes better understood by the public, the importance of excellence in musculoskeletal care will continue to increase... and HSS is leading the way.

Culture of **innovation**

Teams of clinicians and scientists at HSS are working to improve what is already the best care available to patients. Continuous advancement of the field of medicine and of care for each individual patient are what propel our entire organization to push boundaries and explore novel approaches to the diagnosis and treatment of orthopedic and rheumatologic conditions. Innovation and the pursuit of excellence are part of our organizational DNA. For more than a century, we've been revolutionizing musculoskeletal medicine. We designed and developed the first total knee replacement; created the first orthopedic residency program in the U.S.; and established the nation's first hospital-based program of computer-aided design and manufacture of joint prostheses.

Today, leading experts — surgeons, physicians, imaging specialists and engineers — collaborate in unprecedented ways to deliver cutting-edge care to our patients. To accelerate the translation of breakthrough ideas into patient care and value for the Hospital, the HSS Innovation Center was launched in 2014. The Innovation Center supports the creation of new implants, biomarkers,

medical devices, therapeutics and instruments to enhance mobility and reduce pain. More recently, we have begun developing cutting-edge digital health products — such as wearables, software and apps — to improve care delivery.

Our surgeons, physicians and scientists are encouraged to bring their ideas for new technologies and better care delivery processes to the Innovation Center. Companies, patients and entrepreneurs are invited to partner with us to explore cutting-edge technologies, ideas and testing of products and services at HSS. We routinely collaborate with start-up companies as well as industry leaders to pilot and launch breakthroughs in musculoskeletal medicine. By constantly pursuing better diagnostic and treatment methods, we will always be able to offer patients high-value care.



NUMBER OF INVENTIONS
from the HSS Innovation Center in 2015

Leading the way in musculoskeletal genomics research

HSS scientists are pioneering an entirely new way of developing treatments for musculoskeletal conditions. The David Z. Rosensweig Genomics Research Center was established in 2013 with a five-year, \$5.6 million grant from The Tow Foundation. "We wanted to develop a center at HSS that would partner with the New York Genome Center to make breakthrough discoveries that can lead to new treatments for rheumatoid arthritis and lupus," says Leonard Tow, Founder and Chairman of the Foundation. At the Genomics Research Center, scientists are investigating human cells and genes to understand genetic and environmental contributions to these diseases. "Genomics allows us to take a big leap forward in our ability to study individual patients," says Lionel Ivashkiv, MD, Director of the Genomics Research Center and Chief Scientific Officer.

Until recently, scientists thought that genetic diseases were predominantly caused by mutations in the "body"



Dr. Lionel Ivashkiv is studying the switches that turn genes “on” and “off” to identify new targets for medications.

of a gene that result in deleterious effects on the function of the gene product (protein). Today, it's believed that much of the genetic variation that predisposes people to complex multi-genic diseases is not in the gene bodies themselves. “The thinking has shifted,” says Dr. Ivashkiv. “A lot of the genetic variation associated with autoimmune diseases and likely orthopedic diseases is probably in the switches that turn a gene ‘on’ and ‘off.’ This opens up the possibility of targeting the switches. It's a whole new therapeutic space.” To

understand what turns genes on and off, HSS scientists are studying the expression of genes across the entire genome, the set of instructions needed to make every cell, tissue and organ in the body.

A genomic approach to research that leads to personalized treatments shows great promise in cancer, but is only now emerging in autoimmune diseases and has not been applied to musculoskeletal conditions. “We're among the first to be doing this for autoimmune diseases,”

“We're among the first to use genomics to study autoimmune conditions — and will pioneer its use in orthopedics.”

says Dr. Ivashkiv. “If we used this approach to study orthopedics, we would be the first. It would be a tremendous opportunity for us to be the pioneers.”

One gene that plays an important role in autoimmune diseases is A20. It’s been linked to everything from rheumatoid arthritis and lupus to diabetes and inflammatory bowel disease. Patients tend to have too little of it, says Dr. Ivashkiv. “We’re trying to understand how the switches work,” he says. “If we could control the A20 switches, we could increase the gene’s expression, which would turn off the inflammatory process.” HSS researchers are also trying to come up with new drugs that can target these switches. They’ve tested a few, which have been shown to be effective in preliminary research focusing on osteoporosis and inflammatory arthritis.

The Center is currently embarking on studies of patients. In one innovative study led by Susan M. Goodman, MD, a rheumatologist and Associate Attending Physician, researchers are using genomics approaches to determine why some patients with rheumatoid arthritis experience flare-ups of symptoms when they are taken off their medications prior to surgery. At the time of the operation, HSS scientists take a piece of their joint tissue and investigate the differences between the cells of patients who flare and those who don’t. Our scientists are using a machine called a portable Drop-seq, which was custom-built by an engineer at the New York Genome Center. The machine enables us to perform sequencing to reveal gene expression in single cells and how these cells contribute to disease.

Another new study that’s underway is the Improving Knee Surgery Outcomes

Project—the first to investigate an orthopedic problem using genomics. Although most patients are pleased with the results of their total knee replacements, our researchers want to increase satisfaction rates. So Dr. Ivashkiv has assembled a team of researchers in biomechanics, imaging, molecular biology and genomics to determine why some patients still have discomfort after the procedure. “We’re looking at mechanical loading, advanced MRI imaging, and gene expression and signaling pathways in an integrated manner to understand what contributes to the stiffness and pain,” says Dr. Ivashkiv. “Our hypothesis is that abnormal motion causes an aberrant tissue response.” It’s possible an immune system molecule called ROCK may be involved. If it is, scientists can try to use ROCK inhibitor medications to prevent the tissue response.

Dr. Ivashkiv has begun exploring possible genomics research projects with physicians in the Spine Service. “We want to understand the response of the tissues that would be related to and predictive of early surgical failures,” he says. “If we can understand that, we can devise both surgical and biological approaches to improve outcomes.” One possible area of research: a biological therapy that would reverse or slow spinal disc degeneration.

Eventually, Dr. Ivashkiv would like to use a genomics approach to study aging of musculoskeletal tissues. For now, though, he is excited about “bringing to bear all of our strengths—our scientists, clinical expertise and patient populations—in an integrated way to come up with solutions for major clinical problems.”



593

NUMBER OF ARTICLES
HSS faculty published in 2015



\$44M

OUR TOTAL FEDERAL RESEARCH GRANT
portfolio as of December 31, 2015



50+

**PERCENTAGE OF ANNUAL
EXTERNAL RESEARCH FUNDING**
HSS receives from the NIH and
other federal agencies

Celeste Abjornson, PhD, and **Dr. Frank Cammisa** are using nanotechnology, which is new to the spine, to improve the success of back surgery.



A surgical patch for back pain

Every year, roughly 2 percent of Americans herniate a spinal disc, the shock-absorbing structure located between the vertebrae. The gelatinous material in the center of the disc (the nucleus pulposus) herniates or bulges through a tear in the outer part of the disc (the annulus fibrosis). This can compress a nerve root, causing back pain, leg pain, numbness and weakness.

When surgeons perform a microsurgical discectomy to remove the disc herniation, the hole in the annulus from the herniation is left untreated. Approximately 30 percent of patients still experience pain secondary to this defect in the annulus, and 5 to 10 percent of patients will reherniate within two years. The annulus will scar, but it

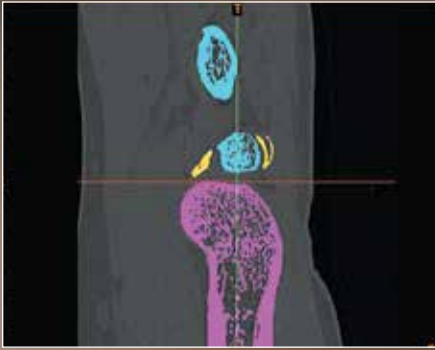
doesn't regain its strength. So there is an area of weakness, which can allow further degeneration.

The HSS Spine Service has been at the forefront of investigating better solutions for patients for many years. In the case of the herniated disc, renowned surgeon Frank P. Cammisa Jr., MD, Chief Emeritus of the Spine Service; Celeste Abjornson, PhD, Assistant Scientist and Director of the Integrated Spine Research Program; and former HSS spine fellow Joshua Schroeder, MD, began to brainstorm ways to help patients. "We talked about the fact that when you blow a tire on a bike, you need a patch," recalls Dr. Abjornson. The annulus has properties similar to those of a bicycle tire. "The outward pressure is high, and the load is your body weight," she says.

This led the research team to design a way to repair the annulus. They decided

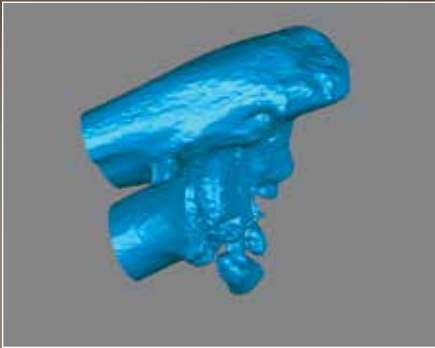
to use a novel technique involving nanotechnology — specifically carbon nanotubes, which are durable. This annular repair patch, aptly named the AnnuloPatch, is designed to be stronger and thinner than currently available technologies. The patch has the strength to withstand the biological forces and continuous bending and stretching created by movement. "Nanotechnology is new to the spine, but it has great potential in treating a number of pathologies, starting with an annular defect," says Dr. Cammisa.

The researchers have already tested the material for biocompatibility and will begin preclinical studies this year. Hopefully, clinical trials will begin in about two years. The researchers' goal is to bring the AnnuloPatch to market sometime after 2020. "It's a long process, but we're excited," says Dr. Cammisa.



CT SCAN DATA

To create a custom joint implant using three-dimensional (3-D) printing, physicians first need to use CT scan data to visualize a person's anatomy.



SEGMENTED MODEL

Physicians use CT scan information to isolate the area where 3-D printing will be most beneficial. In this case, it's a portion of the radius and ulna (the two long bones in the forearm).



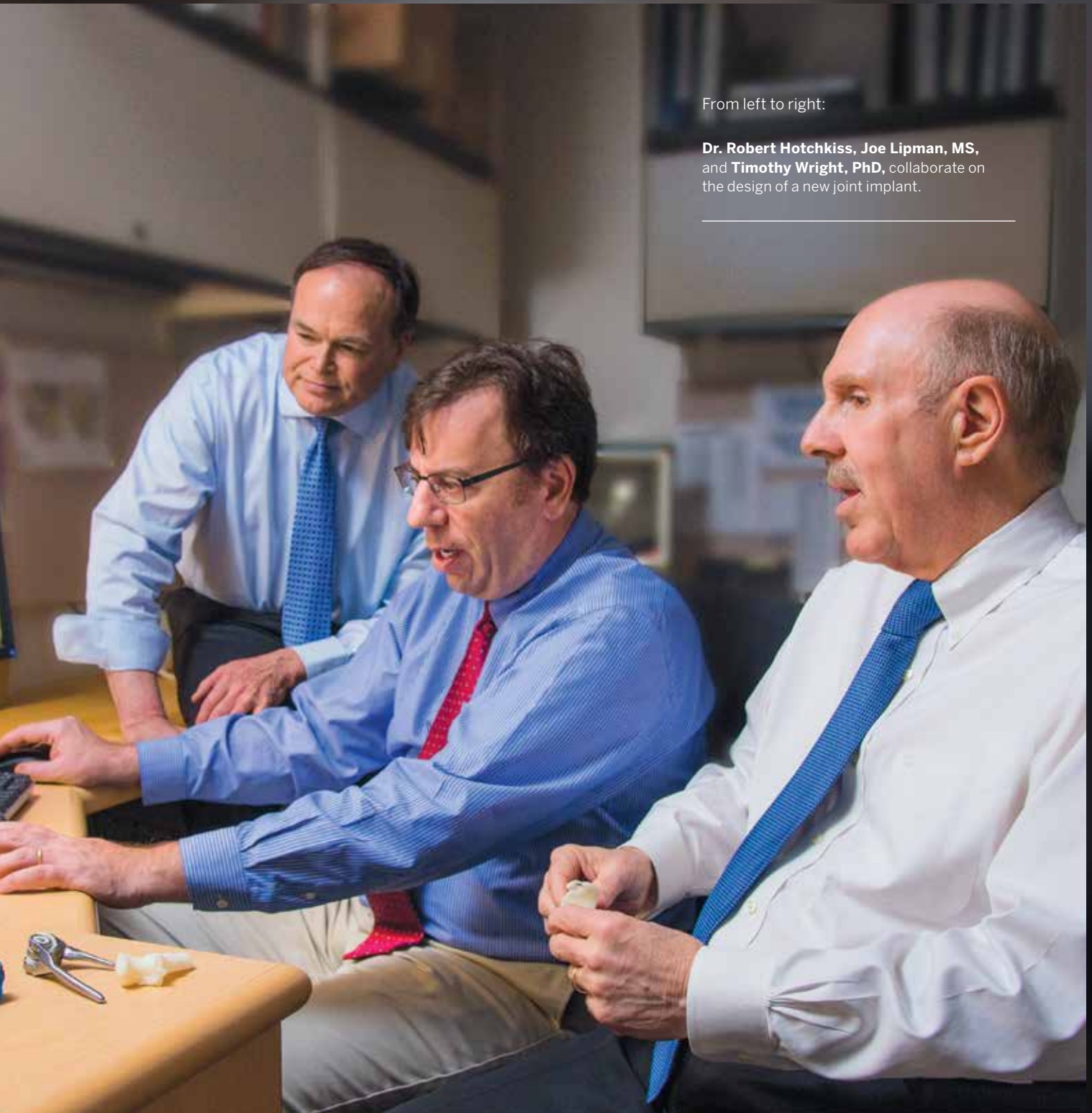
3-D MODEL OR IMPLANT

A 3-D printer can produce a plastic model or a metal implant. HSS surgeons are using a plastic model of the radius and ulna to help them plan for surgery.

Designing more durable joint implants

HSS has been perfecting joint replacement for decades so that patients can live healthier lives after surgery. Our experts are looking at every part of the body to bring relief to patients and ensure longer use of their replaced joints. In the case of the elbow, traditional implants can fail rapidly due to wear of the plastic from which they are made. Timothy Wright, PhD, FM Kirby Chair of Orthopedic Biomechanics and Senior Scientist, and HSS physicians and engineers have redesigned the implant's surfaces to reduce the wear that occurs. They also have turned to three-dimensional (3-D) printing to help perfect their design. With this technology, a computer creates a three-dimensional object that can be built with successive layers of metals or plastic. There are several advantages: The metal components of an implant can be made porous in certain places, enabling bone to grow directly into the implant, resulting in more permanent fixation. Plus, the metal can be formed into natural shapes, allowing for a more patient-specific implant. "3-D printing is one of the most exciting technologies to emerge in the last 10 to 15 years," says Dr. Wright. "It's opened up a lot of possibilities for us."





From left to right:

Dr. Robert Hotchkiss, Joe Lipman, MS,
and **Timothy Wright, PhD**, collaborate on
the design of a new joint implant.

Targeting new therapies for autoimmune diseases

Despite scientists' increased understanding of complex autoimmune diseases, such as lupus, rheumatoid arthritis and scleroderma, patients desperately need better treatments. Commonly prescribed steroid medications are effective, but they're toxic when taken over time. "We need to find treatments that enable patients to have better, healthier lives," says Mary Crow, MD, Physician-in-Chief.

HSS rheumatologists and researchers have made significant progress toward that goal. The medications that show the most potential in improving outcomes among patients with autoimmune diseases are targeted therapies. The idea is that if you can understand what goes wrong with the immune system to cause a certain disease, you will potentially be able to treat it.

Among the most promising targeted therapies are anti-interferon receptor antibody drugs, which are currently entering Phase III clinical trials. "We were one of three groups to show that interferon—a group of molecules that helps fight viral infections—was elevated in lupus patients," says Dr. Crow. In a healthy person, the body produces interferon in response to a viral infection. It activates the immune system to fight the infection, then goes away. In lupus patients, however, the body continues to produce it.

HSS researchers aren't just studying molecules. They are also advocating for patients by encouraging



Dr. Mary Crow's research on a group of molecules called interferon is leading to new medications for lupus.

pharmaceutical companies to test their drugs in people with lupus. Dr. Crow, who is chairperson of the scientific advisory board for the Alliance for Lupus Research, recently helped form the Lupus Clinical Investigators Network (LuCIN), which has identified 60 lupus centers across the country as potential drug testing sites.

Currently, HSS clinicians strive to treat and control autoimmune diseases. The ultimate goal, however, is to prevent them. "In the future, we might be able to prescribe a targeted therapy to a patient showing very early signs of illness to prevent the development of the disease," says Dr. Crow.

Revolutionizing foot and ankle treatments

Despite our ability to diagnose and treat a variety of foot problems, the act of walking remains somewhat of a mystery. “We have limited data about the movement of the 26 bones in the foot,” says Jonathan T. Deland, MD, Attending Orthopedic Surgeon and Chief Emeritus, Foot and Ankle Service. To help create better treatments for foot and ankle conditions, he constructed “the most advanced gait simulator in the world,” he says. It uses robotic technology to replicate walking. The simulator took 18 months to construct and was made

possible by Herbert Black and another generous donor who are supporting this and other innovative projects.

One of Dr. Deland’s research priorities is to study and develop improved ankle replacements and a better treatment for patients who are too young to have these procedures. In pursuit of the latter, Dr. Deland has come up with an innovative, low-friction spacer, which would be inserted in the ankle joint. It would relieve pain, and it would not need to be rigidly fixed to bone. “It is stable and cannot become loose, and with the strong and biocompatible material, it is built to maintain motion, relieve pain and last,” says Dr. Deland. He plans to use the simulator to develop this new

treatment for ankle arthritis and hopefully other joints.

This summer, HSS researchers will present the results of three studies involving the simulator at the annual meeting of the American Orthopaedic Foot & Ankle Society. “It’s unusual for one lab to have three papers accepted by the Society,” says Dr. Deland. “This is thanks to our donors, as well as Dr. Constantine Demetracopoulos and Department of Biomechanics researchers Josh Baxter and Daniel Sturnick, who did the work. Having three papers accepted shows how interested people are in research enabled by our simulator.”

From left to right:

Research engineer **Daniel Sturnick** and **Drs. Jonathan Deland, Scott Ellis** and **Constantine Demetracopoulos** are using HSS’s state-of-the-art robotic gait simulator to improve treatments for ankle arthritis.



Pushing the boundaries in imaging research

At HSS, the sky is the limit when it comes to finding new ways to evaluate common joint problems via imaging. “We’re not afraid to do something no one else has done before,” says Hollis Potter, MD, Chairman, Department of Radiology and Imaging, and Coleman Chair in MRI Research. And that pays off for patients, who benefit from the imaging research that helps HSS physicians and therapists diagnose and treat musculoskeletal problems.

A new quantitative MRI technique called parametric mapping, applied under joint loading, may help predict which

patients will have successful outcomes from transplants of the meniscus, the tissue that cushions the knee between the thigh and shin bones. Parametric mapping will be used to identify a predictive biomarker, a measurable indicator of cartilage degeneration, for patients. This could give doctors clues about whether a patient’s meniscal transplant is failing before he or she has symptoms.

Our imaging researchers are also trying to determine if a new ultrasound

“We’re not afraid to do something no one else has done before.”

technique can be useful for musculoskeletal conditions. Shear wave elastography can help evaluate tissue properties, such as stiffness. Researchers are using the technology to determine whether patients with basal joint arthritis (pain in the joint at the base of the thumb) have a predictable pattern of softening of the muscles of their thumbs due to disuse. If the muscles are softer than normal, they are most likely atrophied and physical therapy may be necessary. Early diagnosis and treatment may help slow the condition’s progression. If the technique proves useful, “we would be among the first to use it in musculoskeletal medicine,” says O. Kenechi Nwawka, MD, Assistant Attending Radiologist and Director, Division of Ultrasound Research.



From left to right:

Drs. Hollis Potter, O. Kenechi Nwawka and **Matthew Koff** are using cutting-edge imaging technologies to evaluate musculoskeletal problems.



Dr. Frank Schwab uses flat detector 3-D imaging in the operating room after performing a procedure to confirm that he delivered on his surgical plan.

Perfecting spine surgery

From flying a plane to operating household appliances, complex undertakings have become safe and predictable through a combination of skill and automated technology. Today, there are parallels with spine procedures, some of which are being performed at HSS with the help of simulation tools and flat detector three-dimensional (3-D) imaging. “These technologies will enable a surgeon to do what he or she does even better,” says Frank Schwab, MD, Chief of the Spine Service at HSS. “They’re leading to a paradigm shift in spine surgery. At HSS, new technologies are helping our team to perfect the most complicated spine procedures.”

HSS is leading the way in automating key aspects of spine procedures. Our physicians are using surgical planning software to create personalized rods, which are implanted in patients with spinal deformities like scoliosis. After the procedure, the physicians receive a report card on how well the patient did. “All of our patients’ images are routinely re-measured post-operatively compared to the surgical plan, so it’s a quality check after surgery,” says Dr. Schwab.

HSS spine surgeons are also starting to perform quality checks during complex revision procedures. We are one of the first institutions in the U.S. to adopt the use of flat detector 3-D imaging in the operating room. With this technology, a fluoroscope — an instrument that uses X-rays to obtain real-time

“Using technology allows a surgeon to perform an operation more predictably and safely.”

images — rotates around the patient and takes several hundred pictures. This can help a surgeon confirm that an implant’s screws and anchors are placed safely and appropriately. “With these new technologies, we are finding we can much more predictably and reliably restore function, alleviate pain and help patients get back to doing what they love,” says Dr. Schwab.

Talent of today and **tomorrow**

Even the most advanced technologies and protocols require the skills, character and values of the people who use them. A strength of HSS is our unique culture, which attracts, engages and enhances superior talent with a singular focus on patient care excellence.

To provide the best care, we train and hire the most renowned surgeons and physicians. The majority of our surgeons completed their residencies here, illustrating our commitment to educating and retaining the best physicians. In 2015, our orthopedic surgery residency program was ranked first in the nation in reputation and research output by the professional healthcare network Doximity for the second year in a row. Our robust fellowship program offers instruction in many areas, from primary care sports medicine and spine surgery to physiatry and pediatric rheumatology.

What's more, our Magnet designation—which we recently received for the fourth consecutive time—helps us attract and retain the best nurses. We have a highly educated nursing workforce; about 97 percent of our nurses have Bachelor of Science in Nursing (BSN) degrees, which is higher than

most institutions. Our nurse vacancy and turnover rates are well below national and New York State averages. At the end of 2015, our vacancy rate was 2.2 percent, and our turnover rate was 4.1 percent.

Our providers' skills and research contribute to our leadership in musculoskeletal education, but our collaborative culture plays a significant role too. At HSS, physicians in different specialties work together to revolutionize patient care.

These advantages will undoubtedly help us reach our goal of becoming “the most trusted educator” on a global level. We want to share our knowledge with physicians around the world to help patients everywhere return to the activities they love.

“There's a unified view that HSS is the greatest place in the world, and we cherish it.”

Collaborating to deliver the best care

When Todd Albert, MD, Surgeon-in-Chief and Medical Director, needs to diagnose a patient, he often heads down to the basement of HSS. That's where he consults with a radiologist at the Coleman Center for Musculoskeletal MRI. Together, the physicians arrive at a diagnosis. “The diagnosis in isolation wouldn't be nearly as good as it is when I collaborate with radiology,” says Dr. Albert.

That collaborative spirit is pervasive throughout HSS. Our biomechanics experts and our rheumatologists collaborate with our surgeons, and our researchers work with our clinicians. “We have the advantage of specializing in only one thing: musculoskeletal medicine,” points out Dr. Albert. This unique focus fosters collaboration in a way that might not happen at other hospitals. “There's no competing with the needs of general surgeons, urologists or cancer specialists” for the attention of radiologists, anesthesiologists and even other surgeons, says Dr. Albert. “At HSS, we're all trying to achieve the same goal—improving musculoskeletal care.”

Our singular focus on musculoskeletal medicine encourages collaboration, but it's not the only reason HSS physicians are inclined to work together. "There's an affection for the institution," says Dr. Albert. "There's a unified view that this is the greatest place in the world, and we cherish it. If you're that proud, you will make sure that any 'visitor' leaves with a view of this place that's incredible. That leads to natural collaboration, and patients sense it."

"When people say, 'my cousin had surgery at your hospital and it's amazing,' it's not just because of the surgery. It's not just that they had pain and the pain is gone. It's the feeling of the people who work here. It's the biggest thing that differentiates us from other institutions."

One of the best examples of collaboration at HSS is that between surgeons, nonoperative sports medicine specialists and physiatrists. We were among the first in the country to develop a model in which sports medicine experts and physiatrists bring in new patients who may not need surgery and identify those who do. If they don't need surgery, they are treated by a non-operative physician. If they do, the sports medicine physician or physiatrist can fast-track the patient to a surgeon.

Our surgeons also collaborate with anesthesiologists, helping to improve patient outcomes. At HSS, these specialists work together to identify patients who are good candidates for a regional anesthetic block, which eliminates pain for two days after surgery. This enables

patients to start rehabilitation immediately and improves outcomes. It helps reduce infection rates and the risk of blood clots and shortens length of stay.

Collaboration at HSS also results in better joint replacement surgery outcomes. Surgeons and scientists in our arthroplasty service have conducted joint replacement retrieval studies that have led to the design of new, improved implants and surgical techniques. And that's the ultimate goal: "Collaboration enables us to deliver the best care to patients," says Dr. Albert.



From left to right:

Physician assistant **Peter Grimaldi**,
Dr. Todd Albert and **Dr. Chad Craig**,
hospitalist, work toward the same goal: to
improve musculoskeletal care for patients.

Preparing residents for the realities of the OR

Step into the Bioskills Education Laboratory (BSEL) at HSS on any given day, and you might find a sports medicine resident learning arthroscopy on a state-of-the-art surgical simulator or a highly skilled orthopedic surgeon practicing a new technique. Or both. HSS is one of the only academic medical centers in the country with an educational lab specializing in musculoskeletal medicine. “Our mission is to train the next group of leaders in orthopedics,” says Mathias P. Bostrom, MD, Attending Orthopedic Surgeon and Director of the Orthopaedic Residency Program. The BSEL provides residents and fellows with a hands-on, comprehensive education in musculoskeletal medicine with anatomic surgical simulators and plastic models of bones and joints. The space is also used for anatomic training in nonsurgical specialties, such as pain management and physiatry.

A secondary focus of the lab is research. In 2015, more than 100 physicians and researchers attended 39 sessions to complete 10 projects in the lab. They included anatomic studies of the blood supply to the hip, patella (kneecap) and hand. Our research findings improve patient care, since they help inform new, more effective approaches to surgery. They also enhance our global leadership in musculoskeletal research.

The BSEL, which was built in 2000, is the only lab in the country focused on orthopedics that is accredited by the American College of Surgeons Accredited Education Institutes Program, meaning it meets rigorous educational

and training standards. It was reaccredited in 2015. The lab is so well-respected that doctors from around the world, including Israel, Greece and China, have traveled to HSS to access the BSEL’s training resources.

To keep up with growing demand for the space, the lab will be renovated this summer, significantly expanding in size. The new BSEL will be dynamic and flexible, enabling the workspace to accommodate 20 students—up from 12. It will also be modernized with new, state-of-the-art equipment. There will



2,300+

NUMBER OF EXPERTS
who used the BSEL in 2015

be upgrades in lighting, surgical tables and instrumentation, allowing the lab to more closely resemble an operating room. Residents and fellows will have access to a second-generation arthroscopic surgical simulator with improved haptic technology, which simulates the sense of touch. The lab’s videoconferencing capabilities will also be modernized to help advance our worldwide educational efforts. These improvements are possible thanks to generous support from the S&L Marx Foundation.

The laboratory, which costs \$500,000 to run annually, is an investment in the future of orthopedics. “To train the best physicians, we have to be at the forefront of training technology,” says Dr. Bostrom.





Adult Reconstruction and Joint Replacement residents learn surgical techniques in the Bioskills Education Laboratory. From left to right: **Dr. Ishaan Swarup** (resident); **Dr. Edwin Su** (surgeon); **Dr. Ekaterina Urch** (resident); **Dr. Braiden Heaps** (resident); and **Dr. Mathias Bostrom** (surgeon and Director of the Orthopaedic Residency Program)

Nurses at the top of their game

There was plenty of clapping and cheering when the American Nurses Credentialing Center (ANCC) announced that HSS was being awarded the Magnet designation for excellence in nursing services for the fourth consecutive time. We became the first hospital in New York State to do so. “I’m proud of all of our nurses,” says Stephanie Goldberg, RN, MSN, NEA-BC, Senior Vice President, Patient Care Services, and Chief Nursing Officer.

Attaining Magnet status is a major accomplishment, since it signals that HSS is a great place to be a nurse, helping us to recruit the best staff, says Goldberg. “One of the attributes of being a Magnet organization is that there is an interdisciplinary process that encourages the team to deliver care to patients,” says Goldberg. “The appraisers from the ANCC were blown away by our interdisciplinary communication and teamwork.”

One of the reasons our nurses achieve significant patient outcomes is that HSS invests heavily in their training and education. We offer evidence-based nurse residency programs to prepare new graduates for the operating room (OR), the post-anesthesia care unit (PACU) and inpatient care. We also provide a tuition reimbursement program, which enables nurses to return to school for advanced degrees.

Our commitment to cultivating the best nurses pays off for patients. We have low infection rates, as well as high rates of fall prevention. But we are always striving to do even better. We measure



Stephanie Goldberg leads a Chief Nursing Officer Advisory Group meeting to find out how to improve the work environment for nurses.

“Our Magnet designation helps HSS recruit the best nurses.”

our patients’ satisfaction with nursing and review the data on a quarterly basis.

At HSS, a council structure encourages nurses to participate in decision-making regarding patient care. Four professional practice councils — representing the OR, PACU, inpatient and ambulatory care — meet regularly to develop policies, procedures and protocols for HSS.

Staff nurses also attend the Chief Nursing Officer Advisory Group meeting six times per year. At these meetings, Goldberg solicits feedback on how leadership can improve the work environment for nurses. “The staff see that we’re responsive to their needs,” she says.

A key goal for this year is to increase retention rates. We will expand HSS’s Nurse Leadership Cohort Program, which enables nurses to do a rotation to expose them to nursing leadership. If a management position becomes available, they can apply. “I’m excited to continue to raise the bar for the work environment for our nursing staff so they can take the best possible care of our patients,” says Goldberg.

Protecting young athletes on the playing fields

When Robert Marx, MD, Attending Orthopedic Surgeon, first heard anterior cruciate ligament (ACL) tears could be prevented, he dismissed it as science fiction. “How can you prevent a ligament from tearing? It just happens,” he remembers thinking. Then, while attending a conference in Europe, he heard Norwegian researchers present data that showed the injuries could be cut in half with a prevention program, and he wanted to start one in the United States.

The opportunity arrived in 2015, when HSS received a \$2.76 million grant to establish the HSS Sports Injury Prevention Program. The grant, provided by HSS Board member James Dinan and his wife, Elizabeth Miller, through The Dinan Family Foundation, enables the Hospital to raise awareness of injury prevention among children and teens. “Philanthropists can play a key role in providing seed funding to launch

important programs like this one,” says Dinan. “We are pleased to be partnering with HSS to help young athletes remain active through effective preventative conditioning,” adds Miller. The first phase of the five-year endeavor will focus on preventing ACL injuries, which are affecting a growing number of young athletes.

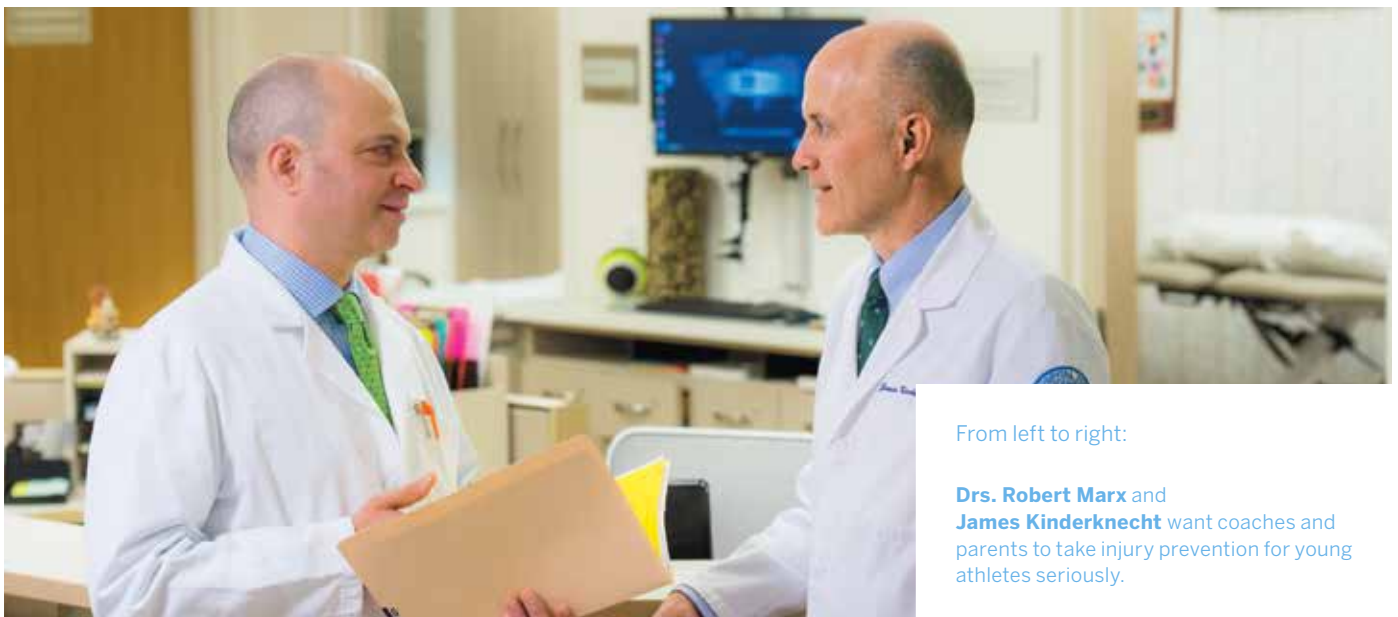
The program, which is co-directed by Dr. Marx and James Kinderknecht, MD, Assistant Attending Physician, will engage coaches, parents and school sports organizations. “Ultimately, our goal is to get every junior high PE program in the world to teach injury prevention strategies,” says Dr. Kinderknecht. Sports injuries in children can have devastating consequences. A child who experiences an ACL injury, for example, is at risk for disabling knee osteoarthritis, says Dr. Marx.

The challenge is convincing parents, coaches and young athletes that injury prevention is worthwhile. “People think, ‘it’s not going to happen to me,’” says Dr. Kinderknecht. To address the problem, HSS will offer seminars and



lectures for parents and athletes and workshops for coaches. Sports administrators and athletic directors will learn about the benefits of implementing a preventive program. A website will provide instructional guides, assessment tools and a discussion board. “What makes our program unique is that we will work directly with various groups to empower them to help reduce injuries among young athletes,” says Joseph Janosky, MS, PT, ATC, Manager of the HSS Sports Injury Prevention Program.

Dr. Marx believes that injury prevention exercises will eventually be accepted by youth sports programs everywhere. “They will be part of a warm-up the same way putting on a seatbelt is part of driving a car,” he says.



From left to right:

Drs. Robert Marx and **James Kinderknecht** want coaches and parents to take injury prevention for young athletes seriously.

Patient experience

The patient experience at HSS is widely acclaimed. Today, a growing number of people are benefiting from our unique care through a variety of services — our lupus support groups, physical therapy and performance training. Patients can now be treated at one of our many locations, including Stamford, CT; Paramus, NJ; Uniondale, NY; Jupiter, FL; Bradenton, FL; and New York City and Queens.

Over the past year, HSS has been focused on improving patient experience and care delivery with transformational technology. In 2016, we launched Epic, an integrated electronic medical record system that enables patients to have access to part of their medical records through a patient portal called MyHSS. The portal allows them to communicate with their care team, view lab results, and update medications and allergies from the convenience of their home computer or mobile device.

Our implementation of Epic gave us the opportunity to create a more coordinated care environment at HSS. Patients can now pre-register for procedures, minimizing their waiting time at the Hospital. We also

established the HSS Access Center to centralize communication with patients and providers.

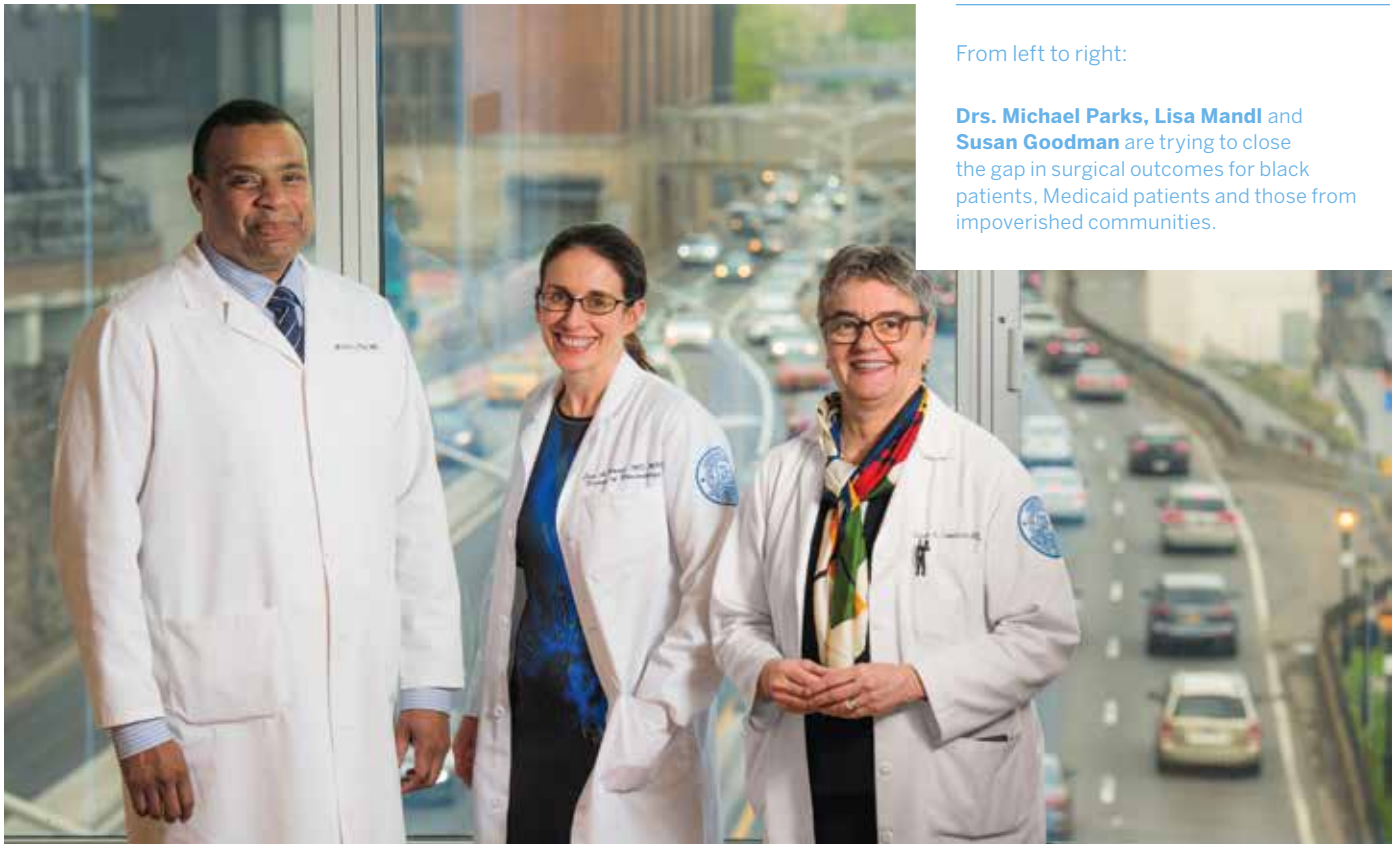
Surveys show that HSS patients are overwhelmingly satisfied with their care. Compared to other Magnet hospitals in the Press Ganey database, we have scored in the 99th percentile on the measure of how likely patients are to recommend HSS to others for 31 consecutive quarters. Still, we always strive to do better, whether it's developing breakthrough medications; improving surgical outcomes; or launching mobile technology-based programs. We are focused on delivering high-quality, efficient care to transform patients' lives.

“Patients need to understand the costs and personal impact of their treatment options.”

Empowering patients to make the right healthcare decisions for themselves

Michael Parks, MD, was stunned when his 84 year-old father, who was limping around his garden, initially refused to undergo knee replacement surgery. Though his father later relented and had successful surgery at HSS, it left Dr. Parks, Associate Attending Orthopedic Surgeon, wondering why his own father — like many other African Americans — would choose pain and immobility over surgery.

It's a complex issue, but it's one the Disparities Group — led by Dr. Parks, Susan Goodman, MD, Associate Attending Physician, and Lisa Mandl, MD, Assistant Attending Physician — has been investigating recently. In a literature review published in *The Journal of Rheumatology*, the researchers found that blacks had poorer outcomes than whites after total knee replacement surgery. They tended to have more pain, less function, lower satisfaction



From left to right:

Drs. Michael Parks, Lisa Mandl and Susan Goodman are trying to close the gap in surgical outcomes for black patients, Medicaid patients and those from impoverished communities.

and a worse quality of life compared to white patients.

In another study, the researchers found that black patients, Medicaid patients, and those from impoverished communities were at increased risk for poor outcomes after hip fracture surgery, including hospital readmission and death.

One explanation for poorer outcomes is that blacks tend to delay surgery, leading to more advanced arthritis. What's more, comorbidities—including diabetes and obesity—are common, increasing the odds of complications. These complications, in turn, decrease patient satisfaction, reducing the likelihood a person will recommend the procedure to others in his or her community.


120K+

NUMBER OF PATIENTS HSS
served in 2015


400K+

NUMBER OF UNIQUE VISITORS
to our "Back in the Game"
website in 2015

Other research shows that people from poor neighborhoods tend to bypass high-volume hospitals for lower volume centers with higher rates of poor surgical outcomes, which warrant revision procedures. This may cause these patients to resist surgery in the future.

One possible solution to these problems is a shared decision-making tool, which is designed to educate patients about the impact of their treatment options. "If you do nothing and become more immobile, there are costs associated with that," points out Dr. Parks.


Ultimately, the goal of the Disparities Group is to find ways to close the gap in surgical outcomes. "If you can get patients engaged, you can empower them to make decisions that are right for themselves," says Dr. Parks.

Transforming lives, one patient at a time

Patients come to HSS from all 50 states and more than 100 countries with good reason: They know that when they are treated by one of our physicians, they

will have the best shot at returning to the activities they love. There's no better testament to that than Back in the Game, a collection of more than 1,300 patient stories that illuminate HSS's power to make a difference in people's lives. From knee and hip replacements to ACL repair and rheumatoid arthritis

treatment, the high-value care people receive at HSS enables them to travel, remain active and spend time with their families — pain-free. The dedication of our talented physicians has created a large group of satisfied patients who want to spread the word. And that attracts even more patients to HSS.



Julie Fitzgerald of Water Mill, New York is enjoying the outdoors after an ankle distraction arthroplasty at HSS.



Dr. Catherine MacLean's mission is to ensure HSS is delivering the highest value healthcare.

The math of value

In the U.S., we pay a premium for medical services but don't necessarily receive high-quality care. At HSS, we have a long history of producing value by delivering high-quality care. Now, Catherine MacLean, MD, PhD, HSS's first Chief Value Medical Officer, is charged with advancing our leadership and sharing our knowledge to help the healthcare marketplace better understand the correlation between quality and value.

An important way to assess quality for musculoskeletal diseases is to measure patient-reported outcomes for pain and functional status, something HSS has done for decades through its many clinical and research registries. Building on our experience in developing and collecting patient-reported outcomes, we will be incorporating these measures into our clinical care. All patients

treated at HSS will fill out surveys about their pain and functional status before and after surgery or other therapies, and the results will be included in their medical records.

HSS is also aiming to coordinate patient care in a more efficient way both within HSS and with other healthcare providers in our medical neighborhood. For instance, the Hospital has developed partnerships with several select, high-quality skilled nursing facilities that have agreed to follow our protocols for how hip and knee replacement patients should be managed postoperatively.

Dr. MacLean is confident HSS will thrive in a value-based marketplace. "Patients want to come to the higher-quality institution, because they understand that it translates into better outcomes and better value," she says.



HSS's Charla de Lupus (Lupus Chat)[®] support group hosts a "prom" for teen lupus patients to take their minds off the disease for a night.

Living better with lupus

It was an unforgettable girls' night out for 35 New York City teens: Each chose a prom dress; had her hair and makeup professionally done; and socialized with peers. The "prom" was a welcome distraction from the teens' daily struggles with lupus, a complex, chronic autoimmune disease that can affect any part of the body.

These girls are members of HSS's Charla de Lupus (Lupus Chat)[®], a national program offering underserved communities with lupus—particularly African Americans and Spanish speakers—support through multiple levels of intervention. The prom is just one example of the many ways HSS helps patients and their families cope with lupus. Other national programs are LANtern[®] (Lupus Asian Network), which is designed specifically for Asian Americans with

lupus and their loved ones and is available in Mandarin and Cantonese, and LupusLine[®], a telephone peer support program. HSS also offers monthly support group meetings, which have been in existence since 1985. We have pioneered more lupus support and education programs than any other hospital in the country.

Our programs are designed to take into consideration both cultural and socioeconomic factors. "We recognize that lupus affects diverse communities," says Jillian Rose, LCSW, Assistant Director, Community Engagement, Diversity & Research. "So we tailor our support and education programs to meet the cultural needs of the populations we serve."

The Department of Social Work Programs partners with the Division of Rheumatology's Lupus and APS Center of Excellence to offer support and education via social media.

Our Facebook chats give patients the opportunity to ask physicians and social workers questions about treatments and social and emotional issues. This spring, we launched Twitter chats to help bring lupus education to a larger audience.


120K+

NUMBER OF CONTACTS
with lupus patients and loved ones,
providers and the public

All of these programs are geared toward enhancing understanding and mutual support to improve coping skills and to provide the best possible outcomes. "Our patient and community partnerships will help us achieve those things," says Rose.

Bringing rehab to patients where they need it most

The typical HSS patient travels more than 75 miles to receive care. This year, many patients will find HSS care closer to home—especially if they're using our rehab services. We are opening new facilities in several locations around the tristate area and in Florida. "This enables us to bring our care to more people," says JeMe Cioppa-Mosca, Senior Vice President, Rehabilitation.

Our newest facility is HSS Sports Rehab Provided By Stamford Health, conveniently located next door to the HSS Outpatient Center at Chelsea Piers in Stamford, CT. It provides therapy for sports-related injuries and conditions.

In early 2017, we will open HSS Rehab in New Jersey within the current HSS Paramus Outpatient Center. Later that year, there will be a 50,000-square-foot

HSS outpatient facility in White Plains, NY. These centers will provide sports rehabilitation, hand therapy and physical therapy for musculoskeletal conditions and post-operative care.

Our many patients in Florida are served by HSS Spine & Sport in Jupiter and by HSS at IMG Academy, a private school and athletic training institute in Bradenton. In early 2016, more than 500,000 Facebook users followed the experience of a Florida resident who had rehab at HSS at IMG Academy after limb-lengthening surgery at HSS in New York. Later this year, our therapists in Bradenton will relocate to a 2,500-square-foot facility, which will enable us to work with more athletes.

Residents of New York, New Jersey, Connecticut and Florida also have access to the HSS Rehabilitation Network. Founded in 1994, this hospital-based network of recommended outpatient rehabilitation practices has more than 150 high-quality, independent member facilities.

HSS is also bringing rehab services to major corporations in New York City. Since 2009, we've provided onsite care to employees through a number of corporate partners, including Goldman Sachs and The New York Athletic Club. In 2015, we launched HSS Onsite at JPMorgan Chase & Co. In April, we began offering care at American Express. Our services include rehabilitation and health education through newsletters, seminars, health fairs and tip sheets.

This summer, we will travel abroad to bring our sports rehab and performance expertise to the Summer Olympics in Rio de Janeiro. We will send 15 of our clinicians to Brazil to care for Olympic athletes who don't have their own medical services. "We perform more musculoskeletal rehab than anyone in the world, and we want to help others stay on top of their game," says Cioppa-Mosca.



JeMe Cioppa-Mosca is bringing rehab services to HSS patients in Connecticut, New Jersey and beyond.

Where the world comes to get **back in the game**



George Robertson
Toronto, Ontario, Canada
knee replacement



Emily Nytko-Lutz
London, United Kingdom
treatment for hip labral tear



Ann-Merrie Hendrickson
St. Croix, U.S. Virgin Islands
treatment for systemic lupus
and deep vein thrombosis

Brazil

HSS is providing orthopedic consulting and advising services in Brazil through its partnership with Hospital Alvorada, a general hospital in São Paulo. We are providing the same services to the orthopedic department at Hospital Americas in Rio de Janeiro. The goal is to provide pathways to increase quality patient care through education and training. The first annual HSS-Hospital Alvorada Symposium for orthopedists and physical therapists was held in São Paulo in 2015 and was attended by 300 surgeons and physical therapists.



354

NUMBER OF INTERNATIONAL ACADEMIC
visitors HSS hosted in 2015

Patients come to HSS from more than 100 countries and all 50 states. Our International Center provides interpretation services and supports patients throughout their treatment. And we partner with other leading orthopedic hospitals to advance musculoskeletal medicine around the world.



123

**NUMBER OF COUNTRIES
WITH HSS eACADEMY®**
(the online learning platform) members



Shimon Russell
Jerusalem, Israel
total hip replacement

South Korea

HSS is collaborating with Bumjin Hospital Group, based in Seoul and Busan, South Korea, to create state-of-the-art sports medicine services. The Group recently became the inaugural member of the HSS Global Orthopaedic Alliance, which was formed to align top orthopedic care providers around the world focused on providing excellent patient care.

China

In 2015, HSS expanded its HSS-China Exchange Program when it signed a medical service collaboration agreement with the Second Affiliated Hospital, Zhejiang University School of Medicine (SAHZU), in China. HSS and SAHZU will discuss case studies, conduct exchange visits, and launch a second opinion program.



Sonya Kennedy
Sydney, New South Wales; Australia
bone graft for broken wrist

HOSPITAL FOR SPECIAL SURGERY

2015 Annual Report

Leadership Report	27
Financial Information	31
Philanthropic Highlights	32
Professional Staff	34
Management & Volunteers	40
Leadership Councils	43
Planned Giving	44
Planned Giving Story	45
Benefactors	46
Officers & Board Members	52

Leadership Report

ADVANCING OUR CULTURE OF INNOVATION

Seismic changes triggered by healthcare reform have produced a wave of consolidation in the U.S. healthcare industry. Acquiring scale is an expedient way to create the impression of growth and increased efficiency. Our view is that true, sustainable growth and advantage happen instead as a result of superior quality and value. 'Bigger' is only better when it is earned.

In this context, the HSS path to growth may be considered unique. We are laser-focused on getting even better at what we do better than anyone else. Our world-class staff enables patients to overcome musculoskeletal health problems and live their lives to the fullest. Since we see only one type of patient, our physicians and care teams are expert in making an accurate diagnosis and guiding people to the right course of treatment. This year, we are leveraging our strengths and bringing new ideas to the world more effectively than ever before. This will enable us to deliver the most innovative care, services and products related to musculoskeletal health.

HSS is growing and pursuing new avenues of research. The \$300 million "Your Life, Our Mission" campaign, which was created to support new research, buildings, laboratories and education programs, has raised more than \$275 million to date. And in 2015, we celebrated the investiture of Lionel Ivashkiv, MD, as HSS's third Chief Scientific Officer and the Richard L. Menschel Chair. Under his leadership, we are developing novel treatments and devices to achieve better outcomes for musculoskeletal patients. We introduced the Precision Medicine Laboratory, which is designed to aid in the discovery of new therapeutic targets and the identification of molecular drivers of disease in individual patients, which will allow the personalization of care.

Our unmatched results have earned us numerous accolades that make HSS synonymous with excellence. This year, we were ranked #1 in the country for orthopedics and #3 for rheumatology by *U.S. News & World Report* "Best Hospitals" (2015-2016 rankings). Healthgrades®, the leading online consumer resource for finding quality medical care, recognized HSS in 2016 with 5-star quality ratings in total hip replacement, back and neck surgery and spinal fusion surgery. We also have been the recipient of the Healthgrades® Orthopedic Surgery Excellence Award™, Joint Replacement Excellence Award™ and Spine Surgery Excellence Award™ for two years in a row (2015-2016). We were named among the top 5 percent in the nation for spine surgery and the top 10 percent in the nation for overall orthopedic services for two years in a row. CareChex®, a division of Comparion, ranked HSS #1 in the Nation for Medical Excellence in both Major Orthopedic Surgery and Joint Replacement for the last three years. The State of New York has recognized HSS for its low infection rates in hip replacement surgery—one of the lowest in the country.

Patients report their high levels of satisfaction in their own ways. In 2015 alone, HSS served more than 120,000 patients. Our patients come from all 50 states and more than 100 countries. In 2015, we had more than 5 million unique visitors to our website. Grateful patients are eager to broadcast their treatment success stories on social media. We recently celebrated the one-year anniversary of our "Back in the Game" website, the world's largest forum of orthopedic and rheumatologic patient stories. The submissions have more than tripled since the site launched; as of May 2016, over 1,300 patients had sent us their stories. More than 2,600 visitors have shared those stories across their personal social media networks, which has resulted in nearly 800 new patient appointment inquiries since the site launched.



From left to right:

Mary K. Crow, MD, Physician-in-Chief

Todd J. Albert, MD, Surgeon-in-Chief
and Medical Director

Louis A. Shapiro, President and CEO

Kendrick R. Wilson III, Chair

Lionel B. Ivashkiv, MD, Chief Scientific Officer

The quality of the HSS patient experience is widely recognized. We are the first hospital in New York to receive four consecutive Magnet Program designations. Compared to other Magnet hospitals in the Press Ganey database, we have been in the 99th percentile for “likelihood to recommend” for 31 consecutive quarters. We recently garnered the Press Ganey Guardian of Excellence Award in the Patient Experience category for the third consecutive year. Despite our successes, we remain committed to widening the excellence gap between our peers and us. Our 2015 accomplishments indicate we are meeting that challenge on every level.

ADVANCING OUR INNOVATIVE APPROACH TO PATIENT CARE

2016 is a year of transformation at HSS. In January we introduced Epic, an integrated electronic medical record system. Throughout the year we are continuing to change processes to optimize the new system. The launch was the culmination of an 18-month, organization-wide effort of unprecedented interdisciplinary commitment to changing how we record and share, in a secure way, patient information. The benefits of converting to Epic are clear: a more efficient and coordinated care environment. We describe the technology as supporting “One patient. One record. One HSS.” It allows for information sharing about patients in real time and improved clinical decision making. It also enables us to better measure performance, improve processes and integrate financial operations. Our patients now have convenient, secure access to portions of their health information via MyHSS, a new web-based patient portal. Initial adoption of the portal far exceeds other Epic hospitals.

Our commitment to improving the patient experience doesn't stop with Epic. We are also investing in data analytics to help us make better decisions about everything from patient care to department management. We will use data to identify opportunities to improve performance, demonstrate greater value in the marketplace, define quality metrics and inform evidence-based practices for musculoskeletal care.

HSS is determined to continue measuring and communicating the excellent value we deliver to patients, so in 2015 we appointed our first Chief Value Medical Officer, Catherine MacLean, MD, PhD. Dr. MacLean will coordinate efforts across service lines and departments to bring the greatest value to our patients and measure those improvements with data that can be communicated to consumers, employers and payers.

INVESTING IN OUR CULTURE OF INNOVATION

For more than 100 years, HSS has been driven by our culture of innovation. In treating the most complex cases, our physicians are continuously innovating musculoskeletal medicine. They not only strive to care for patients better than anyone else, they want to advance the field in the most cutting-edge way. Our scientific endeavors and clinical care are aligned and targeted at transforming musculoskeletal care. This is reflected in the size of our research division, which has a staff of more than 200 and over \$40 million dedicated to musculoskeletal research in 2016.

The HSS Innovation Center, which was launched in 2014, is expanding its pipeline of ideas and collaborating with internal and external stakeholders to accelerate commercialization pathways. A critical part of the HSS Innovation Center mission importantly includes partnering with early stage companies to co-develop, test and refine care delivery and digital health solutions that create scalable value for the global health community. In 2015, we formed new relationships with several biotech and software solutions companies as well as start-ups. To continue to accelerate the process of advancing our research from bench to bedside, our Innovation Center began hosting roundtable brainstorming sessions on specific topics, such as 3-D printing. The technology is integral to another Innovation Center project, the total elbow replacement system, which has a modular design and gives surgeons intra-operative flexibility. A full-day event focused on 3-D printing resulted in several new implant projects. (For more information, see "Designing more durable joint implants" on page 6.)

Our Spine Service is positioned to reach a new level of excellence and comprehensiveness under the leadership of Dr. Frank Schwab, who became our Spine Service Chief in August 2015. His extensive research has resulted in more than 180 published articles, six major awards and honors from organizations such as the NIH and NATO, and eight grants.

Our faculty members have had a productive year, publishing 593 articles in 2015. We received an additional \$10.9 million in new federal funding. More than half of our external funding comes from the National Institutes of Health and other federal agencies, which attests to the high quality of HSS's research. Two of our leading scientists, Dr. Ivashkiv and Carl Blobel, MD, PhD, were elected to the prestigious Association of American Physicians.

IMPLEMENTING OUR INNOVATIVE EXPANSION PLANS

HSS is committed to meeting the growing demand for our services and increasing our influence around the world. In 2015, we introduced a new way to make HSS's expertise accessible to patients: eConsult. This service enables patients to obtain a second opinion from an HSS physician without traveling to New York. Among patients who come to HSS looking for a second opinion, 38 percent receive a recommendation for a different course of treatment, according to our most recent study.

To bring our care closer to more people, we are opening new care centers and expanding existing ones. In January 2016, we signed a lease to establish what will be our largest outpatient center, a 50,000-square-foot facility in White Plains, NY. Construction is set to begin in September, and the center is expected to open in the fourth quarter of 2017. We also partnered with Stamford Health System to open HSS Sports Rehab Provided By Stamford Health next to the HSS Outpatient Center at Chelsea Piers in Stamford, Connecticut in March 2016. (For more information, see "Bringing rehab to patients where they need it most" on page 23.)

In New York City, we are transforming buildings to increase the concentration of high-value activities, such as surgery, at the Hospital. The Caspary building will be turned into a new ambulatory care building for adult reconstruction and joint replacement, spine and sports medicine. At the Hospital, we are extending the third and fourth floors over 70th Street and adding two additional inpatient ORs in 2017 to accommodate patient demand. We also recently relocated our basic and

translational research laboratories to a 37,000-square-foot, state-of-the-art facility.

In 2015, we continued to extend our local and global influence through several new sports partnerships. In the Dominican Republic, Escogido Baseball Club, one of six professional baseball teams in the country—which won the Dominican World Series in January—recently named us their official hospital and medical consultants, becoming the first international sports team to do so. We also became the official hospital of the St. Lucie Mets, the High-A affiliate of the New York Mets.

HSS has several international collaborations in place at hospitals in South Korea and Brazil. We have strengthened these relationships, which are based on sharing knowledge of the best practices in musculoskeletal medicine. We launched the HSS Global Orthopedic Alliance to align top orthopedic care providers around the world. The goal is to improve patient outcomes, increase access to quality care, and advance education, training and research. Three facilities of the Bumin Hospital Group of South Korea, with whom we have a formal consulting relationship, are inaugural members of the Alliance. We will be adding our partner in São Paulo, Brazil to the Alliance network.

In 2015, we formed a new partnership—the first one in China. We signed a medical service collaboration contract with The Second Affiliated Hospital, Zhejiang University School of Medicine (SAHZU). HSS and SAHZU will initiate a second opinion program for orthopedics cases through OptOnc. We will conduct routine case studies and visit each other's facilities. (For more information, see "Where the world comes to get back in the game" on pages 24 and 25.)

SHARING OUR KNOWLEDGE AND CULTURE OF INNOVATION

Our drive to advance our culture of innovation makes it easy to attract top talent to HSS. Our orthopedic residency program is one of the most sought after in the country. It has been ranked #1 for two years in a row by Doximity, the professional healthcare network, and *U.S. News & World Report*. Our Hand Therapy Fellowship and Sports Physical Therapy Residency

recently received a 10-year reaccreditation from the American Physical Therapy Association after a rigorous review, making our program one of the select few in the country offering advanced training in this specialty.

Our digital learning platform, HSS eAcademy, is in a class by itself, with more than 500 eLearning modules for physicians in every musculoskeletal specialty. In 2015, we added more than 200 new learning modules in a variety of formats, including live-streaming webinars, surgical videos and peer-to-peer interviews. Our member base—which consists of physicians, surgeons and health professionals from 118 countries—rose to 9,000, a 55 percent increase. Going forward, the newly formed Education and Academic Affairs Council will provide leadership, expertise and advisement on our education mission.

THE FUTURE OF INNOVATIVE CARE

Despite the turmoil in the healthcare industry, 2015 was a year of growth for us. Our financial performance was strong, with a \$85 million gain from Hospital operations and an overall gain of \$90 million including affiliates, representing margins of 8.3 percent and 8.2 percent, respectively. These results were driven in part by a 5 percent growth in surgical volume—and by prudent and strategic management of expenses.

The generosity and dedication of our loyal philanthropic community made it another outstanding year for fundraising, with nearly \$48 million raised in 2015. A \$6 million leadership gift from Chase and Stephanie Coleman will advance MRI research under the direction of Hollis Potter, MD. A \$5 million gift from Jamie Dinan and Elizabeth Miller includes a \$2.76 million grant to establish the HSS Sports Injury Prevention Program to help keep children and teens safe while playing sports.

Our Hospital's continued growth demonstrates the soundness of our strategic plan and the competitive advantage that is ours, thanks to the exceptional skills and dedication of everyone in the HSS family. HSS will continue to grow and build our future value by being even more focused, dedicated and driven to maintain our status as the leader in musculoskeletal medicine. We will continue to earn advantage and scale by being the best in the world at what we do.

Kendrick R. Wilson III,
Chair



Louis A. Shapiro,
President and CEO



Todd J. Albert, MD,
Surgeon-in-Chief
and Medical Editor



Mary K. Crow, MD,
Physician-in-Chief



Lionel B. Ivashkiv, MD,
Chief Scientific Officer



Financial Information⁽¹⁾⁽²⁾

Hospital for Special Surgery and Affiliated Companies

Statement of Income^{(3) (4)}

(In Thousands)

Year Ended	2015	2014
Hospital for Special Surgery		
Total Revenue ^{(5) (6)}	\$ 1,028,822	\$ 971,889
Total Expenses ⁽⁷⁾	943,579	887,343
Operating Income from Hospital for Special Surgery	\$ 85,243	\$ 84,546
Affiliated Companies		
Total Revenue ⁽⁷⁾	\$ 68,152	\$ 70,743
Total Expenses ⁽⁵⁾	63,541	64,533
Operating Income from Affiliated Companies	\$ 4,611	\$ 6,210
Operating Income for Hospital for Special Surgery and Affiliated Companies	\$ 89,854	\$ 90,756

Statement of Financial Position

(In Thousands)

December 31,	2015	2014
Assets		
Current Assets (Excluding Investments)	\$ 271,099	\$ 244,698
Investments ⁽⁸⁾		
Current	558,437	508,662
Long Term	117,128	109,837
Assets Limited as to Use	87,466	123,313
Property, Plant and Equipment — Net	568,249	482,276
Other Non-Current Assets	102,188	94,046
Total Assets	\$ 1,704,567	\$ 1,562,832
Liabilities and Net Assets		
Current Liabilities	\$ 326,903	\$ 302,500
Long Term Debt	301,553	307,916
Other Non-Current Liabilities	220,594	203,054
Total Liabilities	849,050	813,470
Net Assets	855,517	749,362
Total Liabilities and Net Assets	\$ 1,704,567	\$ 1,562,832

(1) Includes activities relating to Hospital for Special Surgery and its affiliates (Hospital for Special Surgery Fund, Inc., HSS Properties Corporation, HSS Horizons, Inc., HSS Ventures, Inc. and Medical Indemnity Assurance Company, Ltd.).

(2) Complete Audited Financial Statements for both Hospital for Special Surgery and affiliates are available upon request from the HSS Development department at 212.606.1196.

(3) Excludes \$33.3 million and \$38.8 million of restricted philanthropic contributions in 2015 and 2014, respectively.

(4) Excludes non-operating portion of changes in unrealized gains and losses on investments.

(5) Includes \$1.3 million of transactions between affiliates that are eliminated in consolidation in 2015 and 2014.

(6) Includes distributions of \$6.7 million and \$33.4 million the Hospital received as a bequest from a Trust in 2015 and 2014, respectively.

(7) Includes \$58.2 million and \$54.5 million of transactions between affiliates that are eliminated in consolidation in 2015 and 2014, respectively.

(8) Hospital for Special Surgery is the beneficiary in perpetuity of income from an outside trust. The fair value of investments in the trust are not included above and were \$34.7 million and \$37.9 million at December 31, 2015 and 2014, respectively.

Philanthropic Highlights

2015: Nearly \$48 million raised to help advance patient care

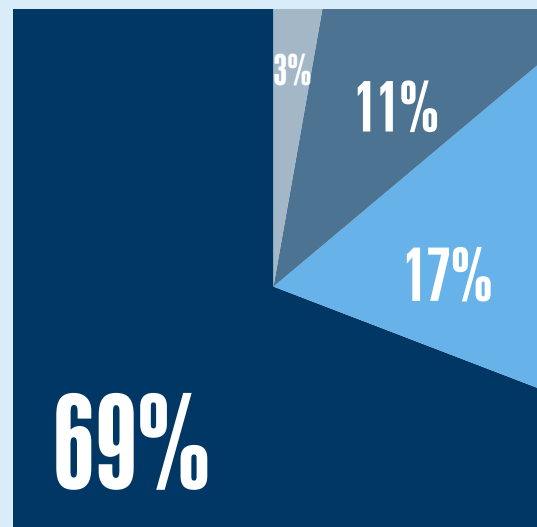
Hospital for Special Surgery is deeply grateful for the extraordinary generosity of thousands of individuals, foundations and corporations who helped make 2015 an outstanding year. We raised nearly \$48 million, thanks to the exceptional support of friends and grateful patients dedicated to advancing the Hospital's mission to improve mobility and quality of life for all patients with musculoskeletal disease — globally and locally. HSS takes great pride in knowing that our benefactors are committed to helping us remain at the forefront of life-changing care and groundbreaking discoveries.

TOTAL PHILANTHROPIC GIVING

In 2015, more than 6,200 donors contributed nearly \$48 million to the Hospital. Grateful patients—who give individually or through their family foundations or bequests—continue to provide the greatest share of philanthropic support. They accounted for 86 percent of the funds contributed in 2015.

During this successful year, we received 11 gifts of \$1 million or more from donors with a long tradition of supporting the Hospital, as well as those making their first gift. The Hospital received three gifts of \$5 million or more: \$6 million from Chase and Stephanie Coleman to advance MRI research under the direction of Hollis Potter, MD; \$5 million from James G. Dinan and Elizabeth Miller through The Dinan Family Foundation to fund the HSS Sports Injury Prevention Program and the capital expansion of the Hospital; and \$6.7 million from the estate of Leonard and Caryl Marmor, bringing their total gift to over \$40 million—the largest in HSS history.

HSS 2015 GIVING BY SOURCE



- Individuals & Family Foundations
- Bequests
- Foundations & Organizations
- Corporations

YOUR LIFE, OUR MISSION CAMPAIGN: OUR COMMITMENT TO IMPROVING PATIENTS' LIVES

The Hospital's *Your Life, Our Mission* Campaign is raising important funds to expand and enhance our clinical facilities to meet growing demand; advance research for new treatments; and build endowment for the future. Under the leadership of Campaign Co-Chairs Michael P. Esposito and Jonathan Sobel, HSS has raised more than \$275 million toward its \$300 million goal. We would like to extend our profound thanks to the thousands of generous supporters who share our vision for the future of the Hospital.

HSS ANNUAL BENEFIT CELEBRATIONS

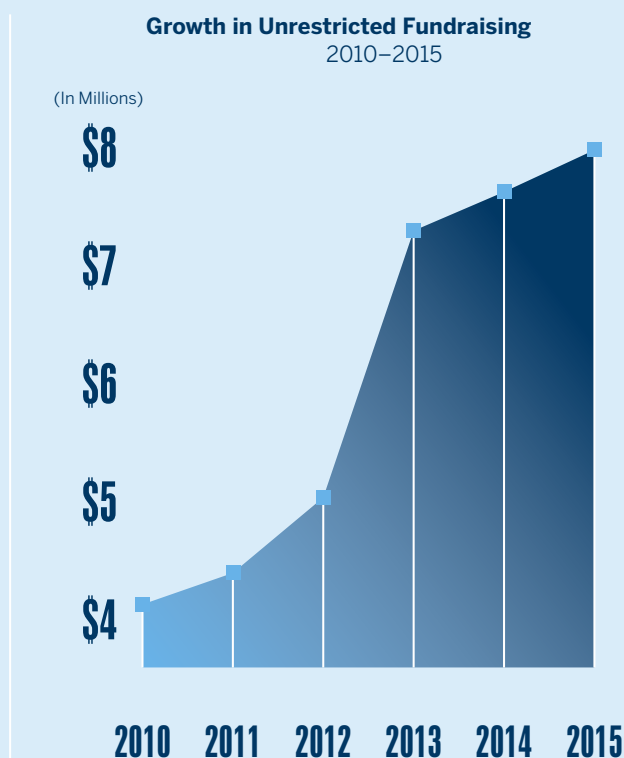
In 2015, the Hospital's 32nd Annual Tribute Dinner raised more than \$4.4 million, a record-breaking achievement. The event honored Brian L. Roberts, Chairman and CEO of Comcast Corporation, and David L. Helfet, MD, Director of the Orthopedic Trauma Service at HSS, who received the Lifetime Achievement Award in recognition of his dedication to providing life-saving care to countless patients over the past 30 years. Traditionally the largest source of unrestricted support for the Hospital, the Annual Tribute Dinner raises vital funds that enable HSS to continue to uphold its promise to provide an unparalleled level of expert and compassionate care to all patients. Chaired by Trustees Kathy Leventhal, Patricia G. Warner and Ellen Wright, the Tribute Dinner was enjoyed by nearly 1,500 special friends of HSS.

Thanks to the dedicated efforts of Chairperson Barbara Albert and Co-Chairs Anne Altchek, Carol Lyden and Ann Roberts, the HSS Autumn Benefit raised more than \$1 million—a new record—in support of medical education to advance the Hospital's commitment to training the next generation of leaders in musculoskeletal medicine. Honoring "Excellence in Education," HSS paid tribute to three physicians chosen by the graduating residents for their commitment to mentoring and training future practitioners and leaders: Scott Rodeo, MD, received the Philip D. Wilson, Jr., MD, Teaching Award; John Lyden, MD, received the Nancy Kane Bischoff Mentor Award; and Lawrence Gulotta, MD, received The Richard S. Laskin, MD, Young Attending Award.

The ninth annual Big Apple Circus Benefit raised nearly \$815,000 for pediatric care and research at HSS, making the 2015 Benefit the most successful in its history. Co-Chairs Monica A. Keany, Trustee; Kate Doerge, Advisor; and David M. Sher, MD, brought together nearly 800 guests for the sold-out Benefit. Funds raised help to advance the Hospital's mission to provide the safest and highest caliber of care to the children we serve.

ANNUAL FUND

The Annual Fund is an essential source of strength for HSS, providing unrestricted support that enables the Hospital to advance its mission of clinical care, research, education and community outreach. In 2015, HSS raised more than \$8 million in general unrestricted funds, double the amount raised in 2010. HSS received unrestricted gifts from trustees, advisors and grateful patients; legacy gifts from Wilson Society members; and a record-breaking Annual Tribute Dinner. This recurring and growing source of support represents a high level of loyalty and gratitude from thousands of donors. It is critical to solidifying the Hospital's position as the world's leading center of excellence in musculoskeletal health.



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Hospital for Special Surgery is proud to recognize our Councils — volunteer leadership groups dedicated to advancing the clinical care, research, education and community outreach mission of the Hospital.

Pediatric Council

The Pediatric Council is dedicated to furthering the mission and goals of the Lerner Children's Pavilion, the "hospital-within-a-hospital" that is renowned for delivering world-class pediatric care. HSS is recognized as one of the few institutions in the world with the skill, years of experience and resources to care for some of the most complex disorders that affect children. The Council aims to increase awareness of the Hospital's expertise in pediatric musculoskeletal medicine and raises critical financial support for patient care and cutting-edge research.

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The Rheumatology Council is dedicated to advancing the mission of the Hospital's Division of Rheumatology. The largest of its kind in the nation, the Division is widely recognized for the excellence of its clinical, scientific and educational activities related to rheumatic, autoimmune and inflammatory illnesses. The Council focuses on fundraising for and raising awareness of the work being conducted by the Division of Rheumatology, as well as educating the public about rheumatic disease.

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The Research Council is dedicated to advancing the research mission of the Hospital. The Council raises awareness of and support for the world-class basic and translational research conducted by the Research Division. With more than 200 dedicated personnel, the Division is identifying the mechanisms underlying musculoskeletal and autoimmune conditions and developing effective approaches for the prevention, diagnosis and treatment of these diseases for the benefit of patients at HSS and around the world.

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In 1998, HSS established the Wilson Society to recognize donors during their lifetimes for including the Hospital in their estate plans. Named in honor of Philip D. Wilson, Jr., MD, and his late father, both of whom served as Surgeon-in-Chief at the Hospital, the Society is helping HSS create a better future for those affected by musculoskeletal disease.

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The Wilson Society Advisory Council comprises a premier group of estate and financial planning specialists who advise HSS on matters related to their area of expertise. As ambassadors for the Hospital, Council members raise awareness of our mission and inspire private philanthropy that strengthens our commitment to providing the highest level of patient care today and for many years to come.

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ALPINE GUIDE FINDS MORE THAN HIS MOBILITY AT HSS

Seven months after his simultaneous bilateral knee replacement at HSS, seasonal mountain guide Fred Jacobson was leading hikers across the Alps. “When I came to HSS, I could barely cross the street. I was probably a couple of years from a wheelchair,” recalls Fred. “My guests were amazed that seven months later I was walking in the mountains. I’m still amazed.”

“Everyone I knew said HSS was the only place to go,” says Fred. He was referred to Russell E. Windsor, MD, who performed the surgery in November 2004. “My active life was over until the surgery. Now, I’m climbing and guiding people,” he says. “And I’m skiing, no worse or better than before, just a little more carefully!”

In addition to returning to his active passions in the Alps, Fred, a New Yorker, started volunteering at HSS each week. “People want to hear from someone who has really been through it and shared their anxieties,” he explains. “It seemed like something that could be very helpful here, and I want people to love this Hospital as much as I do.”

Fred not only gives back to HSS as a volunteer, but also with philanthropic support. “I’m eternally grateful to the Hospital,” he says. “This was a watershed in my life, and I almost immediately wanted to do something more than my annual gifts.”

To Fred, ‘something more’ meant including a bequest to the Hospital in his will and joining the Wilson Society. “One of my great pleasures is supporting places that I want to be around for a long time.”

As a patient and a volunteer, Fred knows the importance of preserving the high level of care our physicians, nurses and technicians provide. “The world needs leadership, particularly in healthcare,” he says. “Things happen here that you



The Alps are a way of life for **Fred Jacobson**, who had knee replacement surgery at HSS.

don’t see elsewhere.” When he visits a patient who has been referred for a complex case or learns about an advancement in research, Fred shares in the pride of being part of an organization that is recognized as being the best at what it does.

Fred knows that he gives his knees a lot of use leading tours of the Alps and cross-country skiing. “When, eventually, I can no longer hike and climb and ski, HSS will be a major emotional center for me.”

“Before the surgery, I’d hoped to still be hiking at 70,” says Fred. “Next birthday I’ll be 78, and I’m hoping now for 80. When I get there, I’ll probably extend my hope.”

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Virginia B. Toulmin Foundation
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Mr. W. Hall Wendel, Jr.
Joel Wilkenfeld
Hansjoerg Wyss
Anonymous (5)

\$25,000–\$99,999

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Jurate Kazickas
AMC Networks
Ameriprise Financial, Inc.
Bartlett, McDonough &
Monaghan, LLP
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Foundation, Inc.
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The Gilbert & Ildiko Butler
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Marilyn and Robert Callander
Charina Foundation, Inc.
Rona and Jeffrey Citrin
Comcast Corporation
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Mary Ann Deignan
Dr. Joshua S. Dines
Kate and Chad Doerge
Suzy Donohue
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The Fanwood Foundation
Renee and Sy Flug
Neal and Sarah Garonzik
Glenwood Management Group
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Greater New York Hospital
Association
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The Marc Haas Foundation
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IAC
Jeffrey and Mary Jay
Johnson & Johnson
Peter and Mary Kalikow
Allison and Warren Kanders
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Sandra L. Kozlowski and
Eduard Reiter
Richard A. Kresch
Mr. and Mrs. Ronald S. Lauder
Jacob R. Leaman
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Christina and Alan MacDonald
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 Tishman Speyer Properties, LP
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 Elizabeth Trump Grau
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 Drs. Victor M. Zayas and
 Kelly Downey
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\$10,000–\$24,999

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 BlackRock, Inc.
 Bloomingdale's
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 Citi
 CKEW Foundation
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 Derek McNulty
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 Andrew and Abby Crisses
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 Joyce and Paul Emposimato
 Mica Ertegun
 Excel Sports Management
 Stuart and Maria Feldman
 Charles and Anne Forber
 Mrs. Michel Fribourg
 Fried, Frank, Harris,
 Shriver & Jacobson
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 Arthur and Barbara
 Goldstein-Amster
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 David and Martha Hamamoto
 Kenneth V. Handal and Mary
 Francina Golden
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 Heartfelt Wings Foundation
 Dr. and Mrs. David L. Helfet

Kilian and Elizabeth Hennessy
 Marieluise Hessel and Ed Artzt
 Mr. and Mrs. Dieter Holterbosch
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 Drs. Karen Lin and Edwin P. Su
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 Center, PLLC
 Salvatore and Mary Louise Ranieri
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Adam Bartos
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Aliza and David Licht
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Daniella Lipper
Stacey and Philip Malakoff

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Betty G. Young
Francis G. Ziegler
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Anonymous (2)

\$1,000–\$4,999

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Jaimo Ahn
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AKF Group
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 Lira Lee
 Steve K. Lee, MD
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 Dorothy Lemelson
 Warren Lesser
 Tommi Levi
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 Ross and Stacey Levin
 Mrs. Wilbur A. Levin
 Dr. and Mrs. David B. Levine
 Dr. and Mrs. David S. Levine
 Daniel Levy
 Kenneth and Gloria Levy
 William J. Levy
 Christopher T. and Robin E. Linen
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 Hilary J. Lipsitz
 Judith Little
 Arthur L. Loeb
 Mr. and Mrs. Walter F. Loeb
 Diana Lopo
 Diane and Robert Lorelli
 Dr. and Mrs. Dean G. Lorich
 The Dorothy Loudon Foundation
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 Charles Luchs
 James Luikart
 Caroline Lussi
 Matthew J. Lustig
 Dr. and Mrs. Gregory E. Lutz
 Susan Lyall
 Alexander and Sally Lynch
 Jennifer B. Lynn and
 Joel B. Buchman
 Donna MacCrae
 Neil G. MacFarquhar
 Dr. and Mrs. John D. MacGillivray
 Neil MacIntyre
 Francis and Greta Magee
 Drs. Steven K. and
 Margaret L. S. Magid
 Francois Maissonrouge
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 Kerri Alison Mandelbaum
 Camille Manning and
 Jean Luc Journet
 David Marcus
 Margolin, Winer & Evens LLP
 Ronen Marmur
 Natalie Marshall
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