

ORTHOPAEDIC CONNECTIONS



The newsletter of the Carl J. Shapiro Department of Orthopaedics at Beth Israel Deaconess Medical Center

Robot technology guides complex spinal surgeries

The latest addition to the staff at the Spine Center at BIDMC can't talk or walk, but has the ability to improve the accuracy of a complex spine surgery procedure while making it safer for patients.

It's a specialized robotic guidance system that helps surgeons to precisely map a patient's spine before surgery and steer their placement of instruments, screws and rods while in the operating room. Since BIDMC acquired the robot from Medtronic in early 2019, Umesh Metkar, MD, has used it to perform spinal fusions on almost 30 individuals.

Spinal fusion is a technique in which two or more vertebrae in the spinal column are fused together to stop the motion between them and lessen pain. The procedure involves removing diseased parts of the vertebra to free up the neural structures, and then reinforcing the spinal column with either bone from a donor or bone taken from the patient's pelvis. Placing two screws in each of the affected vertebra and a rod to connect the screws prevents movement, providing support and strength and allowing the bone graft to heal. Spinal fusion is used to treat people with conditions such as abnormal curvature of the spine (scoliosis or kyphosis), spinal injury, spinal instability caused by degenerative changes, or weak or unstable spine due to infections or tumors.

Metkar primarily employs the robot for surgeries for which its capabilities best complement those of a skilled surgeon. "All spine surgeons must train extensively to be able to perform fusions using freehand screw placement technique," he said. "But there

are cases where the anatomy is altered because of scoliosis or previous surgery, such as a fusion that resulted in all the vertebrae being covered by fused bone. That's where the accuracy of the

robot really helps us obtain a great outcome."

That accuracy shortens what would otherwise be a lengthy procedure, and less time in surgery translates into reduced anesthesia risk. "Scoliosis patients need long fusions from the upper thoracic spine to the pelvis, requiring about 16 to 18 screws on each side of the spine. The robot speeds up that process, taking about an hour instead of the two to three hours needed for freehand screw placement," said Metkar.



BIDMC spine surgeons Efstathios Papavassiliou, MD, and Umesh Metkar, MD, review 3D images of a patient's spine on the robotic guidance system workstation.

Planning, surgery guidance

The Spine Center robotic guidance system is made up of software used to plan the surgery beforehand, and an operating room workstation containing a robotic arm, an integrated 3D camera and a monitor control station for the surgeon.

Before surgery, sophisticated software allows a surgeon to upload and view CT scans of the patient's spine in three dimensions to plan exactly where and at what angle the screws will be placed. This surgical blueprint guides the robot during surgery. "With the planning, the entry points for screw placement are more accurate," said Metkar. "If you don't have the proper trajectory, the screw could go into the spinal canal or outside the pedicle where it needs to go in order to stabilize the spine." Pedicles

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Orthopaedic Connections is published by the Carl J. Shapiro Department of Orthopaedics at Beth Israel Deaconess Medical Center for primary care providers, patients, faculty, trainees, staff, alumni, affiliates and friends.

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Letter from the Chair

We are living in a time rich in uncertainties: from a deadly pandemic to social equity awakenings to major environmental shifts. Our patients have had to defer elective operative procedures and we have had to learn how to “see” patients remotely. Consults, elective procedures and surgical follow-up visits were at a standstill until the people of Massachusetts got through the peak of COVID-19, and we began to see a fall in the numbers of patients in ICUs—many makeshift—and slowly get back to normal volumes. As part of Beth Israel Lahey Health, BIDMC developed a Safe Care plan combining new processes, standards and technologies to ensure patient safety. Our measures meet or exceed Centers for Disease Control and Prevention and Massachusetts Department of Public Health guidelines. We hope they will reassure patients that their safety is our utmost priority as they consider their options for orthopaedic care.



One of our features in this issue focuses on telehealth, which became pivotal for serving our patients at the peak of illness this spring, and continues to be as we return to in-person evaluations as well as elective therapies and operations.

The cover story explores a different kind of frontier in medicine: robotics. Our Spine Center obtained a robotic device for a specific type of spine surgery at the close of 2019. The device combines 3D planning software with an electronic arm that enables BIDMC surgeons to map surgery that requires inserting screws into the spine to stabilize it—a technique often used to help individuals with scoliosis—with reliable precision. What’s more, the cutting-edge technology reduces time in the OR and the need for anesthetics for better patient outcomes.

We welcomed a new physician earlier this year whose background is as a physiatrist—a physician who provides non-operative orthopaedic treatments. Dr. James Sarni brings years of spinal and musculoskeletal experience that complements our highly skilled surgical teams at the BIDMC Needham and Milton campuses. Ironically, he started out his career at Beth Israel Hospital right after completing his sports medicine fellowship three decades ago.

In this issue you can also learn about some important research taking place at the Center for Advanced Orthopaedic Studies at BIDMC under a grant from the National Institutes of Health. Science researcher Fjólá Jóhannesdóttir, PhD, recently received funding for two years to further knowledge about a common occurrence in older people: hip fracture. She will explore a biomechanical approach to predict who is at risk for falling and breaking a hip and compare it to current methods of predicting hip fracture.

And now the bittersweet moment when I recognize that this will be my final “Chair’s message.” I am delighted to welcome Edward Kenneth Rodriguez (aka, “K-Rod”) as my successor as Chair of the Orthopaedic Department at BIDMC and Orthopaedist-in-Chief at the medical center. His appointment is the product of a national search that identified outstanding candidates, and I am delighted with the committee’s choice. He will bring the department to the next higher level, and I look forward to observing from afar the great new ventures he will institute.

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CONTACT US

PHONE

Call: 617-667-3940 Monday – Friday, 8:30 a.m. – 4:30 p.m.

After Hours/Weekends: Leave a detailed message that includes patient’s name and phone number and a brief description of the patient’s condition.

ONLINE

Visit: bidmc.org/orthopaedics

Click “Make an Appointment” in the menu on the left.

EMAIL

Referring physicians: Messages with patient’s name, birth date or BIDMC medical record number, telephone number and presenting problem will generate a timely patient appointment.

Foot & Ankle: orthofoot&ankle@bidmc.harvard.edu

Oncology: orthooncology@bidmc.harvard.edu

General: orthogeneral@bidmc.harvard.edu

Spine: spinecenter@bidmc.harvard.edu

Hand: orthohand@bidmc.harvard.edu

Sports: orthosports@bidmc.harvard.edu

Joints: orthojoints@bidmc.harvard.edu

Trauma: orthotrauma@bidmc.harvard.edu

Orthopaedic Department welcomes physical medicine and rehabilitation specialist

James Sarni, MD, a physical medicine and rehabilitation specialist, joined the Department of Orthopaedics at BIDMC earlier this year. With roots in Melrose, Massachusetts, he completed medical training in New York City and has centered his clinical and teaching career in the Boston area for over 30 years.



James Sarni, MD

Sarni chose medicine as a vocation during his college years.

“I enjoyed the sciences and the challenge of solving problems for which there was an absolute answer, where things were not relative. Eventually the answers declare themselves, but as you are going through the process you don’t always know what those are,” he explained. Sarni decided to specialize in physical medicine and rehabilitation, spurred by his interest in the mechanics of the musculoskeletal system and a desire to help patients improve their level of function.

Sarni’s professional path has evolved along with his chosen specialty, which is also referred to as rehabilitation medicine or physiatry, into non-operative orthopaedics. “Years ago, rehabilitation medicine specialists were doctors caring for patients in the hospital with stable, chronic illnesses—such as a stroke or limb amputation—who needed rehabilitation to maximize function,” he said. “People who have a chronic illness like stroke not only present with weakness but also shoulder pain and hip pain. As a result, a wing of physical medicine and rehabilitation that employed non-operative orthopaedic approaches grew.”

Education and Training

Fellowship: Sports Medicine

Hospital for Joint Diseases, New York, NY

Residency: Physical Medicine & Rehabilitation

Einstein/Montefiore Medical Center, Bronx, NY

Internship: General Surgery

Mt. Sinai Medical Center, New York, NY

Medical School

Mt. Sinai School of Medicine, New York, NY

Sarni wasn’t just a bystander in the evolution of nonsurgical orthopaedics, he helped to define it. After completing his residency in sports medicine in 1990, he convinced two orthopaedic surgeons at the Hospital for Joint Disease in New York City to let him see patients alongside them. “In order to understand musculoskeletal pathology as well as an orthopaedic surgeon, I knew I needed to work with them,” he explained. The two mentors acknowledged that as surgeons their main focus was on the surgical care, yet there was plenty of work that could be done for patients who have non-operative conditions.

In joining Harvard Medical Faculty Physicians, Sarni’s professional journey has come full circle. His first post-residency position was in the orthopedics department of our own Beth Israel Hospital, the predecessor to BIDMC, followed by a decade at Tufts New England Medicine and 16 years at Massachusetts General Hospital. While at Tufts, he also acted as the physician for sports teams at Curry College for five years. In all of these roles, Sarni was the only physiatrist, the first physiatrist, or both.

Sarni’s long and close relationships with both surgeons and physical therapists is a combination of experiences that may

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→ LETTER FROM THE CHAIR *from page 2*

When I look back at the decision I made 17 years ago to take on the role of Chair of a department that barely existed, in a hospital that was beginning to arise from a “near-death” experience, and not knowing whether I had what it might take to re-establish an academic orthopaedic department, I can now say it was the best decision I ever made. Being Chair and helping to recruit and lead such outstanding academic orthopaedic surgeons was (and is) the most rewarding aspect of my medical career. Although it was hard work, the support I received from the hospital leadership and the faculty we all recruited made the job seem almost too easy—at times.

I made the wise choice of asking Stacy Lewis to join me and all of the work that has been done in the past 17 years was done exceedingly well by her, aided initially by our CAO at the time, Deb Vona, and now under the wise counsel of Geoffrey Patton. I learned a valuable lesson: when you recruit the right people and open a door or two for them, and then step out of the way and let them grow and prosper, they do wonderful things! Everyone thinks the Chair did something great, but the dirty little secret is

the Chair did very little; the faculty took the ball and ran with it, and we all looked good.

I would also like to acknowledge my fellow Chairs, who devote their lives to excellence in academic medical care, research and teaching. I often tell them they are the most interesting and intellectually stimulating group of people I ever had the privilege of being with, and I will miss that collaboration as much as I will miss my faculty and staff.

We now have one of the most respected departments in the hospital, if not the city (or world for that matter), and it has been a delight to lead it. We provide excellent patient care with passion and are exceedingly productive in the laboratory, clinical research and teaching. All of this with a faculty that was built on one word: collegiality.

I know that the Department will grow and prosper under Ken’s leadership, and I wish you all good health during this challenging time and the “new normal” times to follow.

Mark C. Gebhardt, MD

Chief, Carl J. Shapiro Department of Orthopaedics

Telehealth options broaden in age of COVID-19

When the spread of COVID-19 shut down face-to-face contact for all care but emergencies, healthcare professionals providing regular, insurance-covered care via video chat or telephone moved from the “yeah, we ought to try that someday” category to a critical healthcare access tool. The widespread adoption of telehealth was largely due to patients needing care they couldn’t otherwise get and clinicians of all stripes—doctors, nurse practitioners and physician assistants—eager to do everything they can to provide it, combined with government and commercial insurers making sure coverage is in place for their members.

During the height of the COVID-19 pandemic in Massachusetts this spring, BIDMC cancelled elective orthopaedic surgeries while orthopaedic specialists continued to see patients who had urgent needs such as trauma or infection. When health insurers began covering telehealth visits, it opened the door for virtual orthopaedic visits. Now, BIDMC orthopaedic specialists are happy to continue seeing their existing patients for follow-up care as well as new patients, even as the COVID restrictions on face-to-face visits have lifted.

Telehealth visits can be done via phone, but video chat is preferred, according to foot and ankle specialist Chris Miller, MD. “On a phone call, I can ask about how the patient is doing and maybe have them send photos or videos to me,” said Miller. “With video chat, the patient or a family member can be holding the camera and moving it to try to help me do a remote physical exam. I can look at a wound, I can see them walk. I can make an assessment of the problem much more accurately.”

Telehealth is an option for many routine orthopaedic issues and, in some cases, urgent ones. “If a person doesn’t require a visit to the emergency room or has an acute injury where they can’t safely be at home, there’s almost nothing we can’t at least do a screening for,” said Miller. “For many elective visits, such as a patient with an ankle sprain or bunion, we can absolutely get started on the proper treatment protocol with a virtual visit.” If an X-ray is needed, he would rather get a patient started on their care without one than have them avoid coming in at all; once the patient does get X-rayed, Miller gets back to them if the results change the diagnosis or treatment.

Fadi Badlissi, MD, a rheumatologist in the Orthopaedics Department who treats musculoskeletal as well as autoimmune disorders, sees patients virtually for exams and follow-ups. “I can view how a person moves and see if there are swollen joints during a telehealth visit,” he explained. Virtual visits are particularly well-suited for follow-up appointments, according to Badlissi. “For example, if I prescribe an immunosuppressant to a patient, we monitor their labs every three months to make sure they aren’t experiencing side effects. For these types of visits, there is almost nothing I can’t do for the patients on a video or

phone call that I would do in an in-person visit, and often the ongoing care is better because there are much fewer cancelled, missed or just not scheduled visits that truly catch and head off trouble,” he said.

New flow

Although telehealth visits are similar in many respects to an in-person visit, they require physicians to rethink the flow of care. As an example, a person experiencing ankle, shoulder or back pain contacts the department office and makes an appointment

to see a specialist. If it’s for an in-person visit, the specialist would likely ask the patient to come in a half hour before their appointment and get an X-ray or MRI onsite. If it’s for a telehealth visit, the clinician would order X-rays and ask the patient to go to a facility and have them taken sometime before the appointment.

One of the features of virtual visits is that diagnostic images can be shared easily with the patient. “I can bring up the patient’s MRI or X-ray onto the screen,”

said Miller. “While I talk with them, they’re looking right at it. In some ways, it’s better than in person because they’re really focused on the images.”

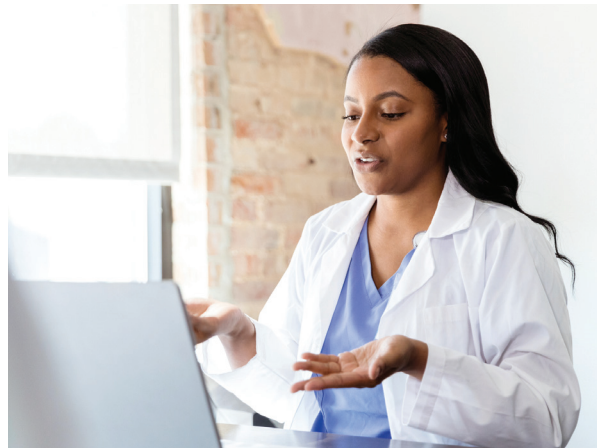
Another plus of virtual healthcare for patients is undoubtedly the ability to avoid the traffic in Boston. “Most of my patients—especially those who are busy working—like the convenience of telehealth,” said Badlissi. “They are happy to avoid the drive into Boston and then having the hassle and expense of parking here.” Of course, those who prefer to come into the office always have that choice, he added.

Miller is tapping into other virtual resources to help patients get what they need to recover from an injury or surgery while avoiding public spaces to avoid the risk of COVID-19 infection. He is able to provide links to resources that include medical devices patients can purchase on Amazon and condition-specific exercises they can do to rehab at home.

Beyond virtual visits

In addition to virtual visits with providers, telehealth encompasses use of technology to keep our overall population healthier and prevent or control chronic conditions. “There are some really exciting developments in orthopedics that can be powerful tools to improve people’s outcomes. One of these is remote monitoring,” said Miller.

Miller is considering one preventive device for his patients: electronic orthotics that measure pressure on the bottom of the feet, a potential source of wounds and ulcers for people with diabetes who lose feeling in their feet. “The orthotic pings the wearer’s phone to signal they’re getting too much pressure under their big toe—something a person with normal sensory reflexes would



readily notice—and prompts them to try specific actions to relieve it, like checking for a pebble in their shoe,” he said. “If these don’t work, the device pings me about the problem, conveys what the patient tried to alleviate it and then prompts me to call the patient.”

Many predict the greater accessibility of telehealth will continue to play a role in post-pandemic healthcare. Miller foresees a time in the next few years when patients will receive

exams, tests and treatments in person and telehealth visits for many follow-up appointments.

“The genie is out of the bottle,” he said. “Telehealth is here to stay. Patients are going to demand it, especially in places like Boston. We’re never going to get away from in-person visits, nor should we. And while we are still adhering to social distancing practices, it allows us to continue to provide high quality care.”

Orthopedic Telehealth Q&A

How do I schedule a telehealth visit? What if I need to see a clinician in person?

All of our orthopedic clinicians are scheduling telehealth and in-person visits. If you have already been seen by one of our orthopedic specialists, or you are a new patient who has a referral from your primary care physician, call 617-667-3940 to schedule an appointment. When scheduling the visit, the clinician will determine if a telehealth visit is appropriate. If you have a previously scheduled appointment, someone from scheduling will contact you to let you know if a virtual visit is an option for you.

As always, if you are experiencing an emergency, please dial 911. BIDMC’s emergency departments are open for in-person visits and we are taking every precaution to keep our patients, staff and community safe.

What kind of device do I need for a telehealth visit?

For a video chat, you will need a device with a screen, camera and microphone/speaker. A smartphone, tablet or laptop work best, since you can move them around as needed during the visit. For an audio visit, you can use any type of telephone.

How do I prepare for my virtual visit?

There are a few simple ways you can prepare to help make the visit go smoothly:

- Write down your questions so they are right in front of you.
- Find a quiet place where you can talk with your physician and won’t be distracted.
- Clear some space on the floor so you can walk around for an evaluation, if needed.
- Charge your computer, tablet or phone, or plug it in.
- Test your technology to make sure it is working, including the microphone and speaker.
- Set up your camera. You should be able to sit comfortably, see the doctor and move around—for example, step back and move your arms and legs—while staying in the frame. You may want to ask a friend or family member to be a camera person or use a stand for your device.
- Dial in to your appointment a few minutes before it is set to begin.
- Have a pen and paper ready to take notes.

Do I need a certain app for my device?

No. You will receive a link to an app when your appointment is confirmed. You can download the app beforehand, or you can just click a link to an online version when you check into your appointment. The orthopedics

team uses StarLeaf, a HIPAA-compliant system that protects your health information. We don’t use platforms like Zoom or FaceTime because they don’t protect your privacy. At this writing, Beth Israel Lahey Health is in the process of selecting a telehealth platform for its entire health system.

Will I get a reminder about my appointment?

In your invitation for the appointment, there will be an option to save it to your own calendar.

Will the cost for a virtual visit be different than an office visit?

During the current emergency, Medicare, Medicaid, and all private and public health insurers in Massachusetts cover telehealth visits for non-COVID 19 care. You will be responsible for the same payments—such as copayments or coinsurance—you would be if you received services in person. If you have any questions, contact your insurer.

Will the quality of my visit be the same with telehealth vs in person?

Any first visit and follow-up care appointment will be the same high quality you receive in person because what you are accessing and receiving in both situations is the most important part of any healthcare encounter: the expertise of your highly trained and experienced clinicians. If your specialist feels an in-person visit is needed to make an accurate assessment of your problem, or if you need a joint injection or other procedure, they will let you know so you can make an appointment at a convenient time for an in-person visit.

What if I need imaging or laboratory tests?

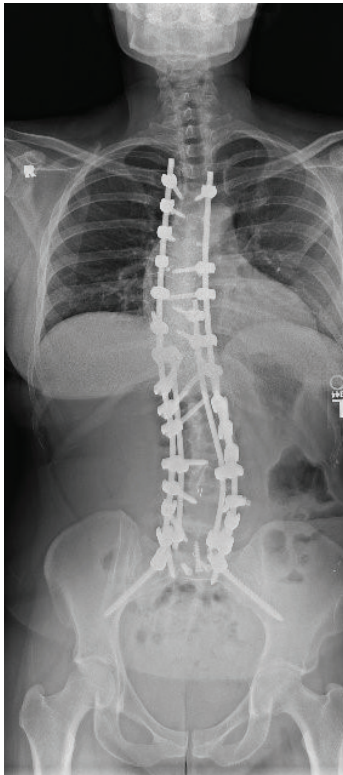
Your specialist will order any tests you need to take. BIDMC has several convenient locations for imaging and lab tests to choose from, including Chestnut Hill and Needham.

What about prescriptions?

If your pharmacy accepts remote electronic prescribing—and almost all do—your specialist can send the prescription directly to them. This includes pain medications, if needed, for post-op patients.

Will my PCP know about my virtual visit?

Yes, your specialist will create and send clinical notes on your virtual visit, just as they would for an in-person visit, so your primary care doctor will be notified that you had a virtual visit and have access to all of the notes and findings from it.



X-ray shows screws and rods inserted into scoliosis patient using BIDMC's robot guidance system for planning and placement.

are the cylinder-shaped projections of hard bone that protect both sides of each vertebra.

At the start of robot-assisted surgery, the robot guides the surgeon in placing a biocompatible metal pin in the patient's pelvis; this pin is what attaches the robot to the patient and provides a reference point for the surgical arm of the robot. Then the robot's 3D camera moves over the patient to map the surface of the patient and the surrounding area to produce an image of the surgical field.

Next, images of the patient's spine are taken with a portable X-ray machine, known as a C-arm. "The platform's software matches the X-rays to the preoperative CT scans. That confirms that what you see in the X-ray is what is on the CT scan and

exactly where the arm should go for the screw placement," said Metkar. In the event they don't match up, a rare occurrence according to the surgeon, another set of X-rays is taken. Once they line up, the robotic arm with a guide for the screw moves into position so the surgeon can drill with precision. This process is repeated until all the screws have been inserted.

In addition to the pre-mapped guidance, the robot provides the surgeon the ability to view the spine on the system's workstation monitor throughout the surgery. "It gives you a real-time picture of what you're doing," summarized Metkar.

Saving time, improving safety

Metkar uses the robotic guidance system for fusions from the thoracic spine to the pelvis—sometimes via open surgery, during which the spine is exposed, and other times, with minimally invasive surgery performed through the skin. Minimally invasive surgery has the added benefits of lowering risk of infection. Both approaches shorten hospital recovery time for patients by one to two days when compared with traditional surgery, he reported.

The robot also enables patients and the surgical team to be exposed less to radiation. For a typical spinal fusion, either open or minimally invasive, only two to four X-ray images are needed with the robotic guidance system compared to about six without it. "This is a remarkable reduction in radiation exposure," said Metkar.


Surgery to treat scoliosis often includes fixing the sacrum to the pelvis in addition to fusing multiple vertebrae, and for this procedure, radiation reduction is even greater. Done the

traditional way, sacro-pelvic fusion requires many X-rays. "To get the right view to place the screws, we often take three or four images. Then after we insert the screw, we take a couple more, and this is repeated several times," Metkar said. "With the robot, we only need about six images total for the spine and the pelvis." Also, cases that require fewer X-rays can save over two hours of surgery time.



Robot guides surgeon's placement of screws to stabilize the spine.

With all these benefits, robotic-assisted surgery doesn't replace a surgeon's knowledge of anatomy. "The robot has significantly more accuracy than freehand screw placement, but it is equally important to know how to put the screws in without the robot. Only then can you be effective in planning and executing the robot function," he commented.

Going forward, Metkar plans to use the robotic guidance system for patients with conditions that are even more complex than those he addresses today. He will also teach the technique to orthopaedic residents and fellows. "The more of us who can use this advanced technique, the greater number of patients who will benefit from it." 

To learn more about robotic spine surgery

View video on how it works:

<https://tinyurl.com/y2goblhl>

View patients telling their stories:

<https://tinyurl.com/y47ajfur>

Visit [BIDMC.org](https://www.bidmc.org) and search for "robotic spine surgery."

Beyond bone density: BIDMC study aims to improve prediction of hip fracture risk

While it is known that osteoporosis can result in fractures, about half of older people who experience fractures from falls don't have low bone mass.

Fjóla Jóhannesdóttir, PhD, a research scientist at the Center for Advanced Orthopaedic Studies at BIDMC was recently awarded a two-year grant from the National Institutes of Health to explore a biomechanical method for predicting which people are at risk of hip fracture before they have an injury.

Hip fracture is prevalent and can be devastating. Over 300,000 older people sustain hip fractures in the United States each year. "These fractures are likely to significantly affect the patient's life. A high percentage of people experiencing hip fracture will never return to their prior levels of function, and 25% die within the first year post-injury," said Jóhannesdóttir.

Moreover, the annual number of hip fractures is predicted to at least double in the coming decades as the elderly population grows.

Today physicians use bone mineral density, as measured by dual-energy X-ray absorptiometry (DEXA), also known as densitometry, and consider other clinical factors to predict who may incur a fracture and could benefit from medications and other interventions to prevent or mitigate the progression of osteoporosis. These other risk factors may include age, gender, fracture history, steroid use, BMI, smoking and alcohol intake.

According to Jóhannesdóttir, the current approach, while seemingly comprehensive, misses the opportunity to intervene in half of all future fractures: those that will occur in people who don't have osteoporosis according to DEXA tests and/or who have few clinical risk factors. "Although more than 90% of all hip fractures are due to a fall, current risk assessment methods don't directly consider the probability of falling or the skeletal loading that likely occurs during a fall," she explained.

In year one of the NIH study, Jóhannesdóttir's objective is to develop a risk tool that provides the probability a specific person will fall. In year two, the objective is to test whether a biomechanical approach that considers the forces impacting the hip during a sideways fall, femoral strength and the probability of falling can predict hip fracture better than the current methods. Other BIDMC scientists and researchers at the Icelandic Heart Association (IHA) Research Institute are collaborating on this study.

Jóhannesdóttir's investigation will build on her prior work using data on a large cohort of older people in her native Iceland who were part of the AGES-Reykjavik study. In that study, funded by the NIH and the IHA, researchers sought to measure interactions between age, genes and the environment. Medical histories and heart, neurocognitive and musculoskeletal health were collected on participants, once when they enrolled and again five years later.

Algorithm to predict hip fracture

It is well-established that a history of falling is a predictor of whether a person will fracture a bone. There are many other

risk factors for falling but how they are related to each other is not well understood. Jóhannesdóttir's first study goal is to discover which factors are associated with risk of falling and how strongly.

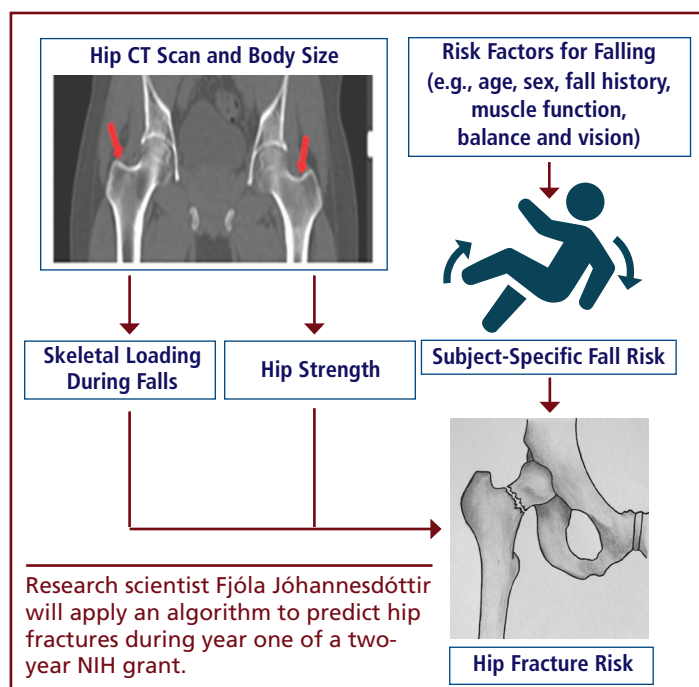
"As I develop this risk tool, I'm working toward being able to assess the contribution of different predictors for falling on your probability of falling," she said. "We expect that age, dynamic balance and fall history will be most strongly associated with future falls. Further, we want to use the fall risk tool to help improve fracture prediction."

To create the risk assessment tool, Jóhannesdóttir will use baseline data from

about 3,500 individuals who were enrolled in the AGES-Reykjavik Study and completed the two visits to predict fall occurrence at follow-up. The visits involved gathering medical histories as well as measuring cardiovascular, neurocognitive and musculoskeletal health via imaging, biochemical measurements, and diagnostic evaluations. The research team will develop an algorithm that considers a number of factors that include age, gender and fall history. "Sex will be factored because females are more likely to fall than males. Also, the older you get, you are more likely to fall, so age is also incorporated," said Jóhannesdóttir.

Strength, skeletal loading during falls

The second goal of the study is to determine whether a subject's fall risk, fall characteristics and hip strength improve hip fracture prediction over the current clinical approaches. For comparison, Jóhannesdóttir will use FRAX (Fracture Risk Assessment Tool),



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→ **HIP FRACTURE RISK** *from page 7*

which integrates bone density by DEXA at the hip and clinical risk factors that are assessed along with a 12-question patient survey, to project the risk of having an osteoporosis-related fracture in the next 10 years.


The BIDMC research will test whether a biomechanical approach that compares forces applied to the hip during a fall to the side and hip strength, as well as accounts for the probability of falling (based on the algorithm developed in year one), improves hip fracture prediction. The force exerted on the hip during a fall will be estimated based on the individual's height and weight and how much the soft tissue thickness on their hip can reduce the impact of the fall.

Jóhannesdóttir will compare 700 individuals with hip fractures to 2,800 controls from the AGES-Reykjavik Study. "The 700 may have fractured their hip after their first visit or their second, so the follow-up time can be from one month up to more than 10 years," she said. The data that are used in the prediction were collected before the participants sustained a hip fracture.

The size of Iceland makes hip fracture data relatively easy to obtain. "It's a very small country so there are only two main

locations where fractures are treated, and that data is collected constantly by the IHA," explained Jóhannesdóttir. "The AGES study participants had previously given consent for their data to go directly into the fracture database if they should break a bone.

"If you don't have a lot of muscle or fat padding over your hip, the load on your bone will be higher than if you have a good amount of soft tissue overlaying the hip," she continued. "For the person with more padding, we expect the force will be absorbed by the soft tissue to some extent before it reaches their bone." Jóhannesdóttir will measure the soft tissue thickness from the 3,500 CT scans.

The study results will offer insights into the risk factors for falling that could lead to more effective interventions and, ultimately, reduce the growing fracture burden. "To improve fracture prevention strategies, it's critical to understand the close relationship of fractures with falls, especially in the older population," commented Jóhannesdóttir. "It may not be enough to improve your bones to reduce hip fractures in people with a high probability of falling. We may also have to prevent them from falling." 

→ **JAMES SARNI, MD** *from page 3*

be unparalleled in the Boston area. "My unique perspective allows me to view the patient's condition from both the surgical and nonsurgical approaches at the same time, with a clear understanding and an ability to explain and advise on what to expect regarding treatment options, chances of success, and the positives and negatives of each approach," he said.

Sarni treats patients with conditions affecting the musculoskeletal system, such as neck and back pain and sports injuries, as well as neurological trauma or disease, such as spinal cord injury, head injury or stroke. "I am equally comfortable treating acute athletic injuries as I am chronic overuse injuries."

In his practice, Sarni focuses on treating people with functional deficits, not simply experiencing pain. "When someone tells me their back hurts, they have my attention and my empathy, but I want to learn more to be able to make a difference. Knowing when and how a patient can't do a task or move in a certain way to carry on their daily lives—that's when I think I can really help them."

Sarni may use interventions including injections guided by ultrasound or X-ray, and physical therapy. "Corticosteroid injections are useful temporarily because they decrease pain while someone's changing the mechanics, whether it's the spine or the shoulder, to minimize their pathology."

Sarni poses questions and explains options to patients to help guide them in therapy decisions. "It's a common notion that surgery is the last option. But surgery is sometimes the conservative path," he said.


Among the types of patients Sarni sees are those with chronic use injuries, which develop as a result of repetitive movements. "Because a person is loading one particular area in a particular manner, their rotator cuff or their shoulder goes, or their back bothers them. These injuries are especially common when people try to cram a one-hour workout into 30 minutes on a regular basis," he said. "Very few chronic use

injuries are curable, but I work with the patient to teach them new mechanics to compensate and rehabilitate for their injury."

Sarni divides his time between sites in Needham and Milton: at Beth Israel Deaconess-Needham he sees individuals with spine issues, and at Beth Israel Deaconess-Milton, those with musculoskeletal conditions. "The position gives me the opportunity to apply an understanding of the biomechanics of rehabilitation combined with the surgical pathology that I have developed over years of experience. The combination of roles fits exactly what I was looking for," he said.

At BIDMC, Sarni hopes to work with researchers in the area of regenerative medicine. "There's enough anecdotal data to indicate there might be some benefit to platelet-rich plasma and stem cells in healing. The questions are, in what cases, for whom and how."

Sarni has two children, Christopher and Adriana; both graduated from his alma mater, College of the Holy Cross in Worcester, Massachusetts, and are pursuing careers in finance and business. When not working, he enjoys physical fitness endeavors. "I stay active by changing regularly what I do—cardio one day, yoga the next, weightlifting the third; maybe a little bit of golf. I try to avoid becoming a patient."

For an appointment with Dr. Sarni, call 617-667-3940 or email orthoappointments@bidmc.harvard.edu. 

“ My unique perspective allows me to view the patient's condition from both the surgical and nonsurgical approaches at the same time. ”

James Sarni, MD 