Stress fractures are common among physically active people: these bone injuries account for 20 percent of physician office visits in runners and are prevalent in the military—especially during initial training and among women—making research on stress fracture risk and prevention a priority for the U.S. Army.

“The risk of having a stress fracture is high during the initial training period, which is sometimes called boot camp,” said Mary Bouxsein, PhD, Director of the Center for Advanced Orthopaedic Studies at BIDMC. “Up to 20 percent of women and six percent of men will suffer a stress fracture in the first 10 weeks of training. We’re very interested in understanding who is at greatest risk.”

Stress fractures, which almost all occur in the lower extremities, are the result of repeated stress rather than a single sudden event, like thousands of car trips over a bridge versus an oversized ship crashing into it. During initial combat training soldiers participate in rucking, which is walking for long periods of time carrying up to 80 percent of their body weight on their backs. New physical activity—like beginning military training or a running training season—increases the likelihood of creating microscopic cracks in your bone that can lead to fractures.

“You’re 18 times more likely to get a stress fracture during your first year of training than in any other time in your military career,” said Julie Hughes, PhD, Research Physiologist for the Military Performance Division of the United States Army Research Institute of Environmental Medicine (USARIEM) in Natick, Massachusetts. “The stress fracture problem is an issue for recruits.”

Stress fractures cost the military millions of dollars a year and impact its readiness. Recovery from a stress fracture may take months, during which time recruits withdraw from training. Some will not return to training, and those who do may see the time lost impact their military careers. In addition, once a bone fractures, there is higher risk for a second fracture.

To understand why stress fractures are common during military training and how to help prevent them, Bouxsein, Hughes and others at USARIEM are

continued on page 6
Dear Colleagues and Patients:

Welcome to our winter issue!

We’re excited to bring you a cover story on the collaboration of Mary Bouxsein, PhD, head of our Center for Advanced Orthopaedic Studies, and U.S. Army researchers on a series of studies on bone fracture, a significant problem for Army recruits. Our story explores two recently published studies. One analyzed over one million soldiers’ medical records to discover who is at highest risk of bone fracture based on characteristics such as ethnic origin, gender and age. Another study—carried out here in Boston—sheds light on whether bone structure is fixed by the time people are young adults. More studies will build on these, with the goal of developing steps soldiers can take to prevent bone fracture. This may lead to insights into bone health for athletes and our aging population.

In other research, our Chief of Hand Surgery Tamara Rozental, MD, recently led a clinical study on a new technique that measures bone quality. Although still only available for research in this country, it holds promise for predicting who is at risk of bone fracture even when bone density appears normal. In this issue you can learn about impact microindentation and the study’s outcomes.

You can also discover how our orthopaedic specialists employ portable ultrasound devices at the point of care. Since ultrasound waves were first used for medical diagnosis in 1942, ultrasound technology has advanced dramatically and expanded across medical specialties. Soon it will be possible to do ultrasounds using a smart phone! Members of our team now incorporate ultrasound into routine care. Using portable devices enables them to deliver improved diagnosis and injection accuracy, and do so in a single clinic visit that offers convenience for the patient.

Last fall we welcomed Everett Hayes, MD, to our growing sports medicine team. As a sports medicine physician, Dr. Hayes uses non-surgical approaches to help patients who are injured during exercise or daily activity as well as sports. He trained in internal medicine at Mt. Auburn Hospital, a Harvard Medical School teaching hospital, and completed a fellowship at Evergreen Sport Medicine in Augusta, Maine. Like his colleagues, he incorporates ultrasound imaging into his practice.

Finally, we announce a new location and collaboration with the Department of Surgery for patients with foot and ankle issues. The official opening of the Foot and Ankle Center in Dedham will coincide with the start of spring. Stay tuned for more information.

Sincerely,

Mark C. Gebhardt, MD
Chief, Carl J. Shapiro Department of Orthopaedics

[CONTACT INFORMATION]
When Everett Hayes, MD, got injured playing ultimate frisbee, he didn’t know then the role it would have in his decision to go into sports medicine. “In my second year of medical school I got a concussion, and that raised my awareness of medical issues in the athlete,” said Hayes. “The following winter I injured my knee while snowboarding and ended up seeing one of the providers at my medical school who was a fellowship director for sports medicine.”

Later in medical school, Hayes selected internal medicine for his residency. But the experiences of his own injuries and treatment by a sports medicine specialist led him to think about working with patients to reach functional goals rather than fixing problems.

“We’re taught in medical school to treat the pain, whereas the athlete’s perspective is based on function,” said Hayes. “An athlete might be concerned they’ll do more damage to their injury if they continue to play or want to know what they can do safely to maintain fitness while they recover from an injury.”

Finally, when he learned the sports medicine field encompasses physicians from a host of specialties in addition to orthopaedic surgery—including internal medicine—his decision became clear. Hayes completed a sports medicine fellowship and joined the BIDMC Department of Orthopaedics in the fall of 2017.

One of the attractions of BIDMC was the diversity of specialties within the orthopaedics group. “Having people from different disciplines creates interesting discussion and thought processes about how to approach issues. If you have a complicated case, or one slightly outside of the typical patient presentation, talking to someone from a different discipline who might have more experience in that area in your own department is very valuable.”

Although people may naturally think of sports medicine as only for professional and college athletes, Hayes sees any individual, athlete or not, who has a non-operative orthopaedic issue, including fracture, sprain and tendon injury. “Having a space within the orthopaedics department is nice because if I see someone who initially I didn’t think had a surgical fracture, I can run it by an orthopaedic surgeon or refer my patient to them. Likewise, in some cases, a surgeon may refer a patient to me.”

In his practice, Hayes uses ultrasound to guide therapeutic injections as well as to diagnose issues. “Sometimes being able to evaluate the rotator cuff tendons, for example, while the patient’s moving their shoulder as opposed to a static MRI gives you a little more information about what’s going on,” he explained. While ultrasound technology isn’t new, using it in this way is evolving in orthopaedic practice, according to Hayes.

During patient visits, Hayes aims to learn what patients are looking for out of the relationship and works with them to get to that goal. “There’s more to what a patient may be concerned about than strictly what the initial body part and injury are,” he said. “I believe in shared decision making, and doing the best I can to educate my patients about the options and the risks and likely benefits they might entail. Also, I will always be honest about things I can and cannot do.”

Hayes finds helping patients who feel defeated by their health to be particularly meaningful—for example, helping someone with hip or knee pain walk normally again and not limp. “It seems like a simple thing, but it snowballs into a lot of other benefits as well. You see the downstream benefit when they come back into your office happier and more energetic. It’s wonderful to be able to provide that to people.”

Hayes’ initial training in primary care helps when it comes to communicating with PCPs. When a PCP refers a patient to him, his response is shaped by whether the PCP has a specific question or isn’t completely sure of the problem. Communicating in the other direction is also important. “Once in a while you’ll recognize something that might not be within your role as a sports medicine physician. In that situation, it’s important to send a message to the primary care provider that you were treating their patient for a knee injury but are concerned about their thyroid function. You want to be on the same page about what’s going on.”

Hayes lives in Cambridge with his wife, a lawyer for a charter school network, and their two-year old son. Some of Hayes interests are international cooking and strategy-based board games, and he continues to enjoy ultimate frisbee and snowboarding along with soccer, basketball and skiing.

Dr. Hayes sees patients at BIDMC, BID-Needham, and BIDHC-Chestnut Hill. For an appointment, call 617-667-3940 or email orthojoints@bidmc.harvard.edu.
In-office ultrasound imaging streamlines care

IDMC orthopaedics specialists are pinpointing joint problems and treating them faster while making the patient experience easier—even fun—by using ultrasound imaging right in their offices.

In-office ultrasound devices now enable physicians to give patients a more accurate diagnosis, relieve pain and provide treatment, often all in the same visit. Department of Orthopaedics physicians are using ultrasound imaging as an integral part of routine office visits to get a close look at muscles, tendons and joints to help them determine the root of a patient’s pain, such as tendinosis or a rotator cuff tear. And, more and more, they are employing the ultrasound image to guide injections into joints from hips and shoulders to fingers, toes, wrists and ankles.

“The ultrasound shows us where the needle goes,” explained rheumatologist Fadi Badlissi, MD, Chief of Musculoskeletal Medicine in the department. The technology, which shows tissues and muscle in real time versus waiting for an MRI, isn’t new. Ultrasound has been used for joint injections and diagnostics for about 30 years, according to Badlissi. But that application has picked up in the last 10 years as ultrasound machines have become smaller and more portable, just like personal computers.

“I can take that [ultrasound] machine, put it in a backpack or carrying case and take it from office to office,” said John-Paul Hezel, MD, a non-operative sports medicine physician whose training as a physiatrist included extensive work with ultrasound images and their application to treatment. Orthopaedic surgeon Joseph DeAngelis, MD, opts for a handheld ultrasound system that he runs on a tablet.

Without an ultrasound device in the office, injections may be performed “blind”; that is, based on the physician’s skill, dexterity and understanding of the anatomy. But the data have shown such injections may miss more than 20 to 25 percent of the time in large joints like the shoulder, according to Hezel. “That’s a high miss rate, especially when a lot of the injections are for diagnostic reasons and we’re going to decide whether to do surgery based on their effectiveness. It’s nice to have guidance to be 100 percent sure we are in the area that we want to be.”

There is one exception: knee injections are accurate without any guidance, because the knee joint is easy for physicians to access.

In addition to guiding injections of medication, ultrasound technology can aid in a therapy called needle fenestration, or needling. “Needling is to poke very small fenestrations in the skin. “Not only can I see the needle when I’m placing it so it’s more comfortable for you, I can also see what happens as I inject the medicine,” DeAngelis said.

The local anesthetic lasts between two and six hours. The effect of the steroid, an anti-inflammatory, ramps up over the first two weeks and can ease pain for months. If the numbing medication makes the patient feel better immediately, the hypothesis was accurate. And, importantly, the physician can repeat the injection in the same spot in the future because it’s recorded by the ultrasound machine.

After diagnosis, patients may opt for continued shots for pain relief or other therapies. If surgery is an option, the anesthetic injection is like a “test drive” before exposure to its risks.

For example, a patient with shoulder arthritis may feel significantly less pain immediately after the injection. “They’re not stronger, they don’t move better, they still have the grinding and crunching. But when the shoulder joint is numb, they can say that 90 percent of their pain is gone,” DeAngelis said. Based on that response, it is likely a shoulder replacement would lead to at least a 90 percent improvement in the patient’s pain level.

The test drive also helps to set patients’ expectations, which ultimately drives satisfaction. “The worst thing in the world is doing a surgery on somebody and they don’t have the result they wanted or the result they expected,” said DeAngelis.

When people come to orthopaedics group specialists, they don’t come with a diagnosis. “A lot of what we do is getting that diagnosis—getting an X-ray, doing a physical examination, hearing the patient’s history,” said DeAngelis. “Sometimes we’ll order an MRI to look at the muscles and tendons. All of this is to answer the question ‘Where is the pain coming from and what can we do to make you feel better?’”

Ultrasound helps provide answers to these questions. After forming a hypothesis about what and where the problem is based on the history, examination and X-rays, physicians may then use ultrasound imaging to guide an injection of a numbing medication and then a steroid into the joint. The ultrasound device gives the physician a super power: the ability to see under your skin. “Not only can I see the needle when I’m placing it so it’s more comfortable for you, I can also see what happens as I inject the medicine,” DeAngelis said.

The local anesthetic lasts between two and six hours. The effect of the steroid, an anti-inflammatory, ramps up over the first two weeks and can ease pain for months. If the numbing medication makes the patient feel better immediately, the hypothesis was accurate. And, importantly, the physician can repeat the injection in the same spot in the future because it’s recorded by the ultrasound machine.

After diagnosis, patients may opt for continued shots for pain relief or other therapies. If surgery is an option, the anesthetic injection is like a “test drive” before exposure to its risks.

For example, a patient with shoulder arthritis may feel significantly less pain immediately after the injection. “They’re not stronger, they don’t move better, they still have the grinding and crunching. But when the shoulder joint is numb, they can say that 90 percent of their pain is gone,” DeAngelis said. Based on that response, it is likely a shoulder replacement would lead to at least a 90 percent improvement in the patient’s pain level.

The test drive also helps to set patients’ expectations, which ultimately drives satisfaction. “The worst thing in the world is doing a surgery on somebody and they don’t have the result they wanted or the result they expected,” said DeAngelis.

In addition to guiding injections of medication, ultrasound technology can aid in a therapy called needle fenestration, or needling. “Needling is to poke very small
holes in tendons and cause inflammation to signal to the patient's body that something is wrong. It helps heal a tendon that is otherwise not getting better,” explained Hezel.

Hezel uses ultrasound guided needling to treat tennis elbow and golfer's elbow, as well as painful Achilles and hip tendinosis. “Tendinosis is when the tendon itself has become disorganized,” he said. “When I put the needle into the tendon and poke little holes and cause inflammation, I'm trying to help the patient's body reorganize the tendon over time.”

**More efficient, more satisfaction**

In the past, Badlissi, DeAngelis and Hezel would send patients to musculoskeletal ultrasound specialists in the Radiology Department when ultrasound was needed for diagnosis or therapy. Now, with support from their colleagues in Radiology, the orthopaedic physicians use their ultrasound tools and skills for more routine cases while Radiology continues to provide diagnostic and prescriptive services for more complex cases. The new flow frees up advanced technology and specialists for the best use of BIDMC health system resources and streamlines care for the patient.

“You can do the ultrasound in real time without the patient having to come back or being sent to Radiology or another practitioner to have a test,” said Hezel. “It saves a lot of time and money. It makes things more efficient.”

According to DeAngelis, anytime you can eliminate the delay between ordering a test and getting the result, the better the patient’s experience will be. “If you have a question about your health and we can give you an answer before you leave the building, then we have eliminated the anxiety and interruption in your life,” he said. “With the acceleration of technology that efficiency is becoming possible, and the quality of care is improving. Ultimately, when you provide the right treatment for the right reason to the right person, total expenditure goes down for the whole health care system.”

Patients’ experience with ultrasound is not only easier and more efficient, they like it.

“People love ultrasound,” said Hezel. “They think it’s a cool technology, and there’s a sense of fun doing it in the clinic. They can see it live, and I can take a video and show them the injections. I always get great feedback.”

Hezel also reports that patients prefer ultrasound to X-ray guided injections. “I have done thousands of injections over the past six years and people who have had X-ray and ultrasound invariably would rather have the ultrasound guided injection,” he said. “There are fewer people in the room and it’s much faster. You don’t have to inject a dye. The entire experience is simpler and more streamlined.”

In Europe ultrasound is standard for evaluating shoulder and other musculoskeletal problems, and it’s growing in the United States. Ultrasound devices here have the added capability of dynamic imaging to capture the movement of muscles, tendons and joints to see how they are functioning.

Of course, ultrasound is not for everything. “There are certain things the MRI is better at showing, but it’s a very helpful diagnostic tool to have in the office,” said Badlissi.

**An ultrasound experience**

A woman in her late 60s came to see Fadi Badlissi, MD, at his Beth Israel Deaconess HealthCare Lexington office for pain in her left hip she’d had for two or three months. Based on the X-rays taken right before her appointment, she had mild osteoarthritis of her hips. Badlissi examined her and confirmed where the pain was coming from.

Then in the quiet, softly lit exam room, he placed an ultrasound probe on the patient’s hip, which projected a live image of her muscles and tendons onto a nearby monitor. He checked the image to see if there were any signs of abnormalities such as gout. He noticed “a good amount of fluid in the hip joint capsule,” which wasn’t visible on the X-ray.

Badlissi then offered the patient the option of an injection to remove the fluid and give her a steroid to ease the pain, to which she agreed. He prepared for the procedure following aseptic technique. After applying numbing medication to the hip, he watched the ultrasound image as his hands directed the needle to the right spot, removed the fluid, switched syringes and injected a steroid.

The prep for the injection took about 10 minutes, the procedure less than five. Afterward, Badlissi sent the fluid to a lab to rule out infection as well as gout and pseudogout—inflammations caused by crystals deposited in a joint.
collaborating on several integrated studies supported by the Department of Defense. Through database, clinical and field research, investigators aim to gain insight into non-modifiable and modifiable risk factors for stress fracture.

Race and ethnic origin significant

Bouxsein and research physiologists and epidemiologists at USARIEM recently looked at who in the Army is most vulnerable to stress fracture. The retrospective study, which appeared in the Journal of Bone and Mineral Research, identifies the influence of race and ethnicity on the risk of stress fracture. Researchers analyzed inpatient and outpatient medical records and demographic data of almost 1.3 million soldiers in the U.S. Army from 2001 until 2011.

“This is certainly the largest study of its kind and has the most up to date categories for race and ethnic origin,” Bouxsein said. “What made it possible was a huge database of all military personnel clinical records. Data analysts were able to apply the latest breakdown of race and ethnicity, used in the 2010 census, to reflect the military’s diversity.”

In 2010, the government changed the way it asks questions about race and ethnicity to account for the fact that some ethnic groups identify more with their ethnic background than race. For example, Hispanics may consider themselves Cuban, Mexican or Latin American, not as white or black. As a result, the last census combined race and ethnic origin categories: individuals could select non-Hispanic black, non-Hispanic white, or Hispanic, among other categories. The richness of the Army’s historical data allowed the study’s researchers to group people the same way, making the results useful to both military and civilian populations.

“Essentially, we found that black individuals have a much lower risk of suffering a stress fracture than do their white counterparts, both for men and for women. Then we provided new information on the new race and ethnic groups,” said Bouxsein.

The study compared race/ethnic origin groups to non-Hispanic whites, who have been shown to be at least risk of stress fracture. Researchers found substantial differences in risk among the groups. Non-Hispanic white soldiers had the greatest risk of stress fracture compared to non-Hispanic blacks, with non-Hispanic white women and men having a 92 and 59 percent greater risk respectively.

The research also found Hispanics had intermediate risk of stress fracture—noteworthy because Hispanics are a quickly growing segment of the active duty U.S. military and the general population, according to the study.

In addition to variations in risk among race/ethnic origin groups, the research showed a female soldier is four times more likely to suffer a stress fracture than a male soldier. That high risk, combined with the 2016 overturning of a 1994 rule banning women from jobs designated for combat, adds to the need for research to prevent stress fractures. “Now that [all combat jobs] have opened up, military research scientists have a real duty to prevent those injuries in female war fighters,” said Hughes.

The results also indicated that for both men and women, recruits under age 20 were more prone to stress fractures than their 20- to 30-year-old counterparts. In addition, recruits who were underweight at the start of training were more prone to stress fractures than their normal weight counterparts.

Bone health in young adults

In a related study published last year in the journal Bone, Bouxsein, Hughes and others looked at a variety of bone characteristics to help explain why blacks have a lower incidence of fracture throughout their lives than whites, and men have a lower incidence than women. Although blacks have greater bone mineral density, this doesn’t completely explain the differences in fracture rates. So the researchers set out to determine if bone microarchitecture, mass and strength vary by race and gender, and assuming there are differences, if the differences are established early in life or develop as people age.

The study enrolled 185 young adults ages 18 to 30 who self-identified as black/African American or white/Caucasian divided into four groups based on gender and ethnic origin. The study found that blacks have a more favorable bone microarchitecture than whites, and men than women. The advantage of this bone strength likely contributes to their lower risk of fractures throughout life, according to the authors.

“We don’t know if the differences in bone microarchitecture are genetic or environmental or some combination of both,” said Bouxsein. “More research is needed to determine the relative influence of each of these factors on bone health.”

The study findings were in part made possible by access to the latest generation of a technology called high resolution peripheral quantitative computed tomography (HR-pQCT). The scanning equipment gave researchers detailed 3-D images of participants’ shinbones while exposing the study participants to only a very low X-ray.
New device may help predict bone fragility

While 60 may be the new 40, the older we get the more likely we are to face certain health issues. For example, bone fracture: one out of two women and one in five men over the age of 50 will experience a fracture due to osteoporosis in their lifetimes. With more people living longer, the number of fractures is expected to grow two- to three-fold in the next few decades.

The standard method for diagnosing osteoporosis and predicting risk for developing a fracture is measuring bone mineral density, or BMD, using a type of X-ray scan known as DXA (dual-energy X-ray absorptiometry). But half of the people who suffer hip and other fractures have bone mass in the normal range according to the DXA scale.

“Bone density is part of the story, but clearly not the whole story,” said Tamara Rozental, MD, Chief of Hand Surgery at BIDMC. “Density typically measures how much bone a person has but doesn’t tell you anything about how the bone is built or what the quality of it is.”

A new technique called impact microindentation may be a quick way to assess how well the bone can withstand injury and thereby bone quality. “In conjunction with density, bone strength measures could give us more information as to who is at risk for fracture in the future,” said Rozental.

Rozental received a grant from the National Institutes of Health to examine whether bone strength in postmenopausal women who had recently suffered a hip fracture or a wrist fracture was different from postmenopausal women who had not had a fracture.

“We wanted to test whether a novel, minimally invasive device that tests bone quality could identify those who have suffered a hip or a wrist fracture, and if so, could we add that measure to bone mineral density measurements to identify those who are at risk for fracture so we can improve diagnosis,” said study collaborator Mary Bouxsein, PhD, Director of the Center for Advanced Orthopaedic Studies at BIDMC. “Can we do better than DXA, or can we add to DXA with a complementary technique?”

The research team was particularly interested in wrist fracture patients. “People who get wrist fractures are usually 10 to 15 years younger than people who get hip fractures,” said Rozental. “Many wrist fracture patients don’t meet traditional criteria for osteoporosis treatment because their bone densities are in the normal or osteopenic range and don’t indicate osteoporosis. Clearly, they have some skeletal fragility. Can we figure out how to measure it differently?”

Bone density vs. quality

Rozental and others on the research team set out to compare DXA to indentation as predictors of bone fracture and determine whether bone strength predicts fracture independent of bone density.

To measure bone strength, the team used a technique that involves applying a small amount of anesthetic to a participant’s shinbone, and then with a very fine probe—like a small needle—making 10 tiny depressions on the surface of the bone. Stronger bone resists the indentation better than weaker ones—the same way a ripe peach resists your thumb more than an overripe peach.

The microindentation device, called the OsteoProbe, measures bone material strength index (BMSi). “The test creates dents you can only see under a microscope,” said Rozental. “It gives you a measurement for how much strength was required to create the dents.” Physicians hope such measurements add information about bone health and who is likely to get a fracture in the future.

The BMSi test, which takes under 10 minutes to perform, immediately calculates a score from 40 to 100. These values parallel scores on school exams: over 90 percent is excellent, 80 to 90 is good, etc. Thresholds for what is normal have not yet been established.

As expected, the research showed that both the hip fracture and wrist fracture patients had lower bone density compared to people who did not have fractures. It also revealed the BMSi was lower in those who had wrist fractures and hip fractures compared to those who did not.

Takeaways and future studies

The takeaways of the study are two-fold. First, lower bone strength is associated with a higher risk of fracture, particularly of the wrist, even if your bone density measure does not indicate you have osteoporosis. Second, impact microindentation appears to measure a different element of skeletal fragility than simply how much bone you have.

continued on page 8 ➔
Foot and Ankle Center to open in Dedham

In a unique clinical collaboration between foot and ankle surgeons and podiatrists, the Departments of Orthopaedics and Surgery of the Harvard Medical Faculty Physicians at BIDMC (HMFP) will open a full-service health care center at the New England Baptist Hospital Outpatient Care Center in Dedham, Massachusetts, in early April. At the HMFP Foot and Ankle Center, patients will have access to podiatry services, foot and ankle surgical evaluation and treatment, and foot orthotics and casting as well as access to X-ray, physical therapy, occupational therapy and outpatient surgical services within the building.

The outpatient care center is a 66,000-square foot structure conveniently located off Route I-95/128 at 40 Allied Drive in Dedham. The facility opened four years ago to provide world-class orthopedic care to people in the south suburbs of Boston who have traditionally had to travel into the city for it. With a focus on sports medicine and orthopedic surgery, the center offers patients a single site for their outpatient surgical, pain management and rehabilitative needs.

In 2014, BIDMC entered into a partnership with the nationally recognized New England Baptist Hospital to create one of the nation’s top destinations for orthopedic and musculoskeletal care. “Locating the Foot and Ankle Center at the NEBH Dedham site was a terrific way to leverage the joint venture between the two medical centers,” said Geoff Patton, Chief Administrative Officer for Orthopedics at HMFP. Ron Jones, Chief Administrative Officer for Surgery at HMFP, added “Developing this partnership between the BIDMC Foot and Ankle Surgery and Podiatry divisions will enable us to serve seamlessly and conveniently any patient with non-emergent foot or ankle problems regardless of its nature or specialty requirement.”

More to explore
Race and ethnicity are not modifiable. But understanding why one race or ethnic group is more protected and the reasons underlying that protection can steer further research into areas that are modifiable.

The researchers are not just probing what breaks bone down, but what builds it. “We’re really interested in finding modifiable risk factors that would make your bones stronger,” said Hughes. “What is it during basic combat training that makes a certain person’s bones more likely to adapt to this physical training and get stronger?”

Some of the modifiable factors Bouxsein, Hughes and colleagues are exploring are calcium and vitamin D, commonly prescribed drugs like NSAIDs and contraceptive hormones, and sleep.

The series of collaborative studies by BIDMC and the military may have implications for runners and other athletes and add to what we know about osteoporosis.

“The results may be translatable to endurance athletes who also commonly suffer overuse injuries. A number of things come together during military training, like a fair amount of psychogenic stress and possibly sleep deprivation, that are different from endurance athletes, but there are a number of things that are similar, like a sudden ramp up of activity,” said Bouxsein.

References

Microindentation continued from page 7

“These results suggest that impact microindentation would add to DXA measures of bone density in identifying people at high risk for fracture,” explained Rozental.

She would like to see a larger study validate the results, making sure they’re helpful and honing in on which patients would benefit most from impact microindentation—perhaps only those with normal DXA reports. Also, a study with more participants could help establish thresholds for normal and abnormal BSMi scores.

Said Bouxsein, “We have more work to do, but the OsteoProbe is intriguing because it has the potential to be used in places where you don’t have a DXA machine, such as an office environment.”

The OsteoProbe is approved for clinical use in Europe and for research purposes in the United States. With further research and FDA approval, impact microindentation may someday help physicians get a more complete picture of bone quality so they can better help patients prevent fractures and detect how well treatments are working.