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# What's Your Score?

It's a fact of life: As we get older, our bones tend to get weaker, and the risk of fractures and other bone injuries threatens our mobility and diminishes our ability to live full, healthy lives. It's a growing challenge especially for populations such as ours in the United States that are both aging and living longer, to avoid the cycle of decline that comes with bone breaks and immobility that in turn results in even weaker bone and greater risk of fractures.

"Half of women over age 50 will have an age-related bone fracture sometime in their lifetimes, due to osteoporosis," said UC Santa Barbara physics professor Paul K. Hansma. For men, the probability is less, about 25%, which is still significant considering that just over a third of the current U.S. population is more than 50 years old. That's a lot of wrist breaks, vertebral traumas and hip fractures.

While we've made great strides in our understanding of bone aging and how to treat fragile bones with medications and weight-bearing exercises, getting ahead of the problem is still our best bet for avoiding age-related bone injuries.

This is where Hansma's Bone Score system comes in. Built around the 2005 discovery of "bone glue" made by Hansma and fellow UCSB professors Daniel E. Morse and Galen Stucky, the system goes beyond bone density to assess the toughness and resilience of bone. Conducted alongside the typical health assessments for older adults, the diagnostic tool can detect potential risks for fractures well before they happen, and often before standard imaging procedures can.

“You can look at the x-ray or the DEXA scan and they can tell you how much mineral is there,” Hansma said, “but bone is made of mineral plus organic material.” Thus, he explained, bones can look dense and substantial in the scans but have the toughness of chalk — ready to dent or crumble with enough trauma or compression.

Key to this new system is the Reference Probe Indentation instrument, also known as an OsteoProbe — a device invented by Hansma that measures the hardness of bone. Similar to the way a center punch works, it makes tiny indentations in the tibia (the shin bone), which are then examined to assess the bone’s quality — translated into the Bone Score.

“The depth of indentation it makes is about the thickness of a human hair, so it’s very safe, but it’s enough to determine how easy it is to indent the bone,” said Hansma, who was inducted into the National Academy of Inventors in 2020. The procedure lasts only about 20 seconds and can be made painless with local anesthetic. From there, the physician would be able to either give the patient a clean bill of health as far as bone hardness goes, or prescribe medications to improve the patient’s bone quality.

The instrument, which has been used in Europe for a while now, won FDA approval last year. And it has already had beneficial effects, according to Hansma.

“My neighbor across the street knew she had osteopenia, but it was marginal and she didn’t want to take bone drugs,” he recalled. “But then she had her bone tested and it was very, very weak.” Her score was so low that it made her embark on therapy and postpone a ski trip until her bones were stronger, he added. The good news is that with drugs and other interventions, bones can become tougher in a matter of weeks.

Meanwhile, another older patient reportedly had very low mineral density, but curiously had not sustained any fractures — a mystery that was solved when he found out his Bone Score was high. “Now his doctor is telling him he doesn’t have to take his bone meds,” Hansma said.

Elderly patients aren’t the only ones who could benefit from a real-time, personalized assessment of their bones. Those on glucocorticoids for allergies and organ transplants, for instance, and those who have conditions that affect how bones are made, repaired or react to stress, are also at risk for fragile, soft bones.

Now that the OsteoProbe is cleared for use in the United States, the hope is that it will prove itself valuable and useful enough to provide the impetus for studies that investigate effective strategies for reducing age-related fracture risks based on hard data, Hansma said. Bone Score is currently available only in Santa Barbara.

“My own sense,” Hansma said, “is that this test will end up being much more useful for helping people know how strong their bones are and how to improve the strength of their bones than any test that’s available.”

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## About UC Santa Barbara

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