



Professor Maria Fiatarone Singh with patient Alice Chan. With a tailored exercise plan for those with early osteoporosis, she says, "For the most part, people feel strong quickly, within weeks."

BRITTLE TO THE BONE

Two out of three Australians aged over 50 have poor bone health, even if they don't know it, putting them at risk of fractures, falls and a shortened lifespan. Many are fighting back – with dumbbells.

STORY BY *Erin O'Dwyer* PHOTOGRAPH BY *Edwina Pickles*

SYDNEY GRANDMOTHER Alice Chan is small, petite and softly spoken. A delicate jade pendant hangs around her neck. She's one of the last people you'd expect to be working up a sweat on a bench press or a lat pulldown in the gym. But two years ago, a regular bone scan showed she had osteoporosis – frail or brittle bones. “I couldn't believe it,” the 74-year-old says of the results. A walker all her life – and a practitioner of tai chi since she emigrated from her native Hong Kong to Australia as a 24-year-old – Chan had always regarded herself as fit. “Even my friends were surprised – how could someone as active as me have osteoporosis?”

Chan's GP started her on six-monthly Prolia injections – the most commonly prescribed osteoporosis medication in Australia – which blocks the formation of cells that break down bone to help slow bone-density loss. When Chan sought acupuncture for knee pain, her acupuncturist suggested she see the geriatrician, Professor Maria Fiatarone Singh, whose office was downstairs. Fiatarone Singh prescribed Chan a twice-weekly, hour-long weight-lifting program. The weights felt “hard to lift” at first, Chan explains, as she cranks out another leg press. But her strength increased quickly and more weight was added every few weeks to maintain the intensity of the workout. “Maria explained to me that tai chi and walking were keeping me flexible and giving me aerobic exercise, but it wasn't enough for my bones,” Chan says.

In January, Chan's latest scan revealed increased bone mass. When she was first diagnosed, Chan's spine had a bone-density score of -2.7 and her hip was -2.5. In people over 50, a healthy bone density is -1 or higher. A score of between -1 to -2.5 indicates bone loss or the precursor to osteoporosis, osteopenia. A score of -2.5 or lower signals osteoporosis. Chan's spine is now at -2.4. “I had hoped I would just maintain my condition,

but I had actually improved,” Chan says. Older people lose about 1-2 per cent of their bone density each year, so even maintaining bone density is a good result. “Sometimes I work out longer than my hour, because I enjoy the weights so much,” Chan adds.

From the outside, Fiatarone Singh's rooms at The Centre for Strong Medicine at Pymble, on Sydney's upper north shore, look like any other suburban medical complex. But inside, occupying an entire floor, is a fully equipped gym lined with treadmills, elliptical cross-trainers and resistance machines. Floor-to-ceiling windows frame the bush behind. Fiatarone Singh works out of a small office adjacent to the gym. The clinic was the life's work of her late husband, Harvard-trained geriatrician, associate professor Nalin Singh. She took over as director when he died in 2021. “My office is a gym with a small room attached, not the other way around,” says Fiatarone Singh, a tall, striking 70-year-old. “I see my patients exercising right outside my door. Very few physicians take this approach.”

Her patients usually come to their first appointment on a plethora of medications – both essential and non-essential. She starts with a full medical – assessing nutrition, strength, balance and overall health – and then usually begins “de-prescribing” drugs. Next, she prescribes a tailored exercise plan, in consultation with her team of four in-house exercise physiologists and two exercise scientists. For people with osteopenia or early osteoporosis, she recommends weight-lifting combined with impact loading – jumps, squats and step-ups. For osteoporosis, the focus is on strength training first with free weights, stretch bands or gym equipment, then progressing to lifting heavy weights quickly (power training) and lowering them slowly (slow-velocity training). People with arthritis, who cannot jump, receive a modified program.

“For the most part, people feel strong quickly, within weeks,” says the University of Sydney professor, who

completed her medical training at Stanford University, Boston University and UCLA. “Lifting light loads too quickly may risk joint or tendon damage, whereas lifting heavy weights, even when moving fast, protects the joints while still stimulating muscle and bone growth.”

WE HEAR a lot about the big two killers of older Australians – coronary heart disease and dementia. But not so much about osteoporosis. Around 1.2 million Australians have osteoporosis, and another 6.3 million – one in four – have low bone density. Of Australians aged 50 years and over, two-thirds have osteoporosis or osteopenia.

As the population ages and people live longer, more people are presenting with osteoporosis. A 2024 report from Healthy Bones Australia – the peak body for bone health – found a 34 per cent increase in prevalence since its 2012 report. Bone mass is lost as we age; the slow decline begins after 30, when bone mass peaks. Our bone strength is a lottery of genes and ethnicity, as well as how much bone density you build up in your 20s. Among people with severe osteoporosis, even a hug from an over-enthusiastic grandchild can cause a fracture. Falls usually result in broken hips, wrists, arms or legs. Incredibly, one in four people who break their hip will die within 12 months.

What's become clear in recent years is that specific forms of exercise can be radically effective in rebuilding bone density in both women and men – as effective, and in some cases even more so, as Prolia and other osteoporosis drugs. In particular, weight-bearing impact exercise (jumping, skipping, stair-climbing) and high-intensity resistance training (lifting heavy weights or using weight machines at the gym).

Among Australians aged 50 and over, one in four men and two in five women will break a bone, usually due to a combination of a fall and brittle bones, as some



Left: assessing the bone density of a hip after a scan. Below: Griffith University Professor Belinda Beck's bone-strengthening exercise program is now used in Europe and the US.

point in the future. The risk for osteoporosis and osteopenia is higher in women because female bones are typically smaller and less dense than male bones. Also, women live longer and bone loss accelerates after menopause, as oestrogen levels drop. Older women lose up to 10 per cent of their bone mass in the first five years after menopause. Men are not immune. As death rates from heart disease in men decline, more men are living long enough to contend with brittle bones.

An older, healthier population is putting osteoporosis front of mind among researchers and pharmaceutical companies. A range of new drugs has become available in recent years, including abaloparatide (brand name Eladynos), a once-daily injection that increases bone density by stimulating the cells that make new bone. Abaloparatide was approved for use in the UK last year and in March was approved by the Therapeutic Goods Administration in Australia. Another drug, Evenity – an injection given once a month to build bone in older women with osteoporosis at high risk of fracture – was made available on the Pharmaceutical Benefits Scheme in Australia as a first-line treatment last November. This means patients can receive treatment after their first fracture, rather than having to wait for two or more fractures or pay for it out of pocket.

Fiatarone Singh, whose clinic specialises in treating osteoporosis as well as muscle-wasting (sarcopenia), frailty/mobility issues and other chronic diseases such as diabetes, dementia and cancer, has spent her career advocating for the integration of medicine, exercise and nutrition. Balance training to prevent falls, and nutritional advice to increase calcium, protein and other essential nutrients, are also part of her osteoporosis care plan.

But exercise is critical, says Fiatarone Singh, who also stretches her patients' grey matter by getting them to juggle while standing on one leg and counting backwards from 1000. "In my clinic, exercise is the practice," she says. She is critical of GPs who recommend walking as the only exercise for their older patients. "You could walk around the block for 20 years and not feel any stronger because you're not actually improving muscle and bone strength," she says.

Fiatarone Singh practises what she preaches. A former amateur fencer, she's been lifting weights for 40 minutes each day, six days a week, since her mid-30s. "Physicians aren't taught how to prescribe exercise, they're taught how to prescribe drugs. Until doctors are taught in medical school that you can prescribe exercise like a drug, and fund it like a drug, patients will continue missing out on one of the most effective treatments available for the most common chronic diseases we see, including osteoporosis."

She warns that drugs are not the panacea pharmaceutical companies might have us believe. "Medications for osteoporosis clearly improve bone density, but they do not improve muscle strength or prevent falls, which

is a critical difference and not always well explained by other physicians."

Slowly but surely, though, the word is getting out. In small suburban physiotherapy and exercise physiology clinics all over Australia, a quiet revolution is happening. Older women and men, in their 60s, 70s and 80s, are gathering several times a week to deadlift barbells and swing kettlebells. They've heard strength training prevents brittle bones.

At Woonona, in NSW's Illawarra region, 77-year-old retired librarian Rosanne Shepherd pulls on her sneakers and a pair of walking pants to attend her twice-weekly strength and balance class at Purpose Physiotherapy. She practises planks on the parallel bars, "fast feet" waltzing, bowing with alternating feet crossed in front, and standing squats with bright blue, one-kilogram exercise balls.



In the past few years, Shepherd has gone from having osteopenia to osteoporosis in her lumbar spine. She has so far avoided Prolia injections – due to concerns about side effects – and is focused on building strength and improving her balance. As a single older woman with no children, living alone, a fall could be disastrous for her independence. "Walking has always been a big part of my life but I've come to realise that it's not enough on its own," Shepherd says. "A gym was too intimidating, but this has been a perfect fit for me. I can feel the strength in my arms, stomach, back, legs and thighs – the muscles that keep me upright and moving."

Purpose Physiotherapy exercise physiologist Shauna Flynn stresses that bone health and fall prevention must go hand in hand. Many people don't realise they have bone-density loss until they've already had a fall or a fracture. "Osteoporosis is one of those silent conditions, it doesn't always come with obvious signs and symptoms," Flynn says.

Balance declines rapidly in midlife, starting at about age 50. A 2016 Duke University study found the average adult in their 30s and 40s could balance on one leg for nearly one minute, while those in their 50s could do so for about 45 seconds. People in their 60s could manage 40 seconds, those in their 70s only 26 seconds, and the over-80s got the wobbles after 12 seconds. "You could be doing all the bone-strengthening exercises in the world, but if you're not also improving balance and mobility, you're leaving half of the equation out," says Flynn. "A fall is the real danger so we work to keep people steady on their feet while building bone strength."

SOME OF the first studies showing the link between exercise and increased bone density in older adults began to emerge in the early 2000s. In 2013, Griffith University Professor of Exercise Science Belinda Beck took a gamble to see if she could push the science further. She and her colleagues recruited 101 older women with brittle bones to take part in a clinical trial lifting heavy weights and jumping for 30 minutes twice a week. At the time, weight-lifting and impact training were contra-indicated for osteoporosis because of a perceived risk of fracture. "We didn't know if we'd end up hurting people," admits Beck, a former middle-distance runner and hockey player who began her career investigating bone stress injuries for her master's and PhD studies, after suffering from them throughout her sporting career.

Beck's bold move paid off. Her team's initial results, published in 2018, were groundbreaking. Participants were about 30 per cent stronger and stood a centimetre taller after only eight months of training. They had an average increase of about three per cent bone density in their spines and the bone in their hips thickened by almost 30 per cent. Some women grew their spine bone density by as much as 12 per cent.

Only 18 per cent of participants lost bone, compared to two-thirds (72 per cent) of the control group who were doing low-impact walking, light weights and stretching. Before the trial, one in three participants had suffered a fracture. No fractures were recorded during the trial. A 2020 study with older men showed similar results.

In 2015, Beck opened The Bone Clinic, a world-first translational research facility in Brisbane where patients could undergo comprehensive testing and supervised strength training. "Normally, it takes decades for something proven in a clinical trial to become standard practice – and often, it never does," Beck says. "I knew if I didn't push this forward, it might never happen."

At the clinic, patients undergo a two-and-a-half-hour assessment, including bone-density scans and dietitian consultations, before starting Beck's trademarked exercise program, Onero (Latin for overload). To meet rising demand, Beck has licensed Onero, which is offered at hundreds of physiotherapy and exercise physiology clinics across Australia, as well as in New Zealand, Europe, the US, South Africa, China and Malaysia. Beck is thrilled – every new Onero clinic represents more people growing bone and more data feeding into her research.

The latest results from The Bone Clinic are compelling. Over a 12-month period, about 86 per cent of patients increased bone mass at the lumbar spine and 69 per cent of patients increased bone mass at the hip. Hip bone mass increased by 2.4 per cent, lumbar spine by about 4 per cent and back muscle strength by 27 per cent. Falls halved – from 45 falls to 25 the following year. Fractures were almost non-existent – from 24 to two the following year.

Indeed, The Bone Clinic's results are outstripping drug company results. Separate studies of patients receiving Prolia injections show that, over 12 months, spinal bone mass density increased 3.2 per cent and hip bone 1.9 per cent. (The Prolia literature claims it reduces falls by 39 per cent.)

Beck echoes Fiatarone Singh's frustration with doctors and the pharmaceutical industry. She identifies it as the biggest issue in osteoporosis management today. "I've spent years trying to educate doctors about exercise as medicine, and while some are starting to get the message, many still don't. I have even heard endocrinologists tell patients that exercise won't prevent fractures, which is simply not true."

And while everyone agrees that Prolia is highly effective in slowing bone loss, it has significant recorded side effects. Most notably, patients who discontinue treatment lose substantial amounts of bone within six months, returning to below pre-treatment levels and increasing their fracture risk.

Hoping to study the impact of Onero on post-Prolia bone loss, Beck approached Amgen, the pharmaceutical company behind Prolia. It declined. "It remains a great opportunity to advance the research," she says.

For now, she is focusing on refining the "dosage" of exercise needed. "The big questions now are: how much training is enough? Twice a week? Three times? Do people need to lift as heavy as we initially thought?"

The future of osteoporosis management lies in prevention, not reaction to fractures or bone-density scans revealing brittle bones, Beck says. When she first opened the clinic, the average patient was in their early 70s. Now, it's their early 60s. "Don't wait until your 80s to worry about osteoporosis," she says. "Start building bone in your 50s and 60s. The earlier, the better." ■

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