

...So If You Fall, You Don't Break!

Jeannette Guerrasio, MD

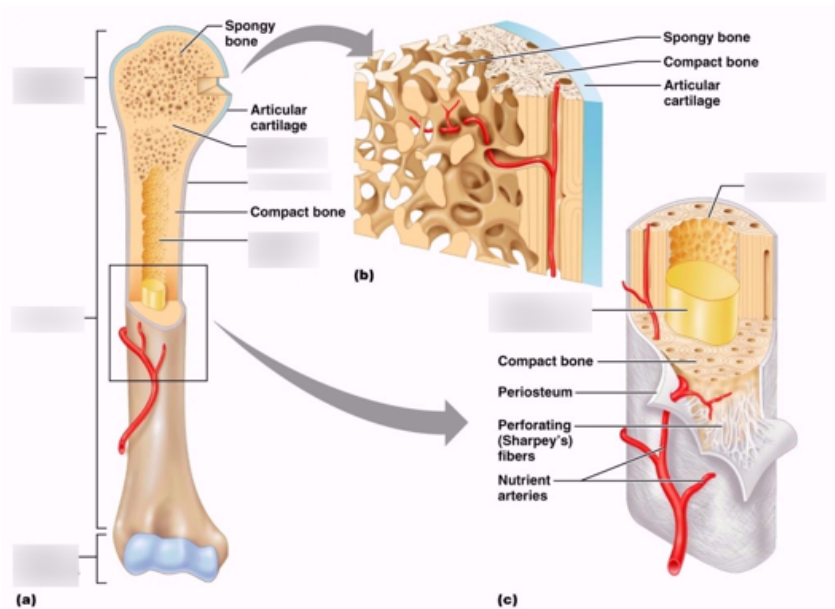


I had the lovely opportunity to teach medicine in Melbourne, Australia for a month when I was 42. What made the trip even more memorable was that I invited my colleague Juan to join me as a co-teacher to share in the adventure. We decided to spend one extra week in Australia to go see the Little Blue Penguins and explore the Great Ocean Road. On our first free day, I stepped off the bus onto an uneven rain gutter and rolled my right ankle. After a few moments of silence, I joked to ease the other passengers, "Thank goodness I'm not old, otherwise that ankle sprain would have been a

couple broken bones!"

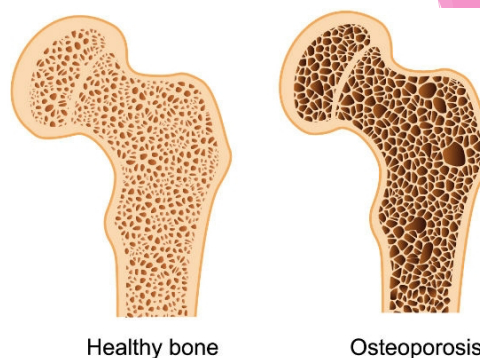
I got up, told Juan he would have to drive the rest of the trip and bought a cane at the gift store. We proceeded to watch the most incredible migration of hundreds of 12 inch penguins as they scurried from the water to their burrows successfully avoiding predators from the sky. I eventually did get an x-ray, and with a chuckle reported the results to Juan, "I guess I am an old lady! Fractured times 2."

One of my many goals is to help you understand osteoporosis and to help reduce the number of fractures. First, let's just review the anatomy of the bone. The bone is covered with a thin layer called periosteum. Under the periosteum is compact bone. The center of the bone is filled with spongy bone with cross links called trabeculae. As bones become thinner, the crosslinks breakdown and there are fewer and thinner trabeculae to stabilize the strength of the bone. Mild thinning is called osteopenia and severe thinning is called osteoporosis.

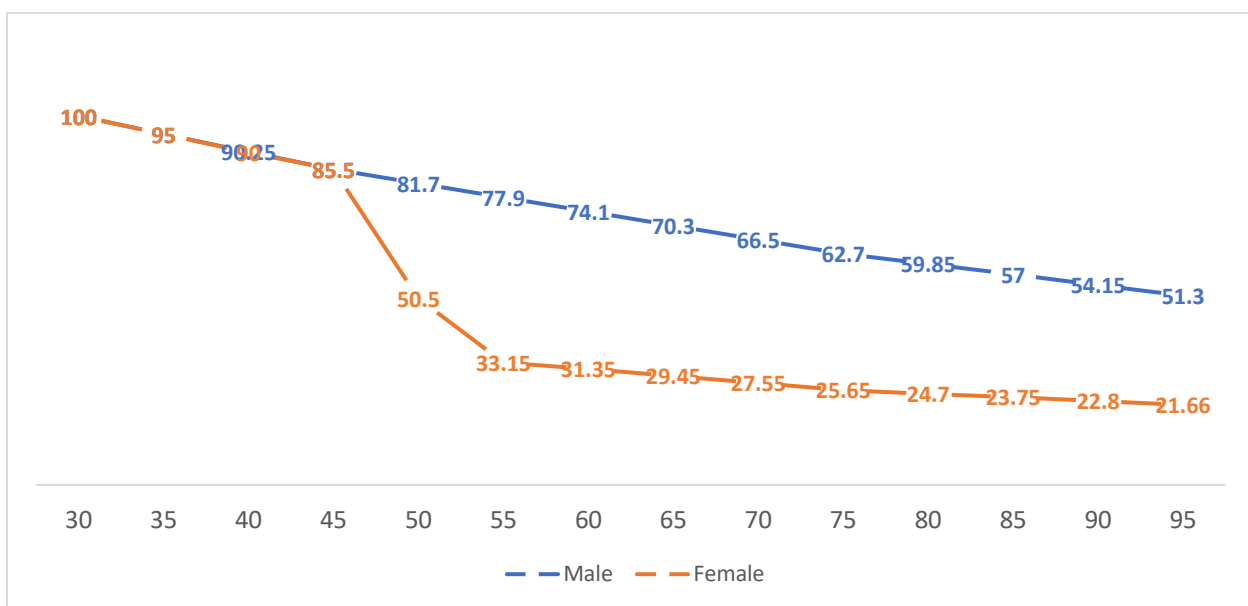


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Starting at around age 30, men lose 1% of their bone mass per year for the rest of their lives. Women also start losing bone mass at 1% per year at age thirty but during the 10 years of perimenopause women lose bone mass at a rate of 7% per year. After menopause, women go back to losing bone mass at 1% per year. It is this 10 years of additional loss, that makes women so much more susceptible to osteoporosis and fractures.



https://www.odtmag.com/contents/view_breaking-news/2017-06-23/awareness-adherence-key-to-improved-osteoporosis-care/



These numbers are averages for a population. Individual variations such as genetics, body size, exercise and diet can affect a person’s bone density. A DEXA scan can be used to accurately measure an individual’s bone density to see if their bones are stronger or weaker than average for their age. DEXA stand for dual-energy X-ray absorptiometry and it uses two low energy X ray beams directed toward any bone to determine the bone mineral density by determining the amount of absorption of each beam by the bone. Typically, the DEXA measures the bones of your spine, hip and long bone of the thigh (femur), and sometimes the forearm bone of your arm you don’t use to write with (non-dominant radius).

As of 2020, the U.S. Preventative Services Task Force (USPSTF) recommends that all women get a bone density scan at age 65, because treatment of osteoporosis can moderately prevent fractures. The USPSTF also recommends that postmenopausal women at risk for osteoporosis be tested prior to age 65. The task force did not find evidence of benefit or harm

in treating men, so most physician do not routinely check men for osteoporosis unless they have a risk factor, such as prolonged steroid medications, immunosuppressive medications, low testosterone levels, excess alcohol consumption or smoking.

The DEXA test will give 2 scores for each bone tested, a Z score which compares your bone density to the average person your age and a T score which compares your bone density to an average 20-year-old. The T score is used medically to determine if you have osteoporosis or a milder version of osteoporosis called osteopenia. A T score of greater than -1.0 is considered normal. A T score of -1.0 to < -2.5 meets the diagnostic criteria for osteopenia. A T score of - 2.5 or less or a pathologic fracture meets the diagnostic criteria for osteoporosis. An osteoporosis pathologic fracture includes femoral neck fractures (top of the thigh bone) and lumbar and thoracic vertebral fractures

All people with osteoporosis should be treated with lifestyle modifications and medication, whether they mean the numeric criteria *or* the pathologic fracture criteria. For people with osteopenia, a calculation is done to decide if you need to be treated with lifestyle modifications alone or with medication as well. If you have osteopenia, you provider with calculate a FRAX score. If the FRAX score predicts a 3% risk of hip fracture in the next 10 years or 10% risk of any fracture in the next 10 years, then you should be treated with both life style modifications and medication.

There are several modalities to prevent and treat osteoporosis. I have already alluded to lifestyle modifications and these include limiting alcohol to < 7 drinks per week for women and <10 drinks per week for men with a drink being 1.5 oz of spirits at 40% alcohol by volume (abv), 12oz of beer at 5% abv or 5 oz wine at 12% abv. The recommendation also includes avoiding tobacco products. Both of these recommendations are easier said than done and if you are having trouble cutting down on your alcohol intake or stopping smoking, then talk with Dave or I.

Many people have heard that they should do weight bearing exercises to help prevent or slow down the progression of bone loss, but don't know what those include. Weight bearing exercises that you would want to do for 30 minutes 4 to 5 days of the week include any of the following:

- Brisk walking
- Climbing stairs
- Dancing
- Hiking
- Jogging
- Jumping rope
- Step aerobics
- Tennis or other racquet sports
- Yard work, like pushing a lawnmower or heavy gardening

Then the remaining 2-3 days out of the week, the some following weight bearing exercises should be incorporated into your exercise regimen:

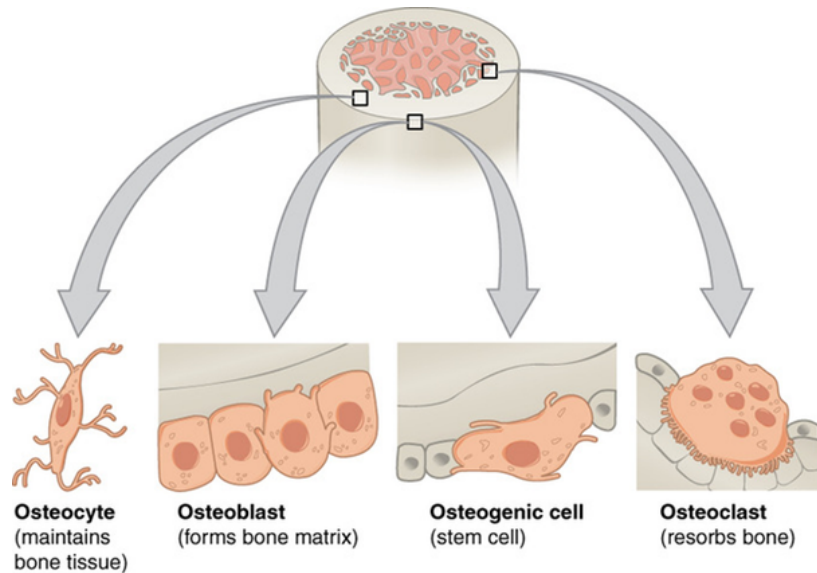
- Elastic bands
- Free weights
- Weight machines
- Push-ups
- Squats

Fracture prevention also includes taking measures to limit falls. To do this, ensure good lighting when moving around your home and unfamiliar areas. Simple exercises to improve balance, like standing on one foot, can help prevent falls by improving your reflexes and more subtle awareness of your footing (proprioception). Handrails on stairwells are usually available indoors, but may need to be added to outdoor stairs, to both sides of a stairwell, around toilets, in showers, or other areas where you find yourself to be unsteady.

Vitamins are used for treatment and prevention. Vitamin D can be found in many forms in the body but Dave and I will specifically measure the 25-hydroxy type of vitamin D to assess your vitamin D level. Weighing the risks and benefits of various blood levels of vitamin D and the current literature, the recommended blood level of vitamin D is 30-55 NG/ml. Most of my patients, who have a normal vitamin D level, are able to maintain a vitamin D level in the recommended range by taking 2000 IU of Vitamin D3 per day. For patients that are deficient, higher doses are needed to get them caught up before they can be maintained on a lower dose. Most people need additional vitamin D as we spend so much time indoors and when we are outdoors in the sun, which is where we get most of our vitamin D, we are wearing sunscreen to prevent skin cancer.

Vitamin D works best to prevent fractures if it is taken with calcium (as least in women, as we know less about osteoporosis in men). This is likely because most people do not get enough calcium in their diets. The dietary recommendation is 1200-1500mg/day. There are some tips for taking supplemental calcium. If you take medication for heartburn then you should take calcium citrate, otherwise calcium carbonate is appropriate. Take your calcium with food to prevent constipation and bloating and 500 mg at a time to maximize absorption. If you need to take 1000mg, then split it into 2 doses that you take throughout the day. Calcium can also affect the absorption of iron, zinc and magnesium as well as medications including the following classes of medications: fluoroquinolone and tetracycline antibiotics, bisphosphonates, beta blockers and calcium channel blocker blood pressure medicines and anti-seizure medicines. The best way to avoid interactions is to take calcium 2 hours apart from your other medications. If that is too inconvenient, talk to your pharmacist to inquire about potential interactions of calcium with your medications.

If you have osteoporosis or osteopenia with a FRAX score that recommends medication treatment, there are several options: Bisphosphonates, monoclonal antibodies and parathyroid hormone analogs. Bisphosphonates include medications like alendronate (Fosamax), ibandronate (Boniva), risedronate (Actonel), pamidronate (Aredia) and zoledronate (Zometa). They are used to prevent bone loss and are the most common medications to treat osteoporosis. Evidence shows that they reduce the risk of fracture in post-menopausal women with osteoporosis. In healthy bone, bone is constantly breaking itself down with cells called osteoclasts and rebuilding healthy bone by cells called osteoblasts. Bisphosphonates kill the osteoclasts, preventing bone loss. They are most commonly given in a pill form. The side effects include nausea, chest pain, hoarseness and irritation of the esophagus. This can be avoided by sitting up (or standing) for 30 minutes after taking this medication. A very rare but serious side effect includes osteonecrosis, most notably the death of bone in the jaw. 95% of the cases involved patients on chemotherapy or who were on steroids and had undergone a tooth extraction, and/or had received intravenous bisphosphonates. These medications can only be taken for 5 years. After 5 years, they increase the risk of a very unusual fracture called a chalk stick fracture of the femur or thigh bone. Since many patients switch doctors, it is important for you to help us keep track of how long you have been on one of these medications.



There are two monoclonal antibodies used for osteoporosis denosumab (Prolia) and romosozumab (Evenity). Denosumab also works to stop the osteoclasts which are the cells that break down bone. It has been shown to be more effective at increasing bone density than bisphosphonates in clinical trials. We don't yet know if that equates to less fractures. Some people experience flu like symptoms with each dose of denosumab, but it is only dosed through a shot every 6 months. Most patients would prefer taking the risk of a lazy day feeling ill than the risk of a fracture. Serious side effects are similar to that of bisphosphonates. Certain patients are not eligible for denosumab, such as those with low calcium levels, but Dave and I can review this with you, so that I can avoid sounding like a pharmaceutical commercial. Romosozumab is very similar to denosumab with a few exceptions. Romosozumab is recommended for patients with osteoporosis who have already had a fracture. It is dosed as a monthly shot. Unfortunately, it cannot be used with patients who have an increased risk of heart attack or stroke and is only approved for women.

The final category to be discussed is the parathyroid hormone analogs teriparatide (Forteo) and abaloparatide (Tymlos). These medications work by regulating calcium and phosphate metabolism in the bones and also in the kidneys. They increase bone mineral density by promoting new bone formation. Teriparatide is approved for men and women! These medications are dosed through a daily injection. Side effects are usually mild if any and are related to elevated levels of calcium in the body. It does pose a very rare risk of osteosarcoma and is not for patients with high calcium levels, as it raises your calcium. Typically, patients are treated for 2 years.

Dave and I will help you decide which medication is best for you. Some patients who started with a bisphosphonate are switched to a monoclonal antibody after 5 years. Others just start with a monoclonal antibody.