understanding osteoporosis

American Medical Association

Osteoporosis is a bone disease in which bones become weak, and even a simple fall or bump can cause a bone to break. The most common bones to break or fracture are those of the spine, hip, and wrist. It is called a "silent disease" because you cannot feel or see your bones becoming weaker. Loss of bone strength occurs slowly, over time, until a usual activity like picking up a grandchild or a bag of groceries, or trying to open a stubborn window, can cause a bone to break. In fact, most people don't know they have osteoporosis until a bone breaks. By that time, the disease is advanced.

Signs of advanced osteoporosis include broken bones, typically at the hip, spine, wrist or ankle. Vertebral (spinal) fractures cause back pain or tiredness, loss of more than one inch of height, a stooped, round-shouldered appearance, or a hump forming in the upper back. Sometimes, you can have a vertebral fracture without even knowing it.

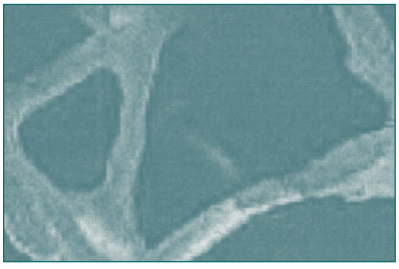
Fortunately, there are steps you can take to *prevent* osteoporosis and painful fractures. If your physician tells you that you already have osteoporosis, there are medications that can slow bone loss and, in some cases, even help you build up bone mass, which can reduce your risk of broken bones.

Osteoporosis is a bone disease, often known as "the silent thief" because it robs individuals of their bone strength without causing symptoms.

BONE BASICS

Since osteoporosis is a disease of the bones, it is important to understand how bones grow and change. Contrary to popular belief, bone is not a lifeless structure. Bone is a living, growing tissue.

- **Bone Structure**



Our bony skeleton is made up of an outer shell of cortical or 'dense' bone surrounding an internal honeycomb-like structure of cancellous, or trabecular, bone. Bone is composed of a protein framework (you might think of it like a builder's scaffolding), that hardens when the minerals calcium and phosphorus are deposited on it. These mineral deposits are what make bones strong. Without enough calcium, bones get weak.

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- **Bone Remodeling**

Bone is constantly changing. Old bone is removed and new bone is laid down. The process is called "bone remodeling." Bone remodeling consists of two distinct stages. The first is bone breakdown or "resorption," when old bone is removed. This is followed by the second phase, bone formation, when new bone fills in the spaces where the old bone was removed. A number of factors affect the bone remodeling, including hormones, the amount of calcium in the body, and exercise. When the bone removed by resorption is completely replaced, bone strength is maintained. In osteoporosis, either too much bone is removed, too little bone is formed, or a combination of both occurs. This leads to a loss in the amount and strength of bone.

During childhood, adolescence, and early adulthood, new bone is added to the skeleton faster than old bone is removed. As a result, the skeleton grows, and bones become larger, denser, and stronger. Peak bone mass, which is the maximum amount of bone a person can have, is reached between 20 and 30 years of age. After age 30, bone is removed faster than it forms. When bone removal occurs too quickly or replacement too slowly, a bone "deficit" is created. Over time, the bone becomes fragile, placing the individual at risk for developing osteoporosis.

- **Influences on Bone Growth**

Many factors influence the normal growth, development, and maintenance of bone. While it is natural to lose some bone mass as you age, it is not natural to develop osteoporosis, experience painful fractures, or lose significant amounts of height. Throughout life, from early childhood to old age, children, women, and men must do everything possible to promote and maintain bone health.

At menopause (the end of menstruation), which usually occurs between ages 45 and 55, women begin to lose bone rapidly. At this stage of life, bone loss in women greatly exceeds that of men. The rapid loss of bone after menopause is due to the sharp decline in estrogen, a hormone which has a protective effect on bone.

After age 65, women and men tend to lose bone mass at the same rate. Although men do not experience a change similar to menopause, decreases in the production of the male hormone testosterone, can lead to reduced bone mass and fractures.

RISK FACTORS FOR OSTEOPOROSIS

Osteoporosis is a complex disease. Not all of its causes are known, but certain factors are believed to contribute to an individual's likelihood of developing the disease. These are called risk factors. Many, but not all, people who develop osteoporosis have several of the known risk factors.

Low bone density is a serious risk factor for developing osteoporosis. Importantly, it is one of the risk factors that you can alter, along with hormone levels, diet, exercise, and other lifestyle choices. Risk factors that can't be changed include gender, age, family history, body size (to some extent) and ethnicity.

RISK FACTORS YOU CAN CHANGE

HORMONE LEVELS
Early menopause, occurring naturally or surgically (for example, surgical removal of the ovaries), can increase a woman's likelihood of developing osteoporosis. If you fall into this category, hormone supplements are available. It is important to discuss your bone health and hormone therapy with your physician.

DIET
Inadequate calcium and vitamin D intake is harmful to bone health. Excessive consumption of other nutrients, such as protein and sodium, can decrease calcium absorption.

EXERCISE
Maintaining a physically active lifestyle throughout life is important. Individuals who are inactive, immobilized, or bedridden for a long time, are at high risk for osteoporosis.

LIFESTYLE CHOICES
Smoking and excessive alcohol consumption are bad for the skeleton. Women who smoke have lower estrogen levels than non-smokers and go through menopause earlier. Excessive alcohol use increases the risk of bone loss and fractures, due to both poor nutrition and increased risk of falling.

RISK FACTORS YOU CANNOT CHANGE

GENDER
Women are more likely to develop osteoporosis than men, because they have lighter, thinner bones and lose bone mass rapidly after menopause.

AGE
The longer you live, the greater the likelihood of developing osteoporosis. Although all of us lose some bone tissue as we age, the amount and rate of loss varies widely in different individuals.

HEREDITY
Susceptibility to osteoporosis is in part due to heredity. Young women whose mothers and fathers have had fractures tend to have lower bone mass.

BODY SIZE
Small-boned, thin women and men are at more risk than larger, big-boned persons, but bigger bone size is no guarantee that you will not get osteoporosis.

ETHNICITY
Caucasians and those of Asian descent are at higher risk of developing osteoporosis than individuals of African-American descent, however, anyone may be at risk.

SECONDARY CAUSES OF OSTEOPOROSIS

Other factors can lead to osteoporosis, including medications you may need to take, or the presence of other medical conditions.

Certain medications may interfere with the body's ability to use calcium, or may affect the bone remodeling process. These medications are often essential treatments for which there are no substitutes. *Do not stop any treatment or change the dose of any medications without checking with your physician.*

The long-term use of drugs called glucocorticoids (also known as corticosteroids or steroids), can lead to loss of bone density and to fractures. These drugs are used in the treatment of certain cancers, arthritis, asthma, Crohn's disease, lupus, and diseases of the lungs, kidney, and liver. They are also used to prevent rejection of organ transplants. Bone loss can also occur from the use of others drugs, such as antiseizure medications (for example, phenytoin), gonadotropin hormones (used to treat endometriosis), excessive use of aluminum-containing antacids, certain anticancer drugs, and excessive thyroid hormone.

The following list of diseases and conditions may affect bone health and lead to osteoporosis. An osteoporosis prevention program can help counteract some of the bone loss you may be experiencing. If you have any of these conditions, it is important to talk with your physician about your bone health before a fracture occurs—

- Inflammatory disorders, such as rheumatoid arthritis, asthma, and lupus that are treated with steroid medications
- Hypogonadism (inadequate function of the gonads)
- Hyperparathyroidism (excessive parathyroid hormone)
- Hyperthyroidism (excessive thyroid hormone)
- Cushing's Syndrome (overactive adrenal glands)
- Turner's or Klinefelter's Syndrome (genetic disease of low or absent sex hormone levels)
- Low sex hormone levels
  - In women—as a result of over-exercise or eating disorders that caused decreased estrogen production, or premature menopause
  - In men—as a result of decreased testosterone production
- Blood or bone marrow disorders (such as, myeloma)
- Organ transplantation (immunosuppressive medications, such as cyclosporin A and glucocorticoids)
- Chronic kidney, liver, lung, and gastrointestinal disorders
- Breast or prostate cancer (if treatment lowers estrogen levels in women or testosterone levels in men)
- Spinal cord injury that leaves a person with paralysis of the lower limbs
- Multiple sclerosis (if steroid medications are used or if walking ability is reduced)

FINDING OUT IF YOU HAVE OSTEOPOROSIS

The diagnosis of osteoporosis begins with a thorough medical history, including questions about osteoporosis and fractures in yourself and other family members, and other conditions that you may have. Your physician will evaluate you for signs and symptoms of possible fractures and order specific tests, including x-rays if a fracture is suspected, and a bone density measurement. The information obtained from this assessment will determine whether or not you have osteoporosis. One of the most important tests in making the diagnosis is the measurement of bone density.

- **Bone Density Testing**

Bone density testing is often referred to as BMD (for bone mineral density) testing. Bone density testing is a painless procedure.

- **How is a Bone Density Test Done?**

Several different machines can measure bone density, the most common of which are:

DXA (Dual Energy X-Ray Absorptiometry) measures the spine, hip or total body.

pDXA (Peripheral Dual Energy X-Ray Absorptiometry) measures the wrist, heel or finger.

QCT (Quantitative Computerized Tomography) measures the spine, hip or total body.

Ultrasonometry uses sound waves to measure density at the heel, shinbone and kneecap.

A BMD test takes from 1 to 15 minutes, depending on the bone(s) being measured. Your bones are scanned with either x-rays (DXA, pDXA, and QCT) or ultrasound waves (ultrasonometry). The amount of x-ray radiation exposure is very low—less than that received from a dental x-ray.

The density of your bones is compared to the bone density of healthy young adults (ages 30 to 45). The results are reported as a score, called a "T-score", which tells how your bones compare to what is considered normal bone mass. While some bone loss with aging is considered normal, making such comparisons helps to determine whether you are losing bone more rapidly than expected for someone your age.

The results of the bone density test falls into one of three categories: *normal, low bone mass,* and *osteoporosis.* The lower your bone mineral density is, the greater your risk of fracture. Your physician will discuss what steps you should take to maintain or improve your bone health.

- **Should You Have a Bone Density Test?**

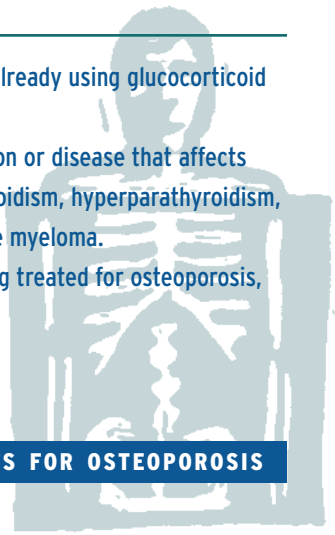
The decision to have a bone density test is based on your risk factors and should only be done if the results will help you to decide about treatment. Therefore, the timing of the BMD test is based on the need for the information. If you have already decided that you will take hormone replacement therapy at menopause, a BMD test may not be necessary. However, if you need information to help make this decision, a BMD test will provide you with some specific information about personal risks, that could be reduced with hormone replacement. Additionally, the BMD test can be repeated at 1 to 2 year intervals to help you monitor your response to treatment.

In general, your physician may advise you to have a bone density test if you are–

- A postmenopausal woman under the age of 65, who has one or more additional risk factors for osteoporosis (besides menopause).
- A woman aged 65 or older, regardless of additional risk factors.
- A postmenopausal woman who has just sustained a fracture. (Your physician will want the information to confirm the diagnosis and determine disease severity.)
- A woman who is considering therapy for osteoporosis, if BMD testing would help to make a final decision.
- A woman who has been on hormone therapy for a long time.

Your physician may also recommend a bone density test if you are–

- A woman or man beginning or already using glucocorticoid medication.
- A woman or man with a condition or disease that affects bone health, such as hyperthyroidism, hyperparathyroidism, Cushing's syndrome, or multiple myeloma.
- A woman or man currently being treated for osteoporosis, to monitor therapy.



ADDITIONAL TESTS FOR OSTEOPOROSIS

- **Biochemical Markers**

Several tests can help determine how quickly bones are 'breaking down' or 'rebuilding'. One test uses by-products of the bone remodeling process, called biochemical markers, to measure the rate of bone breakdown and replacement. These markers can be measured in a blood or urine sample, and can provide information on whether bone loss is occurring faster than normal, or whether treatment is helping to slow bone loss. These tests do not identify low bone density, and cannot diagnose osteoporosis, so they are not a substitute for BMD testing.

- **Laboratory Tests**

The levels of calcium, vitamin D, and several hormones in the blood and urine can help point to a cause of the osteoporosis, particularly when it is not age-related or associated with a known medical condition.

- **Other Tests**

If your physician suspects a fracture – for example, if you have back pain – he or she will order an x-ray. In certain cases, a bone scan may be ordered. A bone scan is different than a bone density test, although sometimes the term "bone scan" is incorrectly used for a bone density test. A bone scan involves the injection in a vein in your arm, of a "tracer" compound that localizes in bone and allows a scanner to see "hot spots," which might be new fractures or other lesions.

In some cases, a bone biopsy (removing a bit of bone tissue) may be required to rule out osteomalacia, another condition of bone thinning. Osteomalacia and osteoporosis have some similar symptoms, but osteomalacia is usually due to a deficiency of vitamin D.

PREVENTION OF OSTEOPOROSIS

Prevention of osteoporosis begins in childhood and continues throughout life. Prevention requires an adequate calcium intake, regular exercise, and appropriate levels of estrogen in women, and testosterone in men. Specific additional aspects of prevention apply at different stages in life.

- **Attaining Peak Bone Mass**

Building strong bones during childhood, adolescence, and young adulthood may help you avoid osteoporosis later in life. Regular physical activity, such as walking, aerobics, or stair-climbing, are important for bone strength; weight-bearing and resistance exercises such as lifting weights or using weight machines can be of added benefit by strengthening muscles and bones through resistance exercise. Adequate calcium intake, and good general nutrition, are also extremely important. Young people also need to avoid risk factors, such as smoking, striving for extreme thinness, and excessive alcohol intake.

- **Maintaining Peak Bone Mass**

Once peak bone mass is reached in a person's 20s, bone loss over the next 20 years should be slight, unless any of the following occur: a diet low in calcium and vitamin D; an inactive lifestyle; low estrogen or testosterone levels; or a disease or medication that causes bone loss. Healthy lifestyle choices, including exercise, proper nutrition, avoiding smoking, and limiting alcohol intake, are important during the adult years to maintain strong bones.

- **Preventing Bone Loss in Later Life**

Bone loss in women usually begins in a person's 40s. It may begin earlier, especially in individuals who have a chronic illness, take medications that cause bone loss, or who have other risk factors. Bone loss is most rapid during the first few years after menopause, but persists throughout the postmenopausal years. Loss of bone at the hip can accelerate in a person's 70s and 80s, perhaps due to changes in activity, muscle strength, or lifestyle; this accelerated loss may contribute to the increase in the number of hip fractures in the elderly. Most men do not begin to lose bone mass until their 50s, and their rate of bone loss is not as rapid as women's. However, men can experience substantial bone loss beginning in their 70s, with the number of fractures in men approaching that of women.

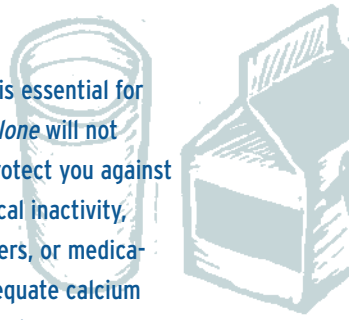
Older women and men benefit from an adequate intake of calcium (1200 mg/day) and vitamin D (400-800 IU/day). Also, remaining physically active is essential for keeping muscles toned, joints flexible, and bones strong.

Elderly individuals with osteoporosis should discuss with their physician additional steps for bone health. These include medication, posture exercises, and fall prevention measures. It is important to continue preventive measures even after fractures have occurred, since this will minimize further bone loss, and help prevent additional fractures and more severe disability.

- **Calcium**

Calcium is the main building block of bone and is essential for bone health. But, an adequate calcium intake *alone* will not ensure healthy bones. Calcium alone will not protect you against bone loss caused by estrogen deficiency, physical inactivity, alcohol abuse, smoking, various medical disorders, or medications known to cause bone loss. However, inadequate calcium can contribute to the development of osteoporosis.

Calcium needs change throughout life. During youth, when the body is growing rapidly, calcium needs are high. Postmenopausal women and older men also need to consume more calcium. With aging, calcium needs are increased because the body is less able to absorb calcium.



ADEQUATE CALCIUM INTAKE

Life-Stage Group	Estimated Adequate Daily Calcium Intake
Infants	
(birth to 6 months)	210 mg/d
(6 to 12 months)	270 mg/d
Young children	
(1 to 3 years)	500 mg/d
Older children	
(4 to 8 years)	800 mg/d
Adolescents and young adults	
(9 to 18 years)	1300 mg/d
Men and women	
(19 to 50 years)	1000 mg/d
Men and women	
(51 and older)	1200 mg/d

Note: Pregnancy and lactation needs are the same as for non-pregnant women (ie, 1300 mg/d for adolescent/young adults and 1000 mg/d for age 19 and older).

Source: National Academy of Sciences

- **Dietary Sources of Calcium**

Dairy products are an excellent source of calcium. The body easily absorbs the calcium in dairy products. Dairy products also provide vitamin D (if fortified), another important nutrient for bone health. Dairy products are available in low-fat and non-fat varieties. Certain vegetables and fish are also good sources of calcium, and a number of cereal and juice products are fortified with calcium.

People who are "lactose intolerant" cannot digest lactose, a sugar found in milk and dairy products. Lactose-free milk, and lactase drops and pills, may enable lactose-intolerant people to consume milk products without uncomfortable symptoms. Vegetarians who do not eat dairy products need to include other calcium-rich foods in their diets.

If your calcium intake falls below recommended levels, you should consider adding calcium-fortified foods and/or calcium supplements to your diet.

Certain foods interfere with the body's ability to use calcium, either by decreasing its absorption in the intestine, or by increasing calcium excretion in the urine. Foods high in oxalate (spinach, rhubarb, beet greens), and phytate (legumes, such as pinto and navy beans and wheat bran), interfere with absorption of calcium eaten at the same time. A diet high in protein and excess sodium can increase calcium excretion in the urine.

Because these foods provide other important nutrients, they should not be eliminated from the diet. Rather, they should be consumed in moderation, and with attention to their combination; together, these foods contribute to a balanced diet.

U.S. DEPARTMENT OF AGRICULTURE–
25 MAJOR FOOD SOURCES OF CALCIUM

Serving size	Food	Amount of Calcium
1 cup	Yogurt, plain, low fat	415
1 cup	Yogurt, fruit, low fat	314
1 cup	Skim milk	302
1 cup	2% milk	291
1 oz	Swiss cheese	272
1 oz	Cheddar cheese	204
1 oz	Colby cheese	194
1 oz	American cheese	174
1 cup	Cottage cheese, low fat	155
1	English muffin, with butter	103
1 cup	Sardines, in oil, drained	351
3 oz	Perch, cooked	117
1 cup	Tofu	260
1 1/2 cups	Chef salad	235
1	Taco	221
1 large	Plain hamburger, with bun	74
1 cup	Almonds	332
1 cup, chopped	Collards, cooked	357
1 cup, chopped	Kale, cooked	179
1 cup	Broccoli, cooked	94
1 cup	Kidney beans, canned	69
10 fl. oz	Vanilla shake	344
1 cup	Vanilla ice cream	170
5 oz	Tapioca pudding	119

- **Calcium Supplements**

Although food sources of calcium are preferred, sometimes it is necessary to use a calcium supplement to meet your daily calcium requirement. The amount of supplement you need depends on how much calcium is in your diet.

There are many brands of calcium supplements on the shelves in supermarkets, health food stores, and pharmacies. The most expensive brand is not necessarily the best. The most common calcium supplements are calcium carbonate and calcium citrate (there are others). Calcium carbonate, the most popular calcium supplement, has the highest percentage of calcium and the lowest unit cost. Both calcium carbonate and calcium citrate are easily absorbed and used by the body. Calcium carbonate should be taken with meals, while calcium citrate can be taken with or without food.

- **Tips on Taking Calcium Supplements**

◗ Look for the amount of "elemental" calcium the supplement provides (this can be found by reading the label on the calcium supplement package). Elemental refers to the amount of usable calcium in the mineral. Figure out how much elemental calcium each pill provides, and how many you will need to take in order to reach your daily requirement.

◗ The supplement must meet "dissolution" requirements, which means that it will dissolve in the stomach (necessary for absorption). Look for labels that say "passed dissolution test" or "USP dissolution tested." If you are not sure about your supplement, you can test it yourself by placing the tablet in a small glass of vinegar or warm water. Stir it occasionally; after 30 minutes the tablet should dissolve. If not, it is probably not dissolving in your stomach either, and is not being absorbed.

◗ Avoid calcium from unrefined oyster shell, bone meal, or dolomite. These forms may contain higher amounts of lead,

and may contain other toxic metals. Also, avoid using aluminum-containing antacids, which contain no calcium.

- Calcium is absorbed better, if 500 mg or less is taken at any one time.
- Certain calcium preparations may cause side effects, such as constipation or gas. It may help to drink more fluids and eat more fiber. You may need to try different calcium supplements until you find one that works for you.
- Do not take more than 2,000 mg of elemental calcium per day.
- Individuals with a personal or family history of kidney stones should talk to their physician before increasing their calcium intake. Calcium rarely causes kidney stones in people with normal kidney function.
- Talk to your physician or pharmacist about possible interactions between calcium supplements and prescription and over-the-counter medications. For example, when calcium is taken with the antibiotic tetracycline, the absorption of the tetracycline is reduced.
- Because calcium can interfere with iron absorption, iron supplements should not be taken at the same time as calcium carbonate supplements. This does not happen if the iron supplement is taken with vitamin C or calcium citrate.

SOME COMMONLY USED CALCIUM SUPPLEMENTS

Type	Brand Name	Strength per tab (mgs)	Elemental Calcium (mgs)
Calcium Carbonate			
	Alka Mints	850	340
	Caltrate	1600	600
	OsCal	625 or 1250	250 or 500
	Rolaids	550	220
	Titralac	420	168
	Titralac Liquid	1000	400
	Tums/Tums E-X	500 or 750	200 or 300
	Tums Ultra/Tums 500	1000 or 1250	400 or 500
Calcium Citrate			
	Citracal Liquitabs	2376 mg/tab	500
	Citracal	950 mg/tab	200
	Citracal Caplets +D	1500	315 + 200 IU vitamin D

- **Vitamin D**

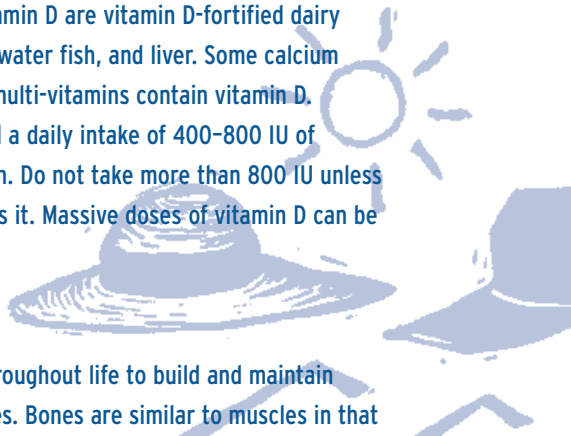
Vitamin D plays a major role in calcium absorption and bone health. Vitamin D has been called the "key" that opens the intestinal wall "door," so that calcium can leave the intestine and enter the bloodstream. Vitamin D also helps absorb calcium in the kidneys that might otherwise be lost in the urine.

Vitamin D is formed naturally in the body after skin exposure to sunlight. Fifteen minutes of sun each day is plenty of time for you to make and store all the vitamin D you need. Remember that sunscreen will block the body's ability to manufacture vitamin D.

The ability to make vitamin D in the skin decreases with age, so an older person may have to take a vitamin D supplement. Studies have shown that the elderly benefit from higher vitamin D (up to 800 IU) and calcium intakes (1200 mg) daily.

Food sources of vitamin D are vitamin D-fortified dairy products, egg yolks, saltwater fish, and liver. Some calcium supplements and many multi-vitamins contain vitamin D.

Experts recommend a daily intake of 400–800 IU of vitamin D for bone health. Do not take more than 800 IU unless your physician prescribes it. Massive doses of vitamin D can be harmful.



- **Exercise**

Exercise is important throughout life to build and maintain strong bones and muscles. Bones are similar to muscles in that they respond to exercise by becoming stronger and denser. Just as muscles get flabby if you don't use them, bones lose density if they are not used. People who are bedridden often have low bone density, because they cannot get up and move about.

The two types of exercise that are best for bone health are weight-bearing and resistance exercises. Weight-bearing means that your feet and legs are bearing your weight. Jogging, walking, stair climbing, and dancing are examples of weight-bearing

exercises (swimming and bicycling are not considered weight-bearing). Resistance exercise uses muscular strength to improve bone strength. Weight-lifting, or using free weights or weight machines, has been shown to benefit bone health at all ages.

Daily activities, and most sports, involve a combination of weight-bearing and resistance exercises. An active lifestyle, filled with a variety of physical activities, strengthens muscles and bones. It is important not to overdo exercise; young women who exercise to the point of stopping their menstrual periods (resulting in a drop in estrogen levels), lose bone mass.

Older adults with osteoporosis or low bone density, should follow an exercise program developed by a knowledgeable health care professional. Depending on the person's health status, this exercise program may include walking, stair climbing, and other low-impact activities. With proper supervision and instruction, everyone can participate in weight training. Since falls account for most fractures, exercise programs that emphasize balance training (such as, Tai Chi), may be helpful.

PREVENTING FALLS

Preventing falls is important for older persons, and for anyone with osteoporosis. Each year about one-third of all persons over age 65 fall. Falls can result in bone fractures. A variety of factors may lead to falls, including poor balance, muscle weakness, poor eyesight, use of alcohol and certain medications, and hazards in and outside the home.

Safety — Indoors and Out

- Wear supportive, rubber-soled, low-heeled shoes. Avoid walking around the house in socks or slip-on slippers.
- Keep floors free of clutter and loose cords and wires.
- Tack down carpets and use non-skid backing on rugs to prevent tripping and slipping.
- Install handrails on both sides of stairs. Have light switches at the bottom and top of stairwells to keep the area well lit.
- Install grab bars beside the toilet, in the tub, and in the shower. If you are unsteady on your feet, try putting a plastic chair with a back and non-skid legs in the shower stall, so that you can sit while you shower. Or, in the tub, use a hand-held shower head to bathe.
- Place a nightlight between your bedroom and the bathroom. Place light switches within reach of your bed or keep a flashlight nearby. Get up slowly from sitting or lying down to avoid dizziness.
- Cover porch steps with gritty, weatherproof paint or treads.
- Use caution when walking on highly polished floors, or floors with confusing visual patterns. You may find these in the lobbies of hotels, banks, or hospitals.
- Falls are even more likely in wet or icy conditions. During the winter, use sand and salt on your walkways and porch steps. Carry a small bag of sand in your car so that if the ground is icy where you park, you can sprinkle the sand by your car door.
- Have your vision and hearing checked regularly.
- Talk to your physician or pharmacist about the side effects of the drugs you take. Sometimes a medication can cause dizziness or lightheadedness.

MEDICATIONS

A number of medications are available for osteoporosis prevention and treatment. While these medications do allow bone to rebuild itself to some degree, they are not a "cure" for osteoporosis. Other bone protective measures must be continued, such as adequate calcium and vitamin D intake, appropriate exercise, smoking cessation, and fall prevention.

HORMONE THERAPY

Some common names

- **Estrogen Oral Preparations**

  conjugated equine estrogen (Premarin, Cenestin)
  estropipate (Ogen, Ortho-Est)
  esterified estrogen (Estratab)
  micronized estradiol (Estrace)

- **Estrogen/Progesterone Oral Preparations**
  conjugated equine estrogen/medroxyprogesterone (Prempro, Premphase)
  ethinyl-estradiol/norethindrone (Femhrt 1/5)

- **Estrogen/Progesterone Transdermal (Skin patch)**
  estradiol (Alora, Climara, Estraderm, Vivelle)
  estradiol/norethindrone (Combipatch)

- **What is hormone therapy?**

Hormone therapy is intended to replace the hormones that your ovaries stop making at menopause. It can consist of estrogen alone (also referred to as estrogen replacement therapy/ERT) or estrogen in combination with progesterone (also referred to as hormone replacement therapy/HRT). When used to prevent and treat osteoporosis, hormone therapy is not intended to *restore* a woman's pre-menopausal hormone levels, but to provide her with the lowest *levels* of estrogen required to protect her bones against osteoporosis.

- **What does hormone therapy do?**

The exact way that estrogen works to prevent bone loss is not known. Estrogen is known to be important in maintaining the balance between bone loss and bone gain, by slowing the rate of bone erosion. Progesterone has no effect on bone, but appears to protect the woman's uterus from endometrial cancer (a risk of estrogen therapy alone).

- **When is hormone therapy used?**

For many women, the decision to take estrogen is a difficult one. ERT may prevent osteoporosis and may have other benefits such as reducing the risks of heart disease and, possibly, Alzheimer's disease and colon cancer. On the other hand, it may increase the risk of breast cancer, and it may aggravate other disorders, such as lupus. Therefore, a woman should discuss the risks and benefits of taking this medication with her physician. Personal current health and medical history, and future health risks should be taken into account before a decision is made.

Hormone therapy is an effective treatment for osteoporosis in postmenopausal women, even if a woman is many years past menopause. Other women who may benefit are menopausal women who also have other risk factors for osteoporosis. Women who have an early or surgical menopause will benefit from an earlier initiation of estrogen therapy, as will postmenopausal women with low bone density and several risk factors for osteoporosis.

- **How is it taken?**

Hormone therapy can be taken by mouth, or through the use of a skin patch. Your physician can prescribe a number of different ways to take hormone therapy. You and your physician can discuss which is best for you.

- **What are the side effects?**

In addition to the slight increase in the risk of breast cancer, hormone therapy can have a number of more immediate side effects, including breast tenderness, headaches, depression, skin irritation, symptoms mimicking premenstrual syndrome, and weight gain.

- **What precautions are there with hormone therapy?**

Hormone therapy should not be given to women with a history of unexplained vaginal bleeding, active liver disease, breast cancer, or a history of blood clots.

Important Notes:

- If you experience irregular bleeding while on hormone therapy, you should report this to your physician.

- Carefully monitor your breast health when taking hormone therapy (necessary throughout your life!)

SELECTIVE ESTROGEN RECEPTOR MODULATORS (SERMS)

Common name

- **Raloxifene (Evista)**

- **What are SERMs?**

Raloxifene is a member of a family of drugs called selective estrogen receptor modulators (SERMs), which have proven to be effective in the prevention and treatment of osteoporosis. Raloxifene and other SERMs have a totally different chemical structure than estrogen and other sex hormones. They act like estrogen on some tissues—such as bone—but block estrogen's effect on other tissues such as the uterus and breast.

- **What does raloxifene do?**

Raloxifene acts to increase bone density and to reduce the risk of bone fractures. The exact way that raloxifene works to increase bone density is not known, but it is likely to work like estrogen to slow the breakdown and removal of old bone tissue.

- **When is raloxifene used?**

Raloxifene is used in women with low bone density and in post-menopausal women diagnosed with osteoporosis.

- **How is it taken?**

Raloxifene is taken once daily, by mouth. It can be taken with or without meals, and at any time of the day.

- **What are the side effects?**

Leg cramps and a worsening of hot flashes are the most common side effects. It may increase the risk of blood clots, especially in women with a history of blood clots or risk factors for clots.

- **What precautions are there with raloxifene?**

Raloxifene has not been studied in premenopausal women or in women with a history of breast cancer. Make sure to tell your physician if you have a history of liver disease or blood clots.

Important Notes:

- Raloxifene may reduce a woman's risk of developing breast cancer.
- It also has been shown to reduce the level of LDL-cholesterol (bad cholesterol) and total cholesterol levels.

BISPHOSPHONATES

Some common names

alendronate (Fosamax)
risedronate (Actonel)

- **What are bisphosphonates?**

Bisphosphonates are a relatively new family of non-hormonal drugs, which have proven to be effective in the prevention and treatment of osteoporosis. Postmenopausal women with established osteoporosis, who are unable or unwilling to take hormone therapy, can consider treatment using this class of drugs. These drugs work only on bone, and do not provide relief from menopausal symptoms or any protection against heart disease.

- **What do the bisphosphonates do?**

Bisphosphonates bind permanently to the bone surface and slow the activity of the bone-eroding cells. This allows the bone-building cells to work more effectively, and the result is usually an increase in bone mass. Treatment with bisphosphonates has been shown to increase bone density at the hip, spine and wrist, and reduce the risk of fractures in these bones.

- **When are bisphosphonates used?**

Bisphosphonates target only the bones, while sex hormones relieve the symptoms of menopause, and help protect against cardiovascular disease as well. However, if you are unable or unwilling to take hormone therapy, bisphosphonates offer an attractive alternative. Your physician will help you to decide the treatment best suited to your situation.

Bisphosphonates are also used in the treatment of medication-associated (for example, steroids) osteoporosis.

- **How are they taken?**

Bisphosphonates are taken once daily, by mouth. To enhance absorption, they are taken upon rising in the morning, on an empty stomach with eight ounces of water. After swallowing the tablet, wait at least thirty minutes before eating and drinking or taking other medications—including calcium supplements. It is important that you remain in an upright position, that is, sitting or standing, for at least 30 minutes after taking bisphosphonates.

- **What are the side effects?**

The side effects of bisphosphonates are minimal. They may include nausea, abdominal pain or loose bowel movements. In rare instances, hypersensitivity to bisphosphonates causes skin rashes.

While some people find it inconvenient to take bisphosphonates on an empty stomach with no liquids other than water, it is critical that these directions be followed. It is the only way that the body will be able to absorb the drug properly.

- **What precautions are there with bisphosphonates?**

Bisphosphonates should not be taken if you have kidney problems, unless directed by your physician. There is a small risk of ulcers in the esophagus with the use of alendronate, but this is minimized by taking the medication as directed.

Important Notes:

- Bisphosphonates must be taken only with water in order to get the maximum benefit.

- Even drinking orange juice or coffee with these drugs can reduce the effect of the medication.

CALCITONIN

Common names

calcitonin (Miacalcin, Calcimar)

- **What is calcitonin?**

Calcitonin is a naturally occurring peptide hormone that is produced by cells in the thyroid gland. It has a role in the body's response to low levels of calcium, and is used in the treatment of osteoporosis.

- **What does calcitonin do?**

Calcitonin increases bone mineral density, and reduces the risk of spinal fractures by interfering with the cells involved in bone erosion. In some individuals, calcitonin may provide relief from back pain caused by vertebral fractures. It has been used for many years for the treatment of osteoporosis.

- **When is calcitonin used?**

Calcitonin is used to treat women with osteoporosis who are 5 years or more postmenopause. It can be prescribed for women who do not wish to take estrogen, or who cannot tolerate estrogen, or in instances where estrogen is contraindicated. Like all osteoporosis medications, it is most effective when used together with adequate calcium and vitamin D intake.

- **How is it taken?**

Calcitonin is taken either by injection or by nasal spray. Your physician can instruct you on how to take the injectable form. For the nasal spray, one spray per day is recommended, alternating nostrils daily.

- **What are the side effects?**

Nausea is the most common side effect of injectable calcitonin, while irritation of the nose (dryness, itching, tenderness, swelling, sneezing, runny nose), is the most common side effect with nasal calcitonin.

- **What are the precautions with calcitonin?**

Tell your physician if you have ever had any unusual or allergic reaction to calcitonin. Also tell your physician if you are allergic to any other substances, such as any foods, preservatives, or dyes.

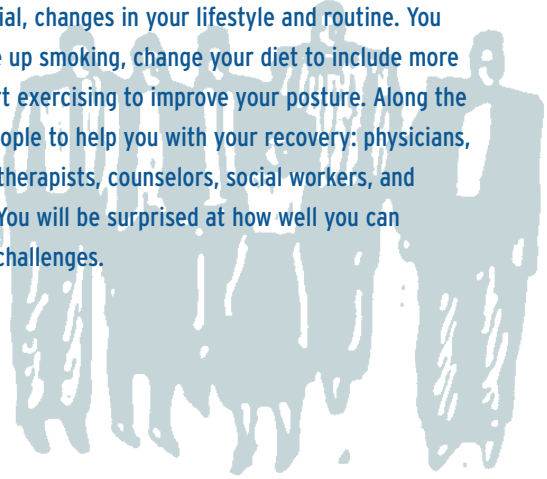
Important Notes:

- The action of calcitonin on bone may decrease with continual use, so your physician may recommend that it be used for short periods of time (for example, 3 months).
- Calcium and vitamin D supplements are usually recommended while taking calcitonin.
- Your physician should provide you with information and instruction on the proper use of the nasal spray.
- Your physician may schedule periodic nasal examinations.

RECOVERING FROM A FRACTURE

If you have fractured a bone weakened by osteoporosis, you know that there is more to the healing process than taking care of the broken bone. You will need to regain strength and mobility, learn fall prevention strategies, begin or continue an osteoporosis treatment program, and learn how to control pain.

Don't be discouraged—even if the treatment plan sounds overwhelming at first. You may be advised to make some necessary, but beneficial, changes in your lifestyle and routine. You may need to give up smoking, change your diet to include more calcium, and start exercising to improve your posture. Along the way there are people to help you with your recovery: physicians, nurses, physical therapists, counselors, social workers, and support groups. You will be surprised at how well you can surmount these challenges.



For additional resources for osteoporosis patient information:

- **National Osteoporosis Foundation**
  1232 22nd Street NW
  Washington, DC 20037-1292
  202-223-2226
  http://www.nof.org

- **National Institutes of Health**
  Osteoporosis and Related Bone Diseases~National Resource Center
  1232 22nd Street, NW
  Washington, DC 20037-1292
  800-624-BONE
  http://www.osteo.org

- **American Academy of Orthopedic Surgeons**
  6300 North River Road
  Rosemont, IL 60018-4262
  800-346-AAOS
  http://www.aaos.org

- **American College of Rheumatology**
  1800 Century Place, Suite 250
  Atlanta, GA 30345
  404-633-3777
  http://www.rheumatology.org

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The information contained in this book reflects current medical knowledge; however, for specific information concerning osteoporosis, the AMA suggests you consult with your physician.

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