Osteoporosis

This educational material was developed by a team of women's health care experts throughout UPMC, including Magee-Womens Hospital, one of the first National Centers of Excellence in Women's Health as designated by the U.S. Department of Health and Human Services.

For help in finding a doctor or health service that suits your needs, call the UPMC Referral Service at 412-647-UPMC (8762) or 1-800-533-UPMC (8762). Select option 1.

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Introduction

Osteoporosis affects more than 10 million Americans — 80 percent of them women. This disease leads to the loss of bone mass, causing bones to weaken and fracture (break). It is often called a "silent thief" or "silent disease" because many women don't know they are affected until a bone breaks.

One in 4 women will develop osteoporosis in her lifetime. A woman's risk of having an osteoporosis-related hip fracture is greater than her risk of developing breast, uterine, and ovarian cancer combined. Fractures related to osteoporosis will happen to 1 in 2 women and 1 in 4 men over age 50.

The disease can be personally devastating. Of the estimated 297,000 individuals who suffer hip fractures each year, 24 percent will die within 1 year, due to complications of the fracture. In addition, 25 percent will need long-term nursing care, and 50 percent of women who break a hip will become disabled, many of them permanently.

Osteoporosis can lead to pain, height loss, difficulty moving around, a deformed backbone that curves forward (sometimes called "dowager's hump"), and the possibility of permanent disability and dependence on others. Women with osteoporosis may suffer from depression due to increased dependence on others, a change in body image, and/or chronic pain.

More than 34 million Americans already have a condition called osteopenia, or low bone mass, which is a warning sign. This makes osteoporosis a major public health threat today.

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Understanding bone

Bone is a living, ever-changing organ made up of several substances. One substance is protein called collagen (KALL-eh-jen). Collagen makes up the framework of bone. Another is calcium phosphate, which is deposited into the framework. Osteoclasts (AH-stee-oh-clasts) are cells that break down bone. Osteoblasts (AH-stee-oh-blasts) are cells that build up bone. These cells are constantly remodeling the bone, just as an old house is remodeled to make it sturdy and new.

In our early years, osteoclasts and osteoblasts can remodel the equivalent of one whole new skeleton every few years. As we grow older, the remodeling process slows down. Around the time of menopause, osteoclasts begin to break down more bone than osteoblasts can replace, and the bones begin to thin.

There are two types of bone: cortical (kor-tih-col) and trabecular (tra-BECK-you-ler). Cortical bone is very dense and hard. It forms the outer layer of most long bones like the upper arm (humerus) and thigh bone (femur). Trabecular bone looks like a honeycomb and is very porous. It makes up the interior of most long bones and the vertebrae in the spine. Trabecular bone is more susceptible to osteoporosis. This is why fractures often occur in the spine, creating the dowager's hump seen in some elderly women with severe osteoporosis.

Bone reaches its peak mass by the time a person has reached 25 or 30 years of age. For this reason, adequate exercise and calcium intake are very important during adolescence and early adulthood. After the age of 30, bone mass begins to decline slowly in both men and women. In women the rate of bone loss increases during the first 5 to 10 years after menopause, when as much as 30 percent of the skeleton can be lost.

This loss occurs because menopause lowers a woman's level of estrogen, the major hormone produced by the ovaries. Estrogen is very important for maintaining bone mass. For this reason, it is important to discuss hormone therapy (HT) with your doctor to prevent osteoporosis. Menopause is also a good time to ask your doctor for a bone density test to measure your bone mass.

By the age of 65, women lose bone at about the same rate as men — which is slower than in the years during and right after menopause.

Osteoporosis risk factors

Medical experts are not completely certain what causes osteoporosis. The primary risk factors for osteoporosis are related to age, gender, family history, use of certain medications, a history of bone fracture in adulthood, and certain medical conditions. Other risk factors are related to race, nutrition, and lifestyle. It is important to remember, however, that many women who develop osteoporosis have no risk factors other than being past menopause.

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Gender: Osteoporosis is much more common in women than in men. Most women don't develop as much bone mass as men during adolescence and young adulthood. Women also lose bone at a greater rate after menopause because of loss of estrogen. In addition, women live longer, so bone loss is greater over time.

Menopause: Menopause is a risk factor because of the reduction in estrogen, which speeds up bone loss.

Early menopause: Women who begin menopause before the age of 45 are at greater risk of developing osteoporosis. This includes undergoing surgical menopause or the removal of both ovaries (oophorectomy).

Menstrual history: Some women stop having their periods as a result of excessive exercise or eating disorders, such as anorexia or bulimia. This is called amenorrhea (AY-men-or-EE-uh). It can increase a woman's risk of developing osteoporosis.

Family history: Women whose mother or grandmother had osteoporosis have a 30 percent increased risk of developing the disease. Less information is available about osteoporosis in men. Men with a family history should ask their doctor about their risk factors.

Race/Ethnicity: Fair-skinned people of Asian and Caucasian descent are more likely to develop osteoporosis than are those with darker skin, such as African Americans. However, women and men of any race can get osteoporosis.

Medications and contraceptives: A history of current or past use of certain medicines can also increase risk. Corticosteroids (steroids), anti-convulsants, thyroid medicines, and prolonged use of blood thinners are examples of some of these medicines. Some experts believe that progestin-only implants and injections used for contraception may have a negative effect on bones.

Diseases: Certain medical conditions increase the likelihood that a person will develop osteoporosis.

Physical inactivity: Lack of regular weight-bearing exercise can make osteoporosis more likely. One study showed that women who spent fewer than 4 hours per day on their feet were at increased risk of developing osteoporosis.

Calcium or vitamin D deficiency: Adequate calcium and vitamin D intake is extremely important throughout life. They are necessary for bone growth during childhood and adolescence and for maintaining bone health.

Poor nutrition: Very thin people often are found to have low bone mass. For this reason, it is important to maintain an adequate weight.

Smoking and alcohol: Both cigarette smoking and drinking alcohol can reduce the body's absorption of calcium and increase the risk of osteoporosis. Additionally, alcohol can lead to falls, which, in people with already weakened bones, can cause fractures. Cigarette smoking has other dangers as well. People who smoke should quit, and those who do not smoke should never start.

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Preventing osteoporosis

Prevention must begin early and continue throughout one's life. Childhood, adolescence, and early adulthood are the best times to build a healthy skeleton. In women, maximum bone mass is formed by the age of 25 to 30. In men, maximum bone mass is developed by age 30 to 35. To prevent osteoporosis, it is crucial to get enough calcium and weight-bearing exercise throughout life.

Nutrition for bone health

As the American population ages, the role of healthy eating habits and its effects on osteoporosis prevention becomes more important. A healthy diet is a key component in keeping bone strong throughout a woman's life.

Smart Food Choices

Use the food guide pyramid (MyPyramid) to plan your intake for overall good health. Start with the food pyramid. Each day, choose a variety of foods from all the food groups to supply nutrients for good health, as well as good bone health. Visit www.mypramid.gov to create a plan that fits your needs.

- Incorporate calcium-rich foods into your meals.
- Use calcium supplements, based on your age and lifestyle, in case your meals do not give you enough calcium.
- Take a multivitamin if you do not eat a variety of foods or if you do not eat vitamin D-rich foods daily.

Calcium and Vitamin D

Calcium is needed for growing and maintaining strong bones. Optimal calcium intake for bone health is the amount needed to:

- maximize peak bone (usually by about age 30)
- maintain adult bone mass
- minimize bone loss in later years

Everyone needs at least 1,200 mg of calcium daily. Women and men over age 65 should get at least 1,500 mg of calcium daily. Menopausal women who are not using hormone therapy should get 1,500 mg each day. Take your calcium in doses of 500 mg or less at a time. Many people find it easy to take a 500 mg supplement at each meal.

Vitamin D is needed for calcium to be absorbed into the bone. Everyone needs 1,000 International Units of Vitamin D each day. You can get enough Vitamin D through 15 minutes of daily exposure to sunlight, or through common foods, like fortified milk and other dairy products. Supplements may be necessary for people who do not get outside or who live in places that do not receive much sunlight.

Be sure to choose enough calcium-rich and vitamin D-rich foods each day. One cup of low-fat or skim milk, 1 serving of low-fat yogurt, or a 1- to 2-ounce serving of most cheeses provide approximately 300 mg of calcium. Calcium can also be found in tofu processed with calcium. Some foods have added calcium, like calcium-fortified brands of juice, breads, cereals, rice, and snack bars. There are many other foods that provide calcium, as the following table shows.

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Calcium-Rich Foods

	Calcium (MG)	Calories	Cholesterol (MG)	Fat (Grams)
Milk Products				
Milk, whole (3.3%), 1 cup	291	150	33	8
Milk, low-fat (1%), 1 cup	300	100	10	3
Milk, skim, 1 cup	302	85	4	Trace
Buttermilk, 1 cup	285	100	9	2
Cheeses				
American, pasteurized process, 1 oz.	174	105	27	9
Cheddar, 1 oz.	204	115	30	9
Cottage, large curd, creamed (4%), 1 cup	135	235	34	10
Cottage, low-fat (2%), 1 cup	155	205	19	4
Mozzarella, part-skim, low-moisture, 1 oz.	207	80	15	5
Swiss, 1 oz.	272	105	26	8
Yogurt				
Plain, low-fat, 8 oz. container	415	145	14	4
Plain, non-fat, 8 oz. container	452	125	4	Trace
Fruit, low-fat, 8 oz. container	345	230	10	2
Desserts				
Ice milk, vanilla, hardened (about 4% fat), 1 cup	176	185	18	6
Ice cream, vanilla hardened (about 11% fat), 1 cup	176	270	59	14
Sherbet, (about 2% fat), 1 cup	103	270	14	4

	Calcium (MG)	Calories	Cholesterol (MG)	Fat (Grams)
Poultry				
Chicken breast, roasted, without skin, 3 1/2 oz.	15	165	85	4
Chicken breast, roasted, with skin, 3 1/2 oz.	14	197	84	8
Turkey, light meat, roasted, without skin, 3 1/2 oz.	19	157	69	3
Turkey, light meat, roasted, with skin, 3 1/2 oz.	21	197	76	8
Eggs				
One egg, large	25	75	213	5
Meat				
Roast beef, eye round, lean and fat, 3 oz.	5	205	62	12
Roast beef, eye round, lean only, 2.6 oz.	3	135	52	5
Ground beef, lean, broiled, 3 oz.	9	230	74	16
Ground beef, regular, broiled, 3 oz.	9	245	76	18
Pork chop, loin, broiled, lean and fat, 3.1 oz.	3	275	84	19
Pork chop, loin, broiled, lean only, 2.5 oz.	4	165	71	8
Lamb, leg, lean and fat, 3 oz.	8	205	78	13
Lamb, leg, lean only, 2.6 oz.	6	140	65	6

continued

(chart continued)	Calcium (MG)	Calories	Cholesterol (MG)	Fat (Grams)
Fish and Shellfish				
Flounder, baked, no added fat, 3 oz.	13	80	59	1
Salmon, red, baked, 3 oz.	26	140	60	5
Trout, rainbow, broiled, 3 oz.	73	129	62	4
Salmon, pink, canned with liquid and bones, 3 oz.	167	120	34	5
Sardines, canned in oil, with bones, 3 oz.	371	175	85	9
Tuna, canned in oil, chunk light, 3 oz.	7	165	55	7
Tuna, canned in water, solid white, 3 oz.	17	135	48	1
Lobster, steamed or boiled, 3 oz.	52	83	61	Trace
Shrimp, steamed or boiled, 3 oz.	33	84	166	1
Almonds, whole, 1 oz.	75	165	0	15
Broccoli, frozen, chopped, cooked, no fat added, 1/2 cup	47	25	0	Trace
Collard greens, frozen, chopped, cooked, no fat added, 1/2 cup	179	30	0	1
Kale, frozen, chopped, cooked, no fat added, 1/2 cup	90	20	0	1
Snap beans, frozen, cooked, no fat added, 1/2 cup	31	18	0	Trace

Source: National Dairy Board

Other Nutrients That Affect Calcium Absorption

Some foods can affect your body's ability to absorb calcium or increase the calcium that leaves your body in urine.

- **Protein:** Limit meats, fish, and poultry to 6 ounces per day.
- **Sodium:** Follow a no-added-salt diet (a diet in which you do not add any salt to your food), limit processed foods (canned and prepared foods such as frozen dinners).
- **Caffeine:** Limit to 300 mg per day (brewed coffee has about 100 mg per 6 ounces).
- **Alcohol:** Limit to 2 drinks per day (1 drink is equal to 1½ ounces of liquor, 4 ounces of wine, or 12 ounces of beer).

Osteoporosis and exercise

Exercise is an important component of an osteoporosis prevention and treatment program. Bones respond to exercise by becoming stronger. Osteoporosis primarily targets the bones of the hips and spine. Therefore, it is important to pay particular attention to these areas.

Weight-Bearing

Weight-bearing exercise is any activity performed in an upright position that forces one to work against gravity. Some examples are walking, jogging, hiking, stair-climbing, and racquet sports. Walking is considered one of the best weight-bearing activities. It is recommended that you walk at a moderate pace for 45 minutes, 4 times a week.

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Posture

Posture exercises strengthen the muscles of the neck and upper back to help maintain proper posture and prevent spinal deformity.

Strength Training

Strength training is a program of performing muscle strengthening exercises with progressively heavier weights. When beginning a strength training program, it is important to consult a health care professional to establish the proper amount of weight and number of repetitions that are safe and effective to perform.

Balance

Our ability to balance declines with passing years. Falling becomes more likely as we age. But falling — often the result of a decrease in one's ability to maintain balance — becomes a significant hazard in life, especially if bones are weak. Developing balance, flexibility, and strength dramatically reduces the risk of falling.

Exercise Facts

- You are never too old to begin an exercise program — exercise can help to improve bone health at any age.
- Getting started is generally the hardest part of an exercise program. Stay motivated by keeping your goal in mind — a stronger, healthier you. And remember, it can take 6 to 12 weeks to notice results.
- The benefits received from exercising last only as long as a program is maintained. This is another good reason to stay with an exercise program.

Guidelines for Exercising

- People over the age of 40 should check with their health care provider before beginning an exercise program.
- Before exercising, do a 5- to 10-minute warm-up to stretch the muscles and reduce the chance of injury.
- At the end of each exercise session, do a cool-down lasting 8- to 10-minutes to decrease muscle soreness.

It is not uncommon to have some muscle soreness when beginning an exercise program. Discomfort that lasts longer than 48 hours may be a sign that you've overdone it.

Testing bone density

A bone density test is a simple, painless procedure to measure the mass, or density, of your bones. Bone density tests use only a small amount of radiation, usually one-tenth or less of what you receive in a chest x-ray or the same amount of radiation as in an airplane flight from Boston to San Francisco. The best test uses a method called DXA (DECK-sa). DXA stands for dual energy x-ray absorptiometry.

For this test, you will be asked to lie perfectly still on a table. A moveable arm passes over the area to be tested (typically the lower spine and one hip). The entire procedure takes about 20 minutes.

The results of the DXA test come as a"t-score." Your t-score compares your bone mass to the "peak" (maximum) bone mass that the average person reaches.

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- **Normal Bone Mass:**
  a t-score rating of –1.0 or higher.
- **Osteopenia or Low Bone Mass:**
  a t-score rating of –1 to –2.5
- **Osteoporosis:** a t-score of –2.5

Your t-score will help your doctor decide what you need to do to protect your bone health.

Hormones and medications

Estrogen

Estrogen is the single most important component in maintaining bone mass in women, especially around the time of menopause. If appropriate, some women can take estrogen throughout menopause to help prevent bone loss. This is called hormone therapy (HT). The preventive benefits of estrogen last only as long as you keep taking estrogen.

The most common side effects of estrogen are tender breasts and nausea. You should not take estrogen if you:

- are pregnant or may become pregnant
- have unexplained vaginal bleeding
- have or are suspected of having breast cancer
- have or are suspected of having an estrogen-dependent tumor
- have active blood clots (thrombophlebitis)

Bisphosphonates

Bisphosphonates (biz-FOS-fo-naytz) can be used to both prevent and treat osteoporosis in men and women. They are non-hormonal drugs. They work by decreasing the action of the osteoclasts, the cells that break down bone. Women who cannot, or who choose not to, take estrogen should consider taking a bisphosphonate. There are 3 FDA-approved bisphosphonates (brand names are in parentheses): alendronate (Fosamax), risedronate (Actonel), and ibandronate (Boniva).

Anyone who takes a bisphosphonate should also take a calcium supplement.

alendronate (Fosamax): available as a once-weekly tablet or a daily tablet

risendronate (Actonel): available as a weekly tablet

ibandronate (Boniva): available as a monthly tablet

Calcitonin

Calcitonin is another agent used to slow bone loss. It is generally reserved for patients unable to take estrogen and/or alendronate. Calcitonin is available as a nasal spray and is generally well-tolerated. It may also help alleviate pain from spinal compression fractures.

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Raloxifene

Raloxifene (Evista) is a selective estrogen receptor modulator (or SERM). Raloxifene protects the bones from bone loss (although probably not as well as estrogen does) and has positive side effects on lipids such as cholesterol. It does not affect breast tissue or uterine tissue and is available in a once-daily pill. A rare but serious side effect of raloxifene is blood clots in the veins. You should not take raloxifene if you:

- are pregnant or could become pregnant
- have had blood clots
- are still having periods and/or hot flashes

Teriparatide

Teriparatide (Forteo) stimulates the growth of new bone. It increases the number and activity of the osteoblasts, the bone-forming cells.

Osteoporosis and safety

Learning to live safely in your home, in your yard, at work — everywhere you go — is important in preventing falls and back injury. It is simple to make your home and yard safe. Follow these tips no matter what your age. By following these suggestions, you can protect yourself from the falls and improper body movements that can result in fractures.

Safety in the House

- Remove or firmly anchor rugs that may slide or bunch up.
- Make sure all rooms have adequate lighting.
- Wear shoes or slippers that grip well while at home. Avoid wearing socks around the house.
- Keep phone cords and electrical wires out of walking paths.
- Keep a flashlight in the bedroom and the kitchen, and occasionally check batteries.
- Keep stairways safe with sturdy railings and non-slip surfaces.
- Equip bathrooms with grab bars, nightlights, and adhesive strips or rubber mats in tubs and showers.
- Avoid couches and chairs that are difficult to get into and out of.

Safety Around the House

- Keep garden hoses coiled.
- Keep garden and yard tools and machinery safely stored while not in use.
- Keep sand or salt near front and back doors during winter.
- Keep walkways and driveways free of leaves, snow, and ice — arrange for help if necessary.
- Avoid shoveling heavy snow or raking wet leaves.
- Keep parking areas clear of debris. Give yourself enough room to get into and out of the car.

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Safety Anywhere

- Watch for small pets or objects on the floor or ground.
- Always use handrails going up and down stairs.
- Ask your doctor if any of your medicines can cause dizziness or otherwise impair your sense of balance.
- Wear shoes that grip well. Avoid high-heeled shoes.
- Use caution when walking near curbs, on wet or icy surfaces, outside at night, and in poorly lit areas.
- Always look where you are walking. "Watch Your Step!"

Safety in Everyday Movements

- Put often-used items within reach. Use reachers for items in high places.
- Avoid using step stools.
- Avoid bending over from the waist. Instead, squat using your knees, keeping your back straight.
- Don't lift heavy objects or do anything that puts excessive strain on your back.
- Remember, it is better to ask for help than to put yourself at risk of injury.
- Avoid extreme forward positions (such as bending over to pick things up without bending your knees). A person with osteoporosis of the spine can get a spinal fracture simply by bending or lifting incorrectly.

Resources

National Osteoporosis Foundation (NOF)
1150 17th Street NW, Suite 500
Washington, DC 20036
Phone: 1-800-223-9994
Web: http://www.nof.org

The NOF is the nation's leading resource for people seeking up-to-date, medically sound information on the causes, prevention, detection, and treatment of osteoporosis.

North American Menopause Society (NAMS)
P.O. Box 94527
Cleveland, OH 44101
Phone: 216-844-8748
Fax: 216-844-8708

Automated Consumer Request Line
Phone: 1-800-774-5342
E-mail: info@menopause.org
Web: http://www.menopause.org

NAMS is a non-profit organization dedicated to promoting the understanding of menopause and improving the health of women as they approach menopause and beyond.

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Older Women's League (OWL)
666 Eleventh Street NW, Suite 700
Washington, DC 20001
Phone: 202-783-6686

OWL is a membership organization dedicated to addressing the needs of women as they age.

American College of Obstetricians and Gynecologists (ACOG) Resource Center
P.O. Box 96920
Washington, DC 20090-6920
Web: http://www.acog.com

No calls; send self-addressed, stamped envelope.

American Association of Clinical Endocrinologists (AACE)
1000 Riverside Avenue, Suite 205
Jacksonville, FL 32204
Phone: 1-800-393-2223
Web: http://www.aace.com