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Bone Health Issue

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Programs Promoting
Musculoskeletal Health

Bone Health 101

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Many of us may think that our bones are solid, unchanging structures. But nothing could be farther from the truth. Our bones are constantly under construction, with cells called osteoclasts breaking down bone (a process called "resorption") and cells called osteoblasts building new bone. Keeping bone breakdown and bone building in balance is vital for maintaining proper bone health.

As we age, maintaining this balance becomes more of a challenge. We start building bone density when we are young, and this continues until about age 30, when bone density reaches its peak. From then on, bone density declines—a process that can be further fueled by other risk factors. While there are some factors we can't change (such as age, gender, or race), there are other environmental factors that are under our control. With attention to our diets, exercise regimens, and medical conditions, there are steps we can take to achieve and maintain optimal bone health.

Osteopenia vs. Osteoporosis

According to the National Osteoporosis Foundation (NOF), 10 million Americans have osteoporosis, and another 34 million have osteopenia. What's the difference?

Osteopenia means low bone density. It is a condition that could lead to osteoporosis (porous bone), but doesn't always. If you have osteopenia, it is important to speak with your healthcare provider about steps to keep your bones healthy. People with osteopenia and osteoporosis have an increased risk of fractures.

Bone density is measured using a scan called a DXA ("dual-energy X-ray absorptiometry"). This tool measures bone density in the spine, hip, and wrist to generate a T-score. A T-score of 1.0 to -1.0 is considered normal bone density. People with a T-score of -1.1 to -2.4 have osteopenia. Those with a T-score of -2.5 and below have osteoporosis, indicating that there are problems with the architecture of the bones.

The T-score compares your bone density to an average healthy 30-year-old who has reached peak bone density. This score is used to diagnose osteoporosis in postmenopausal women and in men age 50 and older. It differs from a Z-score, which compares your



bone density to someone of your age, gender, and body size. The Z-score is used to diagnose osteoporosis in premenopausal women and in men under 50, in addition to children and young adults. (The Z-score may also indicate osteoporosis that develops due to medications or other illnesses.)

Osteopenia and osteoporosis are "silent diseases" because they produce no symptoms. You cannot "see" or "feel" your bones getting weaker. People typically don't learn they have a problem with their bones unless they've experienced a fracture or they had a bone density test. According to the NOF, DXA scanning for bone density should begin by age 65 in women and by age 70 in men. People with other risk *continued on page 2*

factors may need to begin screening earlier (see chart on page 10).

A urine test for N-telopeptide (NTx) is also used to assess bone health. NTx is a marker of bone resorption, and elevated levels in the urine may signal bone loss. This simple test is not used in place of a DXA scan, but can help to monitor someone already diagnosed with osteopenia or osteoporosis. It may also be useful to monitor patients whose DXA scans show that their bone density is declining.

What Causes Osteopenia and Osteoporosis?

The following risk factors for declining bone density cannot be changed:

- **Age:** We all lose bone as we age past 30.
- **Gender:** Women are at greater risk for osteopenia and osteoporosis due to their smaller bone structure. The decline in estrogen levels after menopause can also fuel bone loss, since estrogen protects the bone.
- **A history of fracture:** People who had fractures as adults or who have a family history of fractures in adulthood are at increased risk.
- **Race:** Osteopenia and osteoporosis are more common in whites, Hispanics, and Asians.
- **Other medical conditions:** Osteopenia and osteoporosis risk is elevated in people with overactive thyroids and increased parathyroid activity (which cause the body to draw more calcium from the bones); celiac disease, Crohn's disease, and ulcerative colitis (due to poor absorption of nutrients in the intestine); and inflammatory conditions such as rheumatoid arthritis and lupus (which may be treated with steroid medications that adversely affect the bones). These are just a few of the medical conditions that could lead to bone loss. It is important to speak with your healthcare provider if you have any concerns regarding your medical conditions and your bone health.

These risk factors for osteopenia and osteoporosis can be modified:

- **Low intake of calcium and vitamin D:** These nutrients work in tandem to build healthy bones. See related articles on page 6 and 8 regarding dietary sources of calcium and vitamin D and supplements.
- **Sedentary lifestyle:** People who lead an active lifestyle have stronger bones than those whose lives are sedentary. Two types of exercise are important for your bones: weight-bearing activity and resistance/strengthening exercises. You should consult your healthcare provider before beginning any new exercise program. See the article on page 4 for more information.
- **Smoking:** There are chemicals in tobacco smoke that are bad for bone cells and may inhibit calcium absorption. If you smoke, see your doctor for guidance on how to quit.
- **Too much alcohol:** Consuming three or more alcoholic drinks per day impairs

bone health. Over-imbibing can also impede your balance and increase your risk of falling.

- **Medications:** Certain medications are not good for bone health, including: corticosteroids for inflammatory diseases (5 mg or more daily for three months or more); antiseizure drugs such as phenobarbital; lithium (used for depression); proton pump inhibitors (used to treat chronic heartburn), such as omeprazole (Prilosec®) and esomeprazole (Nexium®); antidepressants called selective serotonin reuptake inhibitors, such as fluoxetine (Prozac®), paroxetine (Paxil®), and sertraline (Zoloft®); and aromatase inhibitors such as anastrozole (Arimidex®), exemestane (Aromasin®), and letrozole (Femara®), which are used to treat advanced breast cancer and block estrogen production. If you are taking any of these medications, speak with your healthcare provider
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When Should You Have a Bone Density Test?

The National Osteoporosis Foundation recommends that you have a bone density test if:

- you are a woman age 65 or older
- you are a man age 70 or older
- you break a bone after age 50
- you are a woman of menopausal age with other risk factors
- you are a postmenopausal woman under age 65 with other risk factors
- you are a man age 50-69 with other risk factors
- you are a postmenopausal woman who has stopped hormone replacement therapy (HRT)
- you have a medical condition or are taking certain medications that could contribute to bone loss
- you are being treated for osteoporosis

A bone density test may also be necessary if:

- an x-ray of your spine shows a break or bone loss
- you have back pain, with a possible break in your spine
- you experience a loss of height ½ inch or more within a year
- you have experienced a total height loss of 1½ inches from your original height

When It's Time to Treat Your Bones

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There are many medications on the market today for treating osteopenia and osteoporosis, but how do you know if, or when, you might need to take one?

While each person's situation is unique, doctors generally recommend these medications for anyone who has been diagnosed with osteoporosis and for people with osteopenia (low bone density) who have an elevated risk of experiencing a fracture in the next ten years.

If you need medication to improve your bone health, your doctor will speak with you about the various treatment options available. Some are in pill form and are taken as often as every day or as little as once a month, while others are given even less frequently as injections or intravenous infusions. The choice is based on your medical history and ability to tolerate certain forms of medication. Whichever medicine is used, the goal is to reduce your risk of fractures. It's best to have a conversation with your doctor to see which treatment option might be best for you.

Who Needs Osteoporosis Medication?

Your doctor will speak with you about starting osteoporosis medication if:

- You have osteoporosis, as indicated by a T-score of -2.5 or less after a DXA scan.
- You have osteopenia (low bone density)

and an elevated risk of experiencing a fracture in the next ten years. People with osteopenia have T-scores of -1.1 to -2.4. If you fall into this category, your doctor may use the online FRAX tool (www.shef.ac.uk/FRAX/tool.jsp) to estimate your risk of having a fracture in the next decade. FRAX takes into account



your age, sex, weight, height, smoking status, alcohol use, and medical history to compute your risk. If the FRAX score shows your risk of a hip fracture is 3 percent or more or your risk of a fracture at another site is 20 percent or more in the next decade, your doctor may consider medication.

- You've already had a fracture in your hip or spine.

Types of Osteoporosis Medication

There are two classes of osteoporosis medications: those that slow bone loss and those that promote the building of new bone. Most medications on the market reduce bone loss. Examples include:

- **Bisphosphonates:** You're probably most familiar with these drugs. They've been shown to reduce the risk of hip and other fractures. Examples include alendronate (the only generic drug in this class, also available under the drug name Fosamax®), ibandronate (Boniva®), and risedronate (Actonel® and Atelvia®), which are tablets taken orally daily, weekly, twice monthly, or monthly, depending on the formulation; zoledronic acid (Reclast®) is given intra-
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Medications for Bone Health

Drug	Class	Form	Frequency
Alendronate (Fosamax®)	Bisphosphonate	Oral tablet	Daily or weekly
Ibandronate (Boniva®)	Bisphosphonate	Oral tablet or intravenous injection	Monthly for tablet, four times a year for IV injection
Risedronate (Actonel®, Atelvia®)	Bisphosphonate	Oral tablet	Daily, weekly, twice monthly, or monthly
Zoledronic acid (Reclast®)	Bisphosphonate	Intravenous infusion	Once a year
Denosumab (Prolia®)	RANK ligand inhibitor	Injection	Every six months
Raloxifene (Evista®)	Selective estrogen receptor modulator	Oral tablet	Daily
Teriparatide (Forteo®)	Parathyroid hormone	Injection	Daily for two years

Get Moving to Build Your Bones

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What do a can of soup, the back of a chair, and a stairway have in common? They are all items you may find in or near your home to help you build and maintain strong, healthy bones through exercise.

Studies have demonstrated that exercise in general, and resistance exercise in particular, increase bone density. Weight-bearing activity is best. Competitive weight lifters have the strongest bone density. But you don't have to hoist 400 pounds over your head to obtain benefits; there are ways you can incorporate resistance exercises into your daily routine. Some you already know; others you can learn in an exercise class or from a physical therapist (particularly if you already have osteopenia or osteoporosis).

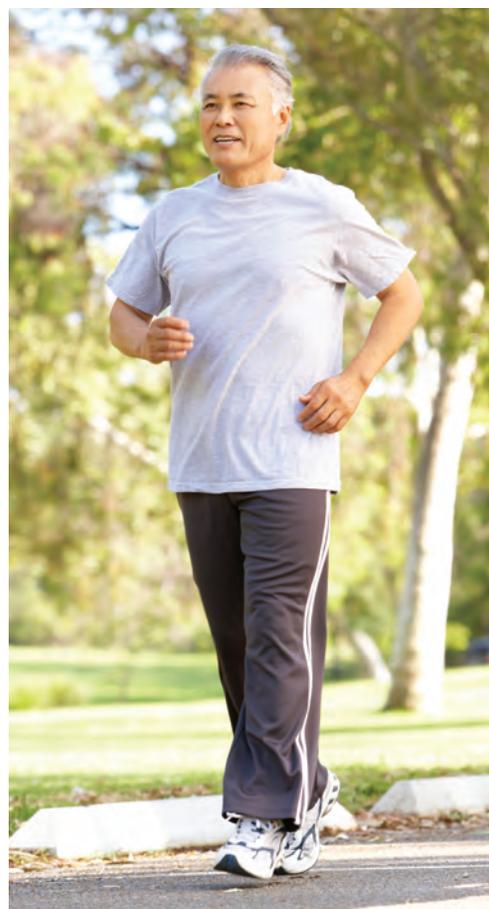
Hospital for Special Surgery recommends a 5-Point Program of exercise focusing on these components: posture, flexibility, strengthening, weight-bearing, and balance. Here are some simple exercises that encompass these five points:

- Walking and stair-climbing are the easiest and most accessible strengthening and weight-bearing activities. They put a healthy dose of stress on your bones and joints. They also help you fine-tune your balance, since you have to shift from one foot to the other.
- Use of an exercise band, a long wide elastic band, can strengthen both your arms and legs with gentle resistance that you control.

- “Weight-lifting” a can of soup in each hand can help increase strength in your arms and shoulders. Just be sure you are steady so you don't drop them! It may be safest to do these exercises sitting on a chair.
- T'ai chi and yoga are excellent for balance and posture.
- Pilates can help you build a strong core, which is also good for balance, strength, and posture, and yoga can help you increase your flexibility. But if you already have osteoporosis or osteopenia, be sure to tell your instructor ahead of time so you can learn if there are certain positions you should avoid (such as curving your spine forward).
- To hone your balance, stand on a sturdy surface and stand on one leg at a time, holding for 20 to 30 seconds. Have a chair nearby to grab onto in case you feel like you may fall, or simply put the raised foot down if you feel shaky. Over time, you'll get better at it, and may even be able to do it with your eyes closed!
- To increase your flexibility, start slowly and be sure to stretch both sides. An

instructor or physical therapist can teach you exercises to stretch the fronts and backs of your legs, your hips, your arms, and your pectoral (chest) muscles. People who hunch forward often develop tight chest muscles and over-stretched back muscles, so stretching the pectoral muscles can help improve your posture. Hold each stretch for 20 to 30 seconds, and don't bounce.

Just as there are exercises you can do to build your bone density, there are also some you should avoid if you have osteopenia or osteoporosis. Don't bend forward in any position that curves the spine; this can put you at risk of silent fractures of the vertebrae, which over time lead to loss of height. If you need to pick up something from the floor, squat down to get it or get a “grabber” tool to reach it for you. Bend from the hips and knees. When getting out of bed, roll to the



HSS 5-Point Program for Bone-Building Exercise

The 5-Point Program of exercise can help you improve your bone health, reducing your risk of osteopenia and osteoporosis. Here are some exercises that achieve the 5 Points:

1. **Posture:** Walking, Pilates, yoga, stretching of the pectoral muscles
2. **Flexibility:** Stretching, yoga
3. **Strengthening:** Walking, stair-climbing, weight-lifting, Thera-band, Pilates
4. **Weight-bearing:** Walking, running (if permissible), weight-lifting
5. **Balance:** T'ai chi, standing on one foot, walking, stair-climbing, Pilates

10 Ways You Can Reduce Your Risk of Falling

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side and push yourself up, rather than curving forward to sit up. And don't do abdominal crunches, which curve your spine; check with an exercise instructor or physical therapist about other ways to strengthen your core muscles.

Check with your insurance company to see if it covers physical therapy if you have osteopenia or osteoporosis. For people with Medicare, up to four visits with a physical therapist are approved. Hospital for Special Surgery also offers fitness classes; for more information, visit www.hss.edu/classes-programs.

Moreover, resistance exercise isn't just for adults. The more adolescents exercise, the more bone mass they build, too, "banking" bone density for their adult years. If you have children, make exercise a family affair so you can all build strong, healthy bones together! ■

"Pick yourself up, dust yourself off, and start all over again." So goes the old song. But for people with osteoporosis, a fall can have dire consequences, such as a hip fracture. According to the National Osteoporosis Foundation, 24 percent of people who suffer a hip fracture die within the following year, due to complications of surgery or the fracture itself.

The U.S. Centers for Disease Control and Prevention (CDC) adds that among adults age 65 or older, falls are the leading cause of death from an injury. They are also the most common cause of nonfatal injuries and hospital admissions for trauma. Most fractures among older adults are caused by falls, the most common being fractures of the spine, hip, forearm, leg, ankle, pelvis, upper arm, and hand.

Some 2 million fractures occur among people with osteoporosis each year, costing the nation \$19 billion — a number that is expected to rise to \$25 billion by 2025, when 3 million fractures may occur (due to the aging of the population). A fall can trigger a downward spiral, with hospitalization possibly followed by nursing home care and a loss of independence. Feelings of depression and isolation may follow.

How can you prevent this cascade of events? By taking care of yourself and mak-

ing a few adjustments to your surroundings, you can dramatically reduce your risk of a fall. Here are ten ways to start:

- 1 Have a falls evaluation and balance test.** A physical therapist can examine you to assess your balance and other factors in your life that may affect your risk of falling. An occupational therapist can visit your home to do a safety evaluation and assess your living situation, and give you recommendations on how to modify your environment to reduce your risk of falling.
 - 2 Get an annual eye exam.** It's not unusual for people to fall because their vision is impaired and they misjudged a step. If you have been prescribed glasses or contact lenses, be sure to wear them, and keep your prescription up to date. If you recently had a
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Feed Your Bones!

Laura Gibofsky, MS, RD | Clinical Nutritionist

With our bones undergoing constant remodeling each day, it's important that we have the nutrients we need to build and maintain new bone. Calcium and vitamin D work in concert: Your bones need calcium to stay strong, and vitamin D helps the bones absorb calcium. There are many excellent sources of both nutrients in the foods we can eat; we just have to be sure to choose the right ones.

Your body gets the calcium it needs in one of two ways. The first and best way is through the foods you eat. However, if you're not consuming enough calcium, your body will get it in a different way: pulling it from your bones, where it is stored. That's why diet is key.

The best source of dietary calcium is dairy products. Many dairy products on the market are high in fat (such as ice cream and most cheeses, which are not good for heart health), so it's important to stick with low-fat dairy products such as yogurt, low-fat or fat-free milk, and reduced-fat cheeses. All forms of milk, no matter what their fat content, have the same amount of calcium. As a guideline, one 8-ounce glass of milk

contains about 300 mg of calcium, so three glasses of milk daily would meet most people's needs. (See the chart on page 7 for Recommended Daily Allowances.)

If you can't tolerate dairy due to lactose intolerance, taking a lactase tablet (the enzyme that breaks down lactose, a milk sugar) or buying products with lactase in them already can make them more tolerable. If you can't consume dairy products due to personal taste or religious reasons, there are other foods you can eat that are naturally high in calcium. Examples include dark leafy greens such as kale, collard greens, broccoli, and spinach.

Fish with soft bones that you can eat, such as sardines and canned salmon, are

excellent natural sources of calcium. Finally, many non-dairy foods are available which are fortified with calcium. Examples include orange juice, breads, whole grain cereals, tofu, and other fortified foods.

Vitamin D is found in dairy products, eggs, salmon, and mackerel. Many manufactured foods come fortified with vitamin D. The body also makes vitamin D when the skin is directly exposed to the sun. However, the amount of vitamin D your skin makes depends on the time of day, season, geographic latitude, cloud cover, smog, and other factors.

For example, sun exposure during the winter months in areas of the northeast is insufficient to produce significant vitamin D in the skin. People who can't be exposed to the sun due to an increased risk of skin cancer and those being treated with certain medications that make the skin more sensitive to the sun should be extra vigilant to get their vitamin D from other sources. Therefore, it is very important to include good sources of vitamin D in your diet, and not rely on the sun as your primary source of this nutrient.

Just as vitamin D promotes calcium absorption, there are nutrients which can inhibit it. Sodium is a prime example; it interferes with calcium absorption, giving you another reason to avoid a high-salt diet. Iron supplements can also diminish calcium absorption, so people who take both calcium and iron supplements should space them apart by about two to three hours. (See the article on page 8 for more information on supplements.)

Adequate intake of calcium and vitamin D begins before birth. It's important for pregnant women, children, and young adults to take in as much dietary calcium and vitamin D as they can, when they are building new bone, so they will be prepared for later life, when bone density naturally diminishes with age.

Start feeding your bones early and often, and your body will thank you later! ■



Foods High in Calcium	Mg of Calcium per Serving
Yogurt, plain, low-fat, 8 ounces	415
Orange juice, calcium-fortified, 6 ounces	375
Milk, 8 ounces	299
Soy beverage, calcium-fortified, 8 ounces	80–500
Tofu, firm, made with calcium sulfate, ½ cup	253
Tofu, soft, made with calcium sulfate, ½ cup	138
Cottage cheese, 1% milk fat, 1 cup	138
Hard cheese (cheddar), 1.5 ounces	307
Ice cream, vanilla, ½ cup	84
Sour cream, reduced fat, cultured, 2 tablespoons	31
Salmon, pink, canned, solids with bone, 3 ounces	181
Sardines, canned in oil, with bones, 3 ounces	325
Breakfast cereal, calcium-fortified, 1 cup	100–1,000
Bread, white, fortified, 1 slice	73
Turnip greens, fresh, boiled, ½ cup	99
Kale, fresh, cooked, 1 cup	94
Kale, raw, chopped, 1 cup	90
Chinese cabbage, bok choy, raw, shredded, 1 cup	74
Broccoli, raw, ½ cup	21
Foods High in Vitamin D	IU of Vitamin D per Serving
Cod liver oil, 1 tablespoon	1,360
Swordfish, cooked, 3 ounces	566
Salmon (sockeye), cooked, 3 ounces	447
Tuna fish, canned in water, drained, 3 ounces	154
Orange juice, vitamin D-fortified, 1 cup (check product labels, as amount of added vitamin D varies)	137
Milk, nonfat, reduced fat, and whole, vitamin D-fortified, 1 cup	115-124
Yogurt, vitamin D-fortified, 6 ounces	80
Margarine, vitamin D-fortified, 1 tablespoon	60
Sardines, canned in oil, drained, 2 sardines	46
Liver, beef, cooked, 3 ounces	42
Egg, 1 large (vitamin D is found in yolk)	41
Ready-to-eat cereal, vitamin D-fortified, 0.75-1 cup	40

Chart Source: Office of Dietary Supplements, National Institutes of Health

10 Ways, continued from page 5
stroke, be sure to get your eyes checked, since such neurologic events can affect your vision.

3 Install proper lighting, especially in hallways and bathrooms. Most falls happen when people are in or on their way to the bathroom at night. Nightlights in your hallways and bathrooms can guide you safely to your destination. Also be sure that the lighting in the rest of your house is sufficient to help you get from one area to another safely.

4 And speaking of bathrooms....Don't wait until the last minute to go. Many
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Potential Hazards in the Home

How many of these hazards do you have in your house? They can increase your risk of falling. Taking steps to correct them will improve your safety.

- Throw rugs
- Slippery shower/bathtub
- Clutter on the floor in major walkways
- Loose stairway railing or steps
- No nightlights in bedroom hallways or bathroom
- Poor lighting in apartment building hallway
- Wet floors
- Uneven indoor floor or outdoor walkway
- A pet that sits on the stairs
- Badly cracked sidewalk or driveway
- Moss on outside steps
- Light burned out over front walk/driveway
- Icy outdoor walkway

To D or Not to D? The Case for Supplements

Richard Bockman, MD, PhD | Attending Physician | Associate Senior Scientist

Every day, some 10,000 mg of calcium moves out of our bones and through our bodies. Some is used to meet the metabolic needs of various tissues, and some is excreted through our kidneys and intestines. While most of the calcium is returned to the bones, some 200 to 300 mg is lost. If you don't replenish that 200 to 300 mg of calcium through your diet, you experience a growing deficit of calcium from your bones. Over time, that could lead to bones that are less dense and more prone to fractures. Since our intestines are only about 30 percent efficient at absorbing calcium, you need to take in 800 to 1,000 mg of calcium a day just to even things out.

While dairy products, certain types of fish, and fortified foods are excellent and balanced sources of calcium and vitamin D, more than half of us fail to get what we need from the typical American diet. That's where supplementation comes in.

From as early as birth, we need at least 200 mg of calcium and 400 IU (international units) of vitamin D a day to provide adequate calcium for bone balance. Those needs rise as we age, with calcium needs peaking between the ages of 9 and 18 (1,300 mg), when our bones build significant density. In fact, 85 percent of bone mass is acquired by age 18 in females and age 20 in males. Older adults continue to need calcium to maintain bone balance. Along with calcium, vitamin D is required to facilitate the absorption of calcium from

the intestinal tract and to push that absorbed calcium into our bones. (See chart below for Recommended Daily Allowances, or RDA.)

Calcium and vitamin D are not only good for preventing osteopenia and osteoporosis; they also enhance the effects of osteoporosis treatment in people taking drugs such as bisphosphonates, which are used to slow bone loss. People who have inadequate blood levels of vitamin D are less likely to respond to these drugs than those with adequate levels.

A Subject of Debate

Calcium and vitamin D supplementation has not been without its skeptics. A review article published in the British Medical Journal (BMJ) in 2010 looked at the

results of several studies of calcium supplements and concluded that calcium supplements taken alone may increase the risk of a non-fatal heart attack. However, this review contradicted a prior summary article. Neither of these "summary" articles were pure prospective, randomized clinical trials the gold standard of medical research. In prospective randomized clinical trials, researchers compare two or more equivalent groups of participants who are randomly assigned to follow a certain regimen (for example, supplements or no supplements), and they follow the study subjects forward through time. Furthermore, the BMJ analysis was a summary article that explored the effect of calcium supplementation only on heart attack risk, when in fact the U.S. Food and Drug Administration recommends that a composite endpoint of non-fatal heart attack, sudden death, and stroke (which truly define "cardiovascular disease") is the most valid one for determining whether a drug or supplement increases cardiovascular risk.

Since the BMJ review, a prospective, randomized clinical trial has been pub-

Calcium and vitamin D are not only good for preventing osteopenia and osteoporosis; they also enhance the effects of osteoporosis treatment in people taking drugs such as bisphosphonates, which are used to slow bone loss.

Recommended Daily Allowances (RDA)

Age	Calcium	Vitamin D
Birth to 1 year	200-260 mg	400 IU
1-3 years	700 mg	600 IU
4-8 years	1,000 mg	600 IU
9-18 years	1,300 mg	600 IU
19-50 years	1,000 mg	600 IU
51-70 years	1,000 mg (men) 1,200-1,300 (women)	600 IU
71 years and older	1,200-1,300 mg	800 IU

These are the RDA values for calcium and vitamin D according to the Institute of Medicine.

lished with a 9.5 year follow-up, and it did not show an increased risk of cardiovascular disease with calcium supplementation. The study, led by Australian researchers, reported that among older women who received 1,200 mg of calcium or a placebo daily for five years and who were followed for an additional four and a half years, those in the calcium group did not have an increased risk of cardiovascular disease. The Professional Practice Committee of the American Society of Bone and Mineral Research has thoroughly reviewed the topic and recently reported that “the weight of the evidence is insufficient to conclude that calcium supplements cause adverse cardiovascular events. Nevertheless, the debate continues.” The recent report by the Institute of Medicine has similarly concluded that supplementation below 2,000 mg of calcium a day is “safe.”

Vitamin D, too, seems to frequently be in the news. In June 2012, the U.S. Preventive Services Task Force concluded that taking up to 400 IU of vitamin D and 1,000 mg of calcium daily is of no benefit for re-

ducing the risk of fractures among postmenopausal women. But what about higher doses? The RDA for vitamin D in postmenopausal women is actually 600-800 IU (not 400), and the RDA for calcium is 1,200-1,300 mg (not 1,000).

These RDA values are backed up by solid scientific evidence. In a 2003 randomized controlled study, people who received an average of 800 IU of vitamin D per day (achieved by giving 100,000 IU every four months) experienced a reduction in their fracture risk. A major analysis published in July 2012 in the *New England Journal of Medicine* concluded that people age 65 and older who took at least 800 IU of vitamin D each day experienced a 30 percent reduction in the risk of hip fracture and a 14 percent reduction in the risk of any fracture outside the spine.

Because vitamin D can be stored in body fat (as opposed to being excreted in the urine, like vitamins B or C), there is a maximum recommended vitamin D dose. The Institute of Medicine has stated that up to 4,000 IU of vitamin D daily is safe for people age 9 and older (1,000 to 3,000 IU for those under age

9). A review by the Endocrine Society notes that up to 10,000 IU may be required.

What Kind Should You Take?

There are different kinds of calcium and vitamin D supplements. Calcium carbonate is the most widely used, due to its low cost and its ability to be dosed in chewable form, effervescent drinks, and syrups, which can make it palatable for people who have trouble swallowing pills. Calcium carbonate is best taken with food; the stomach acid your body produces while eating helps enhance the calcium absorption.

Another form of calcium is calcium citrate; it can be taken with or without food because it does not require stomach acid to facilitate absorption. Other forms of calcium in supplements include calcium citrate maleate, calcium gluconate, calcium lactate, calcium lactogluconate, and tricalcium phosphate, but they are not used as commonly as calcium carbonate and calcium citrate.

Calcium is most effectively absorbed when consumed in amounts of 500-600 mg or less at a time. If you take 1,000 mg of calcium a day, it's best to divide it into two or more doses taken throughout the day.

As for vitamin D, the vitamin D3 formulation—the same form of vitamin D that our bodies make when we are exposed to sunlight—is believed to be more effective biologically than vitamin D2.

The required intake of calcium and vitamin D can vary from person to person, depending on our ability to absorb the supplements and to convert vitamin D to active circulating metabolites, since these levels can be altered by our medications and medical conditions. It is important to speak with your healthcare provider before starting any new supplements or when changing or adding other medications or supplements. ■



10 Ways, continued from page 7

people who fall do so because they are in a rush to get to the bathroom.

5 Drink plenty of water. Dehydration can make you feel dizzy or light-headed, which may increase the risk of falling. Drink at least six to eight glasses of water daily.

6 Check your medications. Speak with your doctor to see if any of the medications you are taking may cause dizziness. If you feel dizzy upon taking a new medication, be sure to let your doctor know. There may be other drugs you can take.

7 Declutter your home. Keep walkways in your home clear of items that you may trip over. Remove throw rugs,

which can slide or get pulled up under a walker, and replace them with wall-to-wall carpeting or just the hard floor.

8 Install safety devices. Grab bars near the toilet and in the shower can help you keep your balance. Consider adding an extra railing to a stairway opposite the existing banister, so you have two railings for support as you go up and down the steps. Use a cane or walker if you need added stability.

9 Clear the way outside, too. Uneven surfaces outside your house can also increase your risk of falls. Have sidewalk cracks repaired. Make sure outdoor walkways are clear of snow and

ice, and salted to prevent further icing. Consider installing a railing along your front walk. Use proper outdoor lighting so you don't fall when you venture outside after dark.

10 Get fit. One of the best ways to prevent falls is an exercise program that builds your strength and balance. Doing so will make it easier to get in and out of chairs and cars, go up and down stairs, and go about your activities of daily living with more ease and stability. See the article on page 4 for exercise ideas.

A little extra care and some advanced planning can decrease your chance of falling and help maintain your independence and mobility! ■

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about when you should have bone density screening, and how often.

Men and Osteoporosis

While we often think of osteoporosis as a disease of women, two million American men have the disease, too. A quarter of all men over age 50 experience a hip fracture in their lifetimes. Men typically experience such fractures about ten years later than women, due to their increased bone mass. However, the risk of dying within a year of a hip fracture is twice as high for men than for women, most likely because of their older age. So it is important for men to pay attention to their bone health as well.

A Growing Problem

As the population ages, Baby Boomers progress through their retirement years, and people live longer, the country can expect to witness a dramatic rise in the number of people with osteopenia and osteoporosis and associated fractures. This increase will be accompanied by an increased burden on patients, their families, and society as a whole.

Bone health is manageable, and there are steps you can take to reduce your risk of low bone density. Talking with your health-care provider is a great place to start; find out what you can do and when you should begin bone density screening. Your bones depend on it. ■

When It's Time, continued from page 3

venously once a year. Potential side effects include unusual stress fracture of the femur (thighbone), muscle and joint aches, inflammation of the eye, esophageal cancer, and osteonecrosis of the jaw (a breakdown of the jaw bone), but these effects are rare. To reduce the risk of side effects, patients should speak to their doctors about taking a "drug holiday," stopping for one to five years after using these medications for five years, since the benefits of these drugs on bone health can last for five years after taking them. Because of the osteonecrosis risk, patients are also advised to see their dentists for regular check-ups.

- Denosumab (Prolia®): This drug is given as a subcutaneous injection (under the skin) every six months in your doctor's office. It works differently than bisphosphonates, reducing bone loss by blocking a protein called "RANK ligand." Potential side effects include jaw osteonecrosis, eczema, and a possible elevated risk of infection.

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Bone Density by the Numbers

The DXA scan for measuring bone density generates a T-score. A T-score of -1.1 or lower indicates an elevated risk of fractures.

T-Score	What It Means
1.0 to -1.0	Normal bone density
-1.1 to -2.4	Osteopenia (low bone density)
-2.5 and below	Osteoporosis (porous bones)

When It's Time, continued from page 10

- **Raloxifene (Evista®):** In the bones, this medication mimics the effects of estrogen, which promotes strong bones. It has been shown to reduce the risk of vertebral (spinal) fractures, but not hip fractures. Potential side effects include blood clots, hot flashes, and leg cramps. It is a tablet that is taken daily.

There is one drug approved by the U.S. Food and Drug Administration for building new bone: teriparatide (Forteo®), a form of parathyroid hormone which patients give to themselves as an injection every day for two years. It is used in patients who have taken drugs to reduce bone loss but who still experience a new fracture or a reduction in bone density or who continue to have severe osteoporosis. Evidence indicates that teriparatide speeds the healing of fractures. The primary side effect is elevated levels of calcium in the blood (called hypercalcemia); patients should adjust the amount of calcium they consume to offset this effect.

How Do You Know Which Medication Is Right for You?

Most patients who begin treatment with an osteoporosis medication start with an oral bisphosphonate. Those who have gastroesophageal reflux (heart burn) or esophagitis (irritation of the esophagus) or who cannot tolerate taking a pill may receive one of these drugs intravenously.

You might also consider how likely you are to adhere to your prescribed regimen of therapy. If you cannot remember to take a pill every day, then a weekly or monthly tablet might be better, or an injection every few months.

You don't need to see a specialist to get a prescription for these medications; you can see your primary care physician or, for women, your gynecologist. Whatever treatment you are taking to improve your bone health, it's important to touch base with your doctor each year to re-assess your medication. You should also have bone density testing to monitor your progress. Doing so will ensure that you're doing all you can to achieve and maintain optimal bone health, well into your golden years! ■

Programs and Resources

Hospital for Special Surgery offers the following classes to help you gain endurance, strength and flexibility and reduce your osteoporosis risk:

Better Balance for Older Adults: Unique exercises selected for individuals who would like to increase their balance control and decrease the risk of falls.

Bone Health Seminar: A half day program bringing together expert clinicians to discuss bone health including the importance of physical activity and nutrition, medication used to maintain bone quality and falls prevention.

Bone Health Monthly Forum: A monthly workshop monthly workshops designed to discuss various topics with leading experts about bone health.

Gentle Yoga: The slow, controlled physical movement of yoga can provide pain relief, relax stiff muscles, ease sore joints and help build strength.

Pilates: A series of specific movements designed to strengthen the powerhouse muscles of the abdomen, back and waist.

Yogalates: A popular form of exercise that blends the best of yoga and Pilates.

T'ai Chi Chih®: Simple, rhythmic movements that provide benefits such as improved balance, strength, flexibility and maintenance of bone mass.

Dance for Fitness and Fun: Studies have shown that dance maintains cardiovascular fitness, enhances emotional well-being, strengthens weight-bearing bones, and slows loss of bone mass.

For more information on the schedule, location and cost of these classes, visit www.hss.edu/pped or call 212.774.2793.

Integrative Care Center (ICC): The ICC, located in mid-Manhattan and affiliated with Hospital for Special Surgery, offers movement and group exercise classes such as OsteoFitness, Back to Basics, therapeutic yoga, Pilates and T'ai Chi Chih®. Please visit www.hss.edu/icc for more information on Winter/Spring 2012 class offerings or call 212.224.7900.

Osteofitness: An exercise program design specifically for individuals with osteoporosis or osteopenia. The classes follow the Hospital for Special Surgery Rehabilitation Department's 5-Point Program. For more information call the Joint Mobility Center at 212.606.1213

Other resources:

Arthritis Foundation: www.arthritis.org

National Institute of Arthritis and Musculoskeletal and Skin Diseases:

www.niams.nih.gov

National Osteoporosis Foundation: www.nof.org

National Bone Health Alliance: www.nbha.org

U.S. Centers for Disease Control and Prevention:

www.cdc.gov/nutrition/everyone/basics/vitamins/calcium

Online Webinars:

Check out our free HSS webinars at www.hss.edu/pped-webinars. Topics include:

- Runner's Health and Marathon Training
- Advances in Lupus Research: Spotlight on Treatment
- Osteoarthritis: Today's Options for Osteoarthritis Management

New issue of HealthConnection FastFacts available online!

Did you know that over 50,000 people every year sustain some sort of winter-related back injury and that almost 6,000 of these injuries are from decorating for the holidays? The latest edition of this online health education newsletter, available at www.hss.edu/public-patient-education has tips for injury prevention and suggestions for treatment.

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at 800.796.0486.

Public and Patient
Education Department
212.606.1057
www.hss.edu/pped

Research Division
212.774.7123
www.hss.edu/research
www.hss.edu/clinical-trials

Additional resources:

Arthritis Foundation
www.arthritis.org

MedlinePlus
www.medlineplus.gov

National Institutes
of Health
www.nih.gov
www.clinicaltrials.gov

National Osteoporosis
Foundation
www.nof.org

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**Community Service Plan 2010-12: Advancing the Prevention Agenda
for Public Health**

The 2010-12 Community Service Plan provides a concise overview of
Hospital for Special Surgery's initiatives that help improve the health, mobility,
and quality of life for the communities it serves. Visit [www.hss.edu/commu-
nity](http://www.hss.edu/commu-
nity) for more information and to download a copy of the Hospital's plan.

The specific outreach goal for osteoporosis awareness and education
is to implement initiatives that will reduce the public impact of osteo-
porosis and related fractures.