# The Future of OSTEOPOROSIS

## Is Your Workplace at Risk?

*Osteoporosis is a disease of compromised bone strength that leads to increased bone fragility and risk of fracture.[1] This potentially crippling disease is associated with the loss of bone mass (density) and deterioration of bone tissue, which occurs very gradually—usually with no symptoms. Osteoporosis often isn't diagnosed until the individual experiences a fracture—most often at the spine, wrist or hip—by which point the disease is already fairly advanced.[1]*

### Is osteoporosis serious?

Osteoporotic fractures can profoundly influence the economic burden of healthcare, quality of life and productivity.

Research has shown that the economic burden of osteoporosis is comparable to that of other major chronic diseases like cardiovascular disease and asthma. It has also been reported that osteoporosis results in more hospital stays than stroke, myocardial infarction or breast cancer.[2]

At its worst, osteoporosis can lead to painful disability, even death (in fact, more women in Canada die each year as a result of osteoporotic fractures than from breast cancer).[3] Hip fractures, in particular, are associated with increased risk of morbidity and mortality: less than half of those breaking a hip return to their pre-injury productivity;[4] 17% will require long-term care, while one-quarter of sufferers die within a year of breaking a hip.[5]

According to the International Osteoporosis Foundation, the annual direct costs of treating osteoporotic fractures of people in the workplace are estimated to be approximately $1.9 billion in Canada.[6] These costs include long-term, hospital and chronic care, doctor visits, physical therapy, orthopaedic supplies and medications.[7]

What's more, according to the International Osteoporosis Foundation, osteoporotic fractures result in huge indirect costs that are rarely calculated.[6] Indirect costs include loss of income to the employer, loss of productivity to the employer, costs to a country's social welfare system, including unemployment and disability pay, health insurance payments and rises in insurance premiums.[6]

The prevalence and cost of osteoporosis are expected to increase as the population ages,[1] and people are staying in the work force longer. According to Statistics Canada, there is some evidence suggesting that Canadians in their late forties and early fifties have pushed back their planned age of retirement.[8] On top of that, there has been a recent increase in the labour force participation rates of older workers in Canada.[8]

These trends suggest that in the not-too-distant future there will be more people with osteoporosis in the workplace than ever before. This, in turn, will have a profound impact for both employers and employees.

Vertebral fractures are more serious as a workplace problem than are hip fractures because they are more likely to affect younger people, even around the age of 50 or earlier.[6] Clinical symptoms of vertebral fractures include back pain, limited spinal mobility, height loss, deformity and disability.[6] In fact, some studies have shown that quality of life following vertebral fractures is reduced

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much more severely than with hip fractures.[6] According to the International Osteoporosis Foundation, by 2050, the predicted vertebral fracture rates for people in the workplace could lead to a 150% increase in Canada.[6]

### How common is osteoporosis?

Often referred to as the "silent epidemic," osteoporosis affects more than 1.4 million Canadians, according to Osteoporosis Canada.[1]

Although the disease can strike anyone at any age, the risk of the disease is higher in women and older people (particularly after menopause in women). Osteoporosis Canada estimates that one in four women over the age of 50 has osteoporosis, while at least one in eight men over 50 has the disease.[1] Given Canada's aging population, osteoporosis will continue to be a significant issue for the general public and for employers.

### How is osteoporosis diagnosed?

Until recently, doctors relied on bone mineral density (BMD) tests to diagnose osteoporosis. But according to Dr. Jacques Brown, rheumatologist at the Rheumatology and Bone Diseases Research Group in Quebec City, a new diagnostic paradigm uses BMD results as only one component of a larger risk-assessment tool. "BMD is one factor that helps us identify who is at risk for a fracture and can benefit from treatment, but it isn't the only factor," he says. "Today, we look at a person's family history of osteoporosis, age, personal history of any minimal-trauma fractures, steroid use, etc. Then, based on all these factors, we can predict the person's 10-year fracture risk." There are three categories for absolute risk: low (less than 10%), moderate (between 10% to 20%) and high (over 20%).

Dr. Brown says this new diagnostic method is similar to that used for cardiovascular disease, whereby a patient's risk of heart attack is assessed by looking at multiple health measures, such as cholesterol levels, blood pressure, smoking history, etc.

Unfortunately, many people with osteoporosis are not aware that they have the disease until they experience a low-trauma or fragility fracture (i.e., a fracture that results from a force equivalent to a fall from standing height or less). Dr. Brown emphasized that early diagnosis and intervention are critical, as research shows that the risk of subsequent fracture increases after an initial fracture.[9]

"If you have had a fragility fracture after the age of 50, the risk of subsequent fracture increases twofold, regardless of your BMD score," explains Dr. Brown. For example, a 55-year-old woman with a normal BMD score, who has no family history of osteoporosis and has never taken steroids, would be considered to be at low risk for an osteoporotic fracture. But if she's had a fragility fracture after age 50, she would be considered to be at high risk for another fracture.

"Experiencing an early fragility fracture with a normal BMD is like having a heart attack when you have normal cholesterol levels. You still need treatment, regardless of the test results," he says.

### What treatments are currently available?[7]

Treatment for osteoporosis typically combines lifestyle modification (diet and exercise) and medications.

Calcium and vitamin D are essential to bone health, and many people with or at high risk for osteoporosis can benefit from consulting with a registered dietitian to learn how to

## Assessing the risk

A Bone Mineral Density test is only one step in diagnosing osteoporosis and assessing a person's risk of fracture, says rheumatologist Dr. Jacques Brown. "You need to ask yourself, 'What are my risk factors?'" These include:[2]

Major Risks

- Low bone mineral density
- Prior fragility fracture after age 40
- Over age 65
- Family history of osteoporotic fracture

Minor Risks

- Use of certain medications
- Being female
- Thin and/or have a small frame
- Estrogen deficiency as a result of menopause, especially early or surgically induced
- Low lifetime calcium intake
- High caffeine intake
- Vitamin D deficiency
- Inactive lifestyle
- Smoking (active or passive)
- Excessive use of alcohol (Three or more drinks per day)

meet their nutritional needs.

Exercise has long been recognized as an important factor in preventing osteoporosis. Weight-bearing exercises, particularly those that put stress on the bones (e.g., tennis, squash, stair climbing, basketball and hiking), have been shown to effectively build bone mass. While lower impact activities (such as swimming and walking) don't build bone mass, they are beneficial as they improve balance and build muscles, which can help prevent fracture-inducing falls.

Along with these lifestyle improvements, medications—if taken correctly—can help slow bone loss and reduce the risk of fracture. However, many drugs carry significant tolerability and compliance issues that impact their effectiveness.

Four different classes of medications are currently available in Canada for the treatment and prevention of osteoporosis: bisphosphonates, selective estrogen receptor modulators (SERMs), parathyroid hormones and antiparathyroid hormones.[7] Individuals need to work with their physician to determine which medication is right for them, based on the benefits and risks of each medication, side effects, convenience and cost (provincial formularies and private insurers may cover certain drugs only for certain patients). The goal of all osteoporosis treatment is the same: to reduce bone loss and prevent fractures.

Bisphosphonates are by far the most commonly prescribed class of medication for osteoporosis, representing approximately 95% of all scripts written for this disease in Canada. Oral bisphosphonates—which include alendronate (Fosamax® [Merck]), etidronate (Didronel® [Procter & Gamble]) and risedronate (Actonel® [sanofi aventis])—are considered first-line therapy for both men and postmenopausal women.[7]

## The biology of bones

Bone tissue continually breaks down and is replaced by new bone. In youth, cells called osteoclasts create small holes in the bone, while cells called osteoblasts fill in these cavities. In middle age, however, bone erosion outpaces bone building. This bone loss is increased in postmenopausal women because of the decrease in estrogen production, which plays an important bone–protective role in the body. In someone with osteoporosis, bone loss occurs even more rapidly, causing the bones to become thinner and weaker and significantly increasing a person's risk of fracture.[2]

People who take oral bisphosphonates must carefully follow the dosing instructions, which include taking the drug with a full glass of water on an empty stomach and not lying down for at least 30 minutes after a dose to decrease the risk of stomach upset and esophageal irritation. Other concomitant medications cannot be taken together with oral bisphosphonates, which can present an inconvenience to patients who are taking multiple medications.

"These drugs are effective in reducing fractures, but can have convenience issues," notes Dr. Brown. "It's hard for many people to wake up and have to wait 30 to 60 minutes before you can eat or drink anything, even black coffee."

With their strict dosing regimen, people often stop taking oral bisphosphonates after only six months, with many more quitting treatment within one year, Dr. Brown says, adding that "patients need to take a bisphosphonate for at least 12 months—preferably three years—to get the drug's full benefit."

Patients who cannot tolerate oral bisphosphonates have zoledronic acid (Aclasta® [Novartis]), a bisphosphonate that is administered intravenously once a year as a potential option.

Raloxifene (Evista® [Eli Lilly]), the only SERM approved in Canada for postmenopausal osteoporosis,[7] has been shown to reduce fractures.[10] It's taken orally daily, but its dosing doesn't require an empty stomach. An increased risk of thromboembolism, or blood clots, is a serious but rare side effect (striking about 2% of patients, usually in the first year of treatment).[10] More common are muscle cramps, which are usually minor but may lead some women to discontinue treatment, says Dr. Brown.

Teriparatide (Forteo® [Eli Lilly]) and antiparathyroid hormones (Miacalcin® [Novartis]) offer a different mechanism of action than bisphosphonates and SERMs. Teriparatide, for instance, works to increase bone formation rather than reduce bone loss.[11] Although there are few side effects, patients need to be trained to self-inject the medication each day, which may present an inconvenience to some patients. At a higher cost per year,[12] a special authorization form may be required by the insurance company for coverage. Teriparatide hormone is indicated for individuals with severe osteoporosis or who continue to fracture despite other treatments.[11]

### What does the future hold?[7]

Although increasing awareness of osteoporosis and the availability of various treatment options, debilitating osteoporotic fractures are not only common, but expected to significantly increase in coming years (by nearly 50% by 2025 in the U.S, according to *Journal of Bone and Mineral Research*, 2007).[13] Clearly, new treatment options are needed to help patients address compliance issues associated

with currently available medications and to address the root cause of bone loss.

In recent years, new treatment regimens have been developed to try to address the inconveniences associated with oral bisphosphonates. For example, Fosamax® and Actonel® now both have once-weekly formulations; a twice-monthly formulation of Actonel® was launched last year.

### New therapies target root cause

"Biologics is an area where great progress is being made," says Dr. Brown. "New treatments are in late-stage development that have different mechanisms of action to bisphosphonates and are designed to be more targeted to the underlying cause of osteoporosis. Biologic treatment has the potential to successfully address concerns with convenience and adherence as well as potentially improve outcomes. With the advancing science, I'm hopeful the treatment of osteoporosis will be positively impacted in the not-too-distant future."

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## Searching for solutions

It took 11 years for doctors to diagnose Gail Lemieux with osteoporosis, despite the fact that she had had two vertebral fractures and her mother had osteoporosis so severe that she was confined to a wheelchair. The first fall in 1980 was a result of slipping on ice in front of her home in Barrie, Ontario. She spent two weeks in the hospital and six months recuperating, which meant taking time off her job as a home care coordinator for a medical laboratory.

Ten years later, Gail fell again, this time slipping on the stairs at home and fracturing more vertebrae. Within a year she broke another and suffered a compound fracture of the spine. Gail was in such severe pain at this point that she would often have to leave work early and lie flat on her back until the next morning. "My doctor kept telling me to go back to work, so I did," recalls Gail. "I went to work and did the best job I could."

Gail sought a second opinion and was finally diagnosed with osteoporosis. "It was scary news but also somewhat of a relief," she says. "And my employer was understanding." Eventually Gail's employer put her on long-term disability because of her constant pain, inability to do her job and the likelihood that some of her fractures may have occurred at work. "It was good business practice, once I was diagnosed, to put me on long-term disability," says Gail. "Employers need to be concerned about possible liability issues for on-the-job injuries."

In fact, Gail had her eighth vertebral fracture in 2007. This time she had vertebroplasty, which can relieve pain from spinal compression fractures resulting from osteoporosis. In this procedure, a surgeon injects bone cement into the crushed vertebrae through a needle. "It is the most incredible surgery you can possibly have," says Gail, who woke up feeling no pain. "I would have it again in a minute."

Ten years ago, osteoporosis wasn't considered a major problem. Today, it is a known fact that people with osteoporosis will fracture multiple times,[9] which could adversely impact their ability to work.

In addition to receiving research grants and participating in speakers bureaus, Dr. Jacques Brown provides guidance and counsel to members of the pharmaceutical industry including Amgen, Sanofi-Aventis, Eli Lilly and Novartis.