Much of the information that Osteoporosis Canada makes available to the public talks about the risk factors associated with developing osteoporosis. As a result, more people are aware of the common risk factors, such as age, family history, not getting enough calcium, etc.

There is, however, a lesser known situation that puts both men and women at risk: certain medications and medical conditions can thin the bone, thereby leading to osteoporosis. The osteoporosis that results from such situations is called secondary osteoporosis because it occurs as a result of the treatment of another disease or condition, or the condition itself.

**Some Medications Can Cause Bone Loss**

One purpose of this fact sheet is to inform you about medications that can cause bone loss. If you are taking any of these medications, talk to your doctor about this possibility. Many of these medications are essential treatments for certain conditions and, in some cases, they are the best or only drug therapy available. The lifestyle changes suggested in this fact sheet may help to offset the bone-thinning effects of such medications.

**Glucocorticoids Increase the Risk of Osteoporosis**

One class of drugs that has been shown to have a particularly damaging effect on the skeleton are the medications referred to as glucocorticoids. A major risk factor for developing osteoporosis is long-term (more than three months continuously) use of glucocorticoid therapy such as prednisone.

Glucocorticoids are produced naturally by the body as cortisol or cortisone, and are necessary for normal metabolism, growth and responding to physical stresses such as infection, injury and inflammation. Rarely, too much of this substance is produced by the body, resulting in a condition called Cushing’s syndrome, which causes many serious medical problems, including accelerated bone loss.

Cushing’s syndrome used to be so rare that osteoporosis produced by an over-abundance of glucocorticoids was not considered to be a significant health problem. However, in the 1940s, synthetic glucocorticoids were introduced and have been widely used as anti-inflammatory drugs. This widespread use to treat a number of medical conditions has resulted in an increasing incidence of glucocorticoid-induced osteoporosis.

Glucocorticoids are taken in a number of different ways and for a variety of conditions. They are taken orally in tablets or pills; by injection into the joints (for diseases such as arthritis); by inhaler (for asthma); as creams (for skin diseases); as drops (for eye diseases); and less commonly by intravenous injection (for multiple sclerosis or after organ transplantation). When taken in doses above what the body normally makes, they cause bone loss. The most bone damage is likely to result from glucocorticoids taken orally, although use by other methods can also damage bone. Bone health should be carefully monitored during treatment with these drugs.

The diseases most often treated with glucocorticoid medications include:

- Rheumatoid arthritis, lupus erythematosus, polymyalgia rheumatica, vasculitis
- Asthma, chronic obstructive pulmonary disease, allergic rhinitis, cystic fibrosis
- Chronic active hepatitis (liver disease)
- Psoriasis, severe dermatitis
- Leukemia, lymphoma and other cancers, in conjunction with chemotherapy
- Ulcerative colitis, Crohn’s disease


diagnose, treat and monitor bone health. The lifestyle changes suggested in this fact sheet may help to offset the bone-thinning effects of such medications.

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- Ulcerative colitis, Crohn’s disease
• Severe allergic reactions and inflammations
• Multiple sclerosis (decreased mobility and vitamin D deficiency may also contribute to osteoporosis)
• Following organ transplant, e.g., heart, kidney
• Inflammation and diseases of the eye, e.g., glaucoma

**How Glucocorticoid Medications Affect Our Bones**

Bone is living tissue, constantly repairing itself through a process called “remodelling,” in which the bone repairs itself to maintain its strength. Old bone is removed (resorption) and the same amount of new bone is laid down (formation). Abnormally high levels of glucocorticoids are particularly bad for bone, because they are associated with increased activity of the bone cells that break down bone, and they stop the bone-forming cells from building new bone. The result is a very rapid loss of bone.

Glucocorticoids also decrease the amount of calcium that is absorbed from food and increase the loss of calcium in the urine.

In addition, the production of estrogen in women and testosterone in men (both hormones protect bone) is reduced by high levels of glucocorticoids, another factor that may slow down the rebuilding of bone. The bones in the spine, ribs and wrist are the most likely to be affected by glucocorticoids.

**Other Medications That Affect the Bones**

There are a number of other categories of drugs that can have a negative effect on bone:

- **Thyroid hormone therapy:** sufficient levels of thyroid hormones are necessary for normal bone development; excessive amounts, however, can cause bone loss over time.

- **Anticonvulsants:** interfere with vitamin D metabolism, thereby lowering the availability of calcium for bone mineralization. The two widely used anti-epileptic drugs phenytoin (Dilantin®) and carbamazepine (Tegretol®) are recognized to have direct effects on bone cells.

- **Aluminum-containing antacids:** interfere with the intestinal absorption of calcium.

- **Antineoplastics (cancer treatments):** used to treat a variety of cancers, immune disorders and resistant arthritic conditions. Cancer treatment-induced bone loss (CTIBL) is most common in breast (including aromatase inhibitors) or prostate cancer patients undergoing therapies resulting in low levels of sex hormones.

- **Immunosuppressives:** used in organ transplants and for the treatment of some diseases of the immune system.

- **Gonadotropin-releasing hormone (GnRH) analogues:** used in the long-term treatment of endometriosis and uterine fibroids. GnRH therapy decreases production of the hormone estrogen to the levels women have after menopause. GnRH analogues are used in the treatment of breast cancer in women to suppress estrogen levels, and in prostate cancer in men to suppress testosterone levels.

- **Anticoagulants:** used to prevent blood clotting. Vitamin K is one of several vitamins that play a role in bone metabolism. Since some oral anticoagulants interfere with vitamin K, their long-term use may increase the risk of osteoporosis, particularly of the spine and ribs.

- **Conception control agents:** reports suggest that women who use Depo-Provera® may lose significant bone mineral density, possibly because of the low estrogen that it induces.

- **Thiazolidinediones (diabetes medication):** a study found a higher risk of fractures among women who take the drug rosiglitazone (Avandia®), possibly because the drug increases the activity of the cells that absorb bone in the bone remodelling process. Also, clinical trials have shown that female patients treated with pioglitazone (ACTOS®) for type 2 diabetes mellitus were at an increased risk of fracture, particularly of the forearm, hand and wrist, and foot, ankle, fibula and tibia. No increased risk of fracture was identified in men.

- **Drugs used for heartburn and ulcers:** proton pump inhibitors that reduce stomach acid production have been associated with an increased fracture risk, perhaps because calcium absorption from food is less efficient in the absence of stomach acid.

- **Anti-depressants:** daily use of SSRIs (selective serotonin reuptake inhibitors), a popular anti-depressant, may lead to increased risk for fragility fracture in older adults. Daily use of SSRIs is associated with a reduction in bone density in the hip and spine and with an increased risk of falling. Examples of drugs in this class include Prozac®, Paxil® and Zoloft®.

Not all drugs in each category affect bone health, so be sure to ask your physician to consider one that is less harmful to bone.
Medical Conditions that can contribute to Secondary Osteoporosis

As well as certain medications, there are also identifiable diseases that can contribute to osteoporosis. Some examples include:

**Cushing’s syndrome:**
Cushing’s syndrome is an endocrine disorder caused by high levels of cortisol (a corticosteroid hormone) in the blood.

**Primary hyperparathyroidism:**
causes hypercalcemia (elevated blood calcium levels) through the excessive secretion of parathyroid hormone.

**Clinical hyperthyroidism:**
overactive thyroid gland, as in Graves’ disease, the most common form of hyperthyroidism. Too much thyroid hormone interferes with the body’s ability to absorb calcium into the bones.

**Sex hormone deficiency (hypogonadism):**
In women: early loss of menstrual periods (amenorrhea); anorexia nervosa or exercise-induced amenorrhea. In men: low levels of testosterone hormone.

**Malabsorption syndrome:**
diseases that prevent nutrients like calcium and vitamin D from being absorbed. Examples include celiac disease and inflammatory bowel disease, such as Crohn’s disease or ulcerative colitis.

**Type 1 diabetes:**
there is evidence to suggest that both men and women with type 1 diabetes are at higher risk for low bone density and for low-trauma fracture.

**Turner syndrome:**
Turner syndrome (TS) is a chromosomal condition characterized by complete or partial absence of the second X chromosome. Due to inadequate production of estrogen, many women with Turner syndrome develop osteoporosis and are at an increased risk of bone fractures.

Minimizing the Harmful Effects of Medications and Other Medical Conditions on Bone

**Talk to your doctor about your risk of osteoporosis.**

If you are taking any of the medications mentioned in this fact sheet, or suffer from any of the medical conditions, talk to your doctor about doing a more in-depth assessment of your bone health.

To determine existing bone loss, your doctor may suggest you have a bone mineral density (BMD) test. This is a painless test that can help to predict your likelihood of fracture.

Your doctor will also need to take into consideration your age, gender, fracture history, family history and glucocorticoid use to determine your 10-year absolute fracture risk. If you have been on glucocorticoid medication for three months or more, and have had a fragility (low-trauma) fracture after the age of 40, you will be considered at high risk to fracture again.

Consume adequate calcium and vitamin D.

Osteoporosis Canada publishes the fact sheet Calcium: An Essential Element for Bone Health that can help you determine if you are getting enough calcium and vitamin D from your diet or whether you need a supplement. Vitamin D is found in some foods and is produced by the interaction of the sun on our skin. In our northern climate, there isn’t enough sunlight from October to March for this to happen, and the amount of vitamin D in a normal diet is not adequate; therefore, a vitamin D supplement is recommended.

Take part in regular physical activity.

Physical activity, especially weight-bearing and weight-resistance exercises, builds and maintains strong bones. Unfortunately, many of the diseases for which glucocorticoids are prescribed limit the person’s ability to be physically active. Most people are able to do some walking, which is an ideal exercise for bones. Talk to a physiotherapist about an activity that will suit you. OC publishes the fact sheet Physical Activity that provides some general guidelines to choose the exercise that is right for you.

Don’t smoke, drink alcohol in moderation, and avoid excess caffeine.

Smoking contributes to bone loss and increases the risk of osteoporosis in both men and women. Heavy drinkers are prone to bone loss and fractures. OC recommends no more than two drinks of alcohol a day. Calcium loss through the urine is increased by the consumption of excess caffeine. OC recommends no more than four cups a day of coffee, cola or some energy drinks.
We're here to help you!

Osteoporosis Canada is the only national organization serving people who have or are at risk for osteoporosis.

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The information contained in this fact sheet is not intended to replace medical advice. Readers are advised to discuss their individual circumstances with their physician.

Research in osteoporosis is ongoing. Consult our website and click on About Osteoporosis for the most up-to-date information.

www.osteoporosis.ca

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