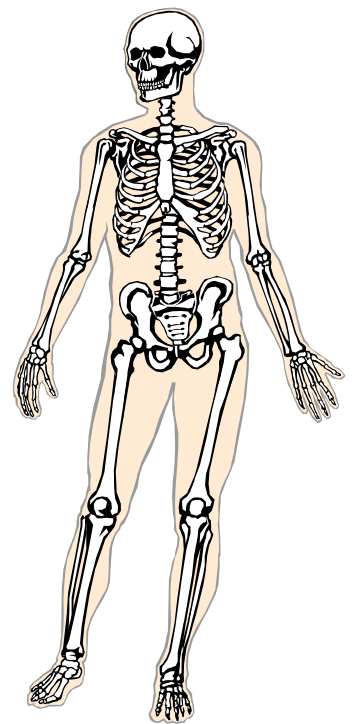


Healthy Bones

Preventing & Managing Osteoporosis



Developed by: Jane Prince RN, BScN
Clinical Resource Nurse
Vancouver Arthritis Centre
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What is osteoporosis?

- a condition that causes a reduction in a person's bone density (amount of bone tissue). The bones become thinner, more porous and fragile which can lead to an increased risk of a broken bone or fracture.



Normal Bone



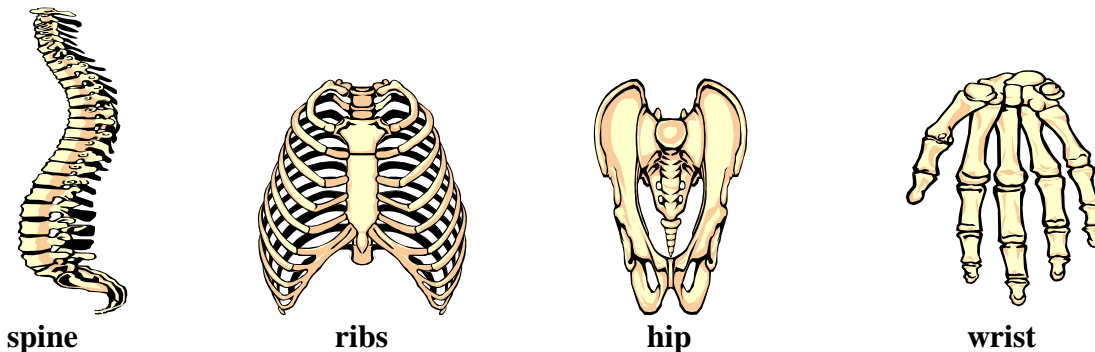
Osteoporosis

What's happening inside the body?

- Bone is living tissue that is continually being renewed through a process in which old bone is removed and replaced by new bone.
- From childhood, particularly during the rapid growth of the teen years, bone is formed at a greater rate than it is removed.
- Growing up with exercise and a healthy diet, rich in calcium, is necessary to ensure strong, dense bones in adulthood.
- By age 20, the growth in the length of the bones has stopped, but the increase in bone density may continue to the mid-thirties to reach a peak (maximum) bone mass.
- After reaching peak bone mass, formation of bone fails to keep up with removal and bone loss occurs. Age related bone loss in women occurs at a rate of 1% per year.

- Menopause:
For the first 5 to 6 years following menopause due to a decrease in estrogen levels, a woman can lose 3 – 5% of her bone density each year. This increases the risk of osteoporosis.
About 25% women over the age of 50 have osteoporosis.
Another 54% have low bone mass.
- Andropause:
After age 50, approximately 19% of men over the age of 50 have osteoporosis. This may be related to the occurrence of a more rapid decline in testosterone levels.
- By age 65 to 70 men and women lose bone mass at the same rate, and the absorption of calcium decreases in both sexes.

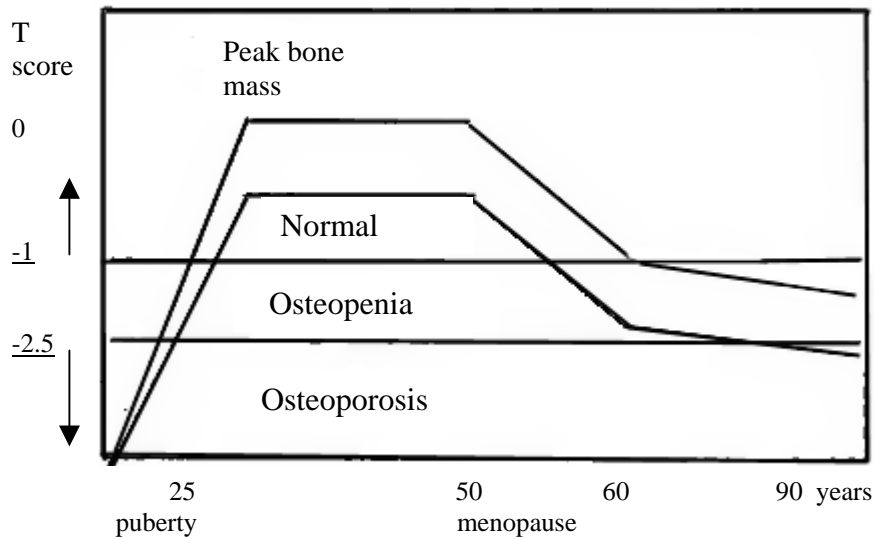
Areas most affected by fractures



How is osteoporosis diagnosed?

Bone mineral density test:

- Small x-ray detector scans your lumbar spine and one or both of your hips to measure bone thickness.
- The test is safe, painless and does not require an injection
- If you are at risk for osteoporosis or have osteoporosis, a bone mineral test should be done every 2 years.
- A broken bone due to a low force trauma or fall from standing weight may also indicate that you have osteoporosis



T- Score

- Number of standard deviations from normal peak bone mass of a young adult

< -1 SD: (normal)

- Means 10% bone loss than average young person
- Low risk of fracture

-1 SD to -2.5 SD: (osteopenia)

- Means low bone mass
- 4 times greater risk of fracture

> -2.5 SD: (osteoporosis)

- means >25% bone loss than average young person
- moderate to high risk of fracture
- 8 times greater risk of fracture

Am I at risk?

There is increased risk if you:

Genetic factors:

- are age 50 or greater
- weigh less than 140 lbs (65 kg)
- slender build
- postmenopausal
- are Caucasian or Asian
- have a family history of fracture or osteoporosis



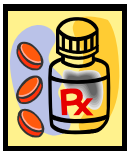
Lifestyle factors:

- do little or no exercise
- smoke cigarettes
- have low calcium intake (< 400 mg/day)
- have low vitamin D intake (< 400 IU/day) or less than 10 –15 minutes of sunshine per day
- drink more than 4 oz of alcohol per day
- drink more than 3 cups of coffee/tea per day
- are a woman who has excessive physical or emotional stress that disrupts or stops monthly periods



Medications:

- have taken
 - cortisone (prednisone)
 - anticonvulsants
 - high doses of thyroid medications
 - anticoagulants/blood thinners (heparin)
 - too much vitamin A



Medical Conditions:

- have
 - rheumatoid arthritis
 - estrogen/testosterone deficiency
 - had a fractured bone or have been in a cast
 - kidney, thyroid, parathyroid, ovarian or liver problems
 - started menopause before the age of 46



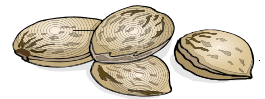
What are some dietary considerations?

Healthy, nutritious meals can help prevent & treat osteoporosis.

- Eat a variety of foods based on Canada's Food Guide.
- Eat 3 meals per day, starting with a balanced breakfast.
- Include healthy snacks between meals and/or at bedtime as needed.
- Adequate protein intake is essential in decreasing risk of hip fracture
- Choose calcium and vitamin D enriched foods in your diet to meet your daily requirements.

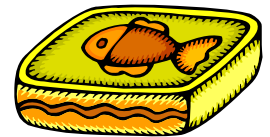
Foods rich in calcium

- milk (1 cup)	300 mg
- milk powder (1/3 cup)	270 mg
- cheese (1 ½ oz)	300 mg
- yogurt (¾ cup)	295 mg
- fortified soy drink (1 cup)	180 mg
- salmon with bones (1/2 can)	240 mg
- sardines, with bones (1/2 can)	200 mg
- almonds (1/4 cup)	95 mg
- broccoli (¾ cup)	50 mg



Foods rich in vitamin D to enhance calcium absorption are:

- fortified milk (1 cup)	100 IU
- fortified rice or soy beverage (1 cup)	100 IU
- salmon, canned (3 oz)	530 IU
- mackerel (3.5 oz)	345 IU
- sardines in water (3.5 oz)	480 IU
- pickled herring (3.5 oz)	680 IU
- eastern oysters (3.5 oz)	642 IU
- shrimp, canned (3.5 oz)	172 IU
- liver (3.5 oz)	45 IU
- egg yolk (large)	27 IU



(Ref: USDA database)

Total Daily Requirements:		
Calcium & Vitamin D from diet		
Plus		
Supplement of elemental calcium & vitamin D		
	Calcium (elemental)	Vitamin D3
19 – 50 years	1000 mg	400 IU
> 50 years	1200 - 1500 mg	600 - 800 IU
Postmenopausal women	1200 - 1500 mg	800 - 1000 IU
Women on cortisone or osteoporosis therapy	1500 mg	800 – 1000 IU
Health Canada recommends if person is > 50 years of age to supplement with Vitamin D 400 IU		
Osteoporosis Guidelines, Osteoporosis Canada, 2002 Health Canada, Instituted of Medicine, 2008		

Supplements



Calcium:

- remember to look at the amount of elemental calcium in the supplement
- do not take more than 500 mg of elemental calcium at one time
- avoid bone meal & dolomite as supplemental calcium sources

Calcium Carbonate:

- Least expensive
- Smallest tablet size
- Take with food to enhance absorption
- May constipate. If constipated try fluids, fibre, and magnesium
- Examples are Caltrate, Calcia, Oscal, Tums etc

Calcium Citrate:

- More expensive
- Larger tablets, therefore more difficult for some people to swallow
- Easier absorbed
- Take on an empty or full stomach
- Does not cause constipation
- Helpful for people who may form kidney stones
- Helpful for people who are older
- Examples are Citrical

Vitamin D:

Vitamin D3 is the preferred source

- Sunlight (at least 10 to 15 minutes/day) helps the skin to produce Vitamin D and will aid the absorption of calcium.
- Fat soluble vitamin



Risk factors for low vitamin D levels in your body

- Not including milk, margarine or fish in diet
- Regularly wearing clothing that covers most of the skin
- Being indoors most of the time
- Living in northern latitudes (Canada) during the winter months
- Use of sunscreens (SPF of 8 or higher)
- Having dark skin colour
- Aging process



Magnesium:

- Plays a role in calcium absorption & building strong bones
- Helps maintain normal muscle & nerve function
- Recommended daily allowance:
 - women 320 mg
 - men 420 mg
- Canadian Osteoporosis Guidelines recommend that these nutrients be obtained from food sources & that supplementation is not necessary.
- If taken, supplements should not exceed 350 mg (National Institute of Health)
- Supplements may interact with blood pressure medications.

- Foods containing magnesium include:

- Almonds 1 oz 86 mg
- Peanuts, dry roasted 1 oz 50 mg
- Spinach cooked ½ cup 65 mg
- Avocado, ½ medium 35 mg
- Kiwi, medium 23 mg
- Bran flakes, ½ cup 60 mg
- Baked beans ½ 40 mg
- Chocolate bar 1.45 oz 45 mg



Nutritional considerations that may interfere with calcium absorption & retention in the body, and enhance bone loss:



Limit caffeine to ≤ 3 cups/day. Caffeine increases the loss of calcium through the urine.



Foods high in fibre, such as raw grains & wheat bran contain phytates that bind with calcium.

Consider taking a calcium food source or supplement on its own or with light meals, snacks or at bedtime.



Foods such as rhubarb, spinach or strawberries contain oxalic acid that can bind with calcium



Limit dietary sodium intake to < 2100 mg /day (1 teaspoon of salt =2325 mg).

Keep your intake of salty foods to a minimum.



Limit soda drinks to occasional treats.

Supplement considerations:



Take only 500 mg of elemental calcium supplementation at one time. The body can only absorb that amount of calcium at a time.



Limit intake of Vitamin A to < 5,000 IU, with no more than 3000 IU in the form of retinol.

Do not take cod liver oil as it is high in Vitamin A

Do not take calcium within 2 hours of taking iron supplements.

Medication considerations:



Do not take calcium within 2 hours of taking a bisphosphonate such as Fosamax, Actonel, or Didrocal

Do not take calcium within 2 hours of taking a protein pump inhibitor (protects stomach) such as Losec, Nexium, or Pariet

Do not take calcium within 4 hours of taking thyroid medication.

What is the role of exercise?



Exercise increases bone strength.

- Research shows that weight-bearing exercise reduces the risk of getting osteoporosis & helps build strong bones.

General considerations



- Check with your doctor or physiotherapist before starting or changing any exercise program.
- Problems with balance, arthritis (joints), heart or lungs may prevent you from doing certain exercises.



- People with arthritis may find weight-bearing exercises too difficult. Exercising in water (non-weight bearing) is usually much easier to do.

- Maintain good, upright posture when exercising.
- Reduce your risk of falls by:
 - * pacing yourself (spreading out activities over the day)
 - * wearing good supportive shoes
 - * using safety strategies/aides (cane, bars, or furniture).



- If you have osteoporosis, consider taking an Osteofit class in your community by trained professionals.

FITT Principle of Exercise



Frequency (How often should I exercise?)

- Exercise at least 3 – 5 times per week in order to build bone and gain the many other benefits of exercise.

Intensity (How hard should I exercise?)



- All exercise is helpful in building bone and improving muscle and cardiovascular health. But, short bursts of high intensity exercise (tennis, aerobics, skipping etc.) seem to be the most beneficial in building bone.

Type (What kind of exercise should I do?)

- Weight bearing exercises are best.
- Vary the type of exercise you do.
- If nothing else, remember to walk!



- Aerobic exercises such as walking, biking etc, help build strong bones & muscles & also make your lungs & heart work better.
- Strength, balance, flexibility exercises are also of benefit if you have or are trying to prevent osteoporosis.
- Strengthening exercises increase the strength of the muscles that support your joints & bones.
- Stretching exercises help to loosen tight & shortened muscles.
- Range of motion exercises help to increase joint movement & flexibility and relieve stiffness.
- The type of exercise you choose will depend on your current health status.



Time (How long should I exercise?)

- Try 10 to 15 minutes once or twice a day.



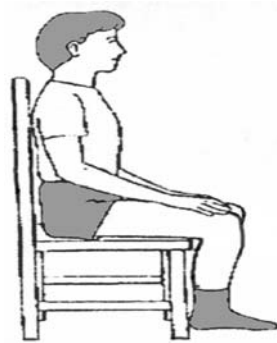
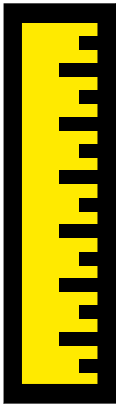
How will I know if I have done too much exercise?

Look for signs such as:

- Pain after exercise that lasts more than 2 hours
- Increased tiredness
- Increased muscle weakness
- Increased swelling of joints
- Decreased range of movement of the joints

Protect Your Spine

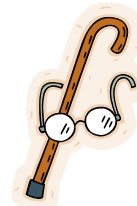
- Have your height measured regularly
- Be aware of your posture at all times
- Head back, chin in, shoulders back & stomach tucked in
- Check posture by leaning straight against a wall



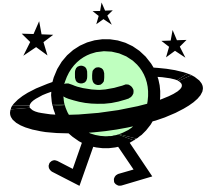
Prevent Falls

Things you can do to prevent falls:

1. Exercise regularly
2. Avoid fast movements if unsteady on feet
3. Wear low-heeled shoes with firm, non-slip soles
4. Use safety aids (canes, walkers etc.) as recommended
5. Have regular vision checks & wear glasses if needed
6. Have the sensation of your feet checked by your doctor, especially if you have diabetes or any other condition that may decrease sensation.



7. Avoid medications which could make you dizzy & unsteady such as sleeping pills, tranquilizers & some pain medications



8. Avoid heavy alcohol use

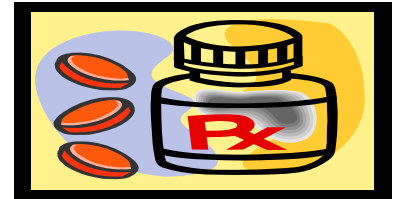
9. Take safety measures to prevent falls in the home.

- a. Remove loose rugs & objects from the floor
- b. Use adequate lighting throughout the house & ensure use of night lights
- c. Use bathtub bars, raised toilet seats etc



Osteoporosis Medications

Bisphosphonates



How do bisphosphonates work?

They bind permanently to the surfaces of the bones and slow down the bone removing cells, allowing the bone-building cells to work more effectively. The result is an increase in bone mass and reduced risk of fractures.

Who can take bisphosphonates?

Used to prevent osteoporosis or to treat osteoporosis in

- postmenopausal women with low bone mass or osteoporosis
- men with low bone mass or osteoporosis
- people on cortisone medication

How are bisphosphonates taken?

These medications are poorly absorbed from the stomach

- must be taken 30 to 60 minutes before breakfast
- take with a large glass of water (not juice or coffee)
- remain upright (sitting or standing) for 60 minutes
- do not take calcium or other vitamins for 2 hours before or after

Didrocal (Etidronate)

- taken in cycles: 2 weeks of daily etidronate 400 mg (white tablets) followed by calcium carbonate 500 mg for 76 days.

Fosamax (Alendronate)

- take 10 mg tablets daily or 70 mg tablets once weekly

Actonel (Risedronate)

- take as 5 mg tablets daily or 30 mg tablets once weekly

What are the possible side effects?

- stomach upset, diarrhea, constipation, stomach pain
- hypertension
- joint discomfort
- esophageal burning (rare).

Zoledronic Acid (Aclasta)

How does zoledronic acid work?

- It is bisphosphonate medication
- It has been shown to increase bone strength & reduce risk of fractures in areas of the body typically affected by osteoporosis including the hip, spine & non-spinal areas such as the wrist, arm etc.

Who can take zoledronic acid?

- It is used to treat postmenopausal osteoporosis

How is zoledronic acid taken?

- The dose is 5 mg
- It is given in a I.V. infusion over 15 minutes once a year
- It is important to drink 2 glasses of fluids prior to receiving the medication to prevent kidney problems.



What are the possible side effects?

- Fever, pain in the muscles, bones or joints, flu-like symptoms & headache may occur within 3 days following the infusion & usually resolves within 3 to 4 days. Symptoms may last up to 2 weeks.
- Osteonecrosis of the jaw
- Hypocalcemia (low levels of calcium in the blood)
- Increased risk of atrial fibrillation, a heart irregularity, that may increase the risk of stroke (1.3% versus .4%)

Calcitonin

How does calcitonin work?

- It inhibits bone removing activity and slightly increases bone in the spine

Who can take calcitonin?

- Used as first choice of therapy for pain associated with acute spinal fractures
- Used as second choice of therapy for treating postmenopausal women with osteoporosis
- May be considered for use of non-pregnant premenopausal women with osteoporosis and for men with osteoporosis

How is calcitonin taken?

- It is taken by a spray of medication (Miacalcin) into your nose or by an injection (Calcimar) into the fat tissue on your arm, abdomen or leg.

What are the possible side effects?

- nasal congestion from nasal spray
- flushing and lightheadedness
- nausea, vomiting or diarrhea (rare)

Selective Estrogen Receptor Modulators (SERMs) Raloxifene (Evista)

How do SERMs work?

- It is a medication that is not estrogen, but binds to estrogen receptors and interacts with the body's tissues. sometimes acting like estrogen and at times has the effect of blocking estrogen.
- SERM's have a positive action on bone without the potential risks of breast or endometrial cancer associated with estrogen.
- Raloxifene (Evista) has been shown to help prevent spinal fractures in postmenopausal women and to increase bone mineral density at the spine & the neck of the femur bone in leg.
- Raloxifene may improve lipid profile by reducing LDL cholesterol (bad cholesterol) and total cholesterol.

Who can take Raloxifene (Evista)?

- Used to prevent or treat postmenopausal women with low bone density or osteoporosis

How is Raloxifene (Evista) taken?

- It is taken as a single tablet of 60 mg/day with or without food.

What are the possible side effects?

- may increase hot flushes and leg cramps
- may increase risk of a blood clot (rare)

Hormone Replacement Therapy (HRT) (Estrogen & Progestin/Progesterone Therapy)

How does HRT work?

- HRT in postmenopausal women has been shown to
 - a) halt the accelerated phase of bone loss that begins with irregular flow in perimenopause and continues for 4 to 5 years and sometimes up to 10 years after menopause and

- b) increase bone mineral density at all measured sites.
- In postmenopausal women with osteoporosis, it is effective in preventing spinal fractures and non-spinal fractures including hip fractures.

Who can take HRT?

- Used as a first choice preventative therapy in
 - post-menopausal women with low bone density and other health concerns, as the risks of HRT may outweigh the benefits if used for osteoporosis alone.
 - women who experience menopause before the age of 45.
- Used as a second choice of therapy for treatment in postmenopausal women with osteoporosis and other health concerns, as the risks may outweigh the benefits if used for treating osteoporosis alone

What are the possible side effects/risks?

- HRT taken for more than 5 years after menopause increases the risk of
 - breast cancer by 26%
 - coronary artery disease by 29%
 - stroke by 41%.
- The use of estrogen without progesterone increases irregular vaginal bleeding and the risk of endometrial cancer.
- HRT increases the risk of venous blood clots.

Teriparatide (Forteo)

How does Forteo work?

- Parathyroid Hormone –recombinant human hormone used for the treatment of osteoporosis
- It stimulates new bone formation, increases bone mineral density and helps prevent fractures

Who can take Forteo?

- Used in the treatment of postmenopausal women with
 - severe osteoporosis who are at high risk of fracture or
 - those who have failed or are intolerant to other therapies

- Used to increase bone mass in men with
 - primary or hypogonadal severe osteoporosis or
 - those who have failed other therapies

How is Forteo taken?

- It is taken in a dose of 20 ug once daily by subcutaneous injection (into fat tissue). It is supplied in a 3ml pen-filled delivery system that lasts 28 days.

What are the possible side effects/risks?

- dizziness & fast heart beat due to low blood pressure after the injection
- redness, swelling, pain or itching at injection site
- Watch for signs of too much calcium in the blood – nausea, vomiting constipation, low energy or muscle weakness
- During studies it has caused bone cancer in rats. The clinical significance in humans is not known.

Suggested Resources

1. **The Osteoporosis Book, Prevention and Treatment for Men and Women**, 2nd edition, 2001. By Dr. John Wade and Gwen Ellert RN, MEd
2. **Osteoporosis Canada** - website at www.osteoporosis.ca or telephone 1-800-463-6842 or contact the BC division for local information 1-800-363-1933
3. **2002 Clinical Practice Guidelines** for the diagnosis and management of osteoporosis in Canada, Osteoporosis Canada
4. National Osteoporosis Foundation – www.nof.org
5. **WHO Fracture Risk Assessment Tool (FRAX)** - www.shef.ac.uk/FRAX/index.htm

6. **Canada's Food Guide** – Health Canada
www.healthcanada.ca/foodguide
7. **Dial-a-dietitian** at 604-732-9191 or 1-800-667-3438 or
www.dialadietitian.org
8. **BC Dairy Foundation** at 604-294-3775 or 1-800-242-6455
9. **Osteofit** information line: 604-875-2555
10. **The Arthritis Society** - www.arthritis.ca
11. **Arthritis Foundation** – www.arthritis.org
12. **Physical Activity Guide & Handbook - Health Canada**
www.healthcanada.ca/paguide