

OSTEOPOROSIS: what do I need to know?

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for INFOHEALTH NOTL
March 2008

What is OSTEOPOROSIS?

- A systemic skeletal disease that is characterised by low bone mass and microarchitectural deterioration of bone tissue, leading to increased bone fragility, and a consequent *increase in the risk of fracture.*

- Canadian Agency for Drugs and Technologies in Health, 2006

OSTEOPOROSIS



Normal bone



Osteoporotic bone

OSTEOPOROSIS

- *Osteoblasts* - cells that build bone
- *Osteoclasts* - cells that break down bone

- normally, these cells function in a balance ie. $\text{OSTEOBLASTS activity} = \text{OSTEOCLASTS activity}$

OSTEOPOROSIS

- Osteoporosis occurs when this balance is lost



OSTEOPOROSIS

- Osteoclast activity outweighs osteoblast activity, so the delicate balance is lost, and the result is a net deficit of bone.



Loss of bone density and bone quality leads to thinning bone (osteopenia) and eventually OSTEOPOROSIS

OSTEOPOROSIS



Normal bone



Osteoporotic bone

OSTEOPOROSIS

- Who is affected by osteoporosis?
- 1.4 million Canadians suffer from osteoporosis.
- One in four women over the age of 50 has osteoporosis. At least one in eight men over 50 also has the disease. However, the disease can strike at any age.

50-50 RULE

- At age 50, the remaining lifetime risk of an osteoporotic fracture exceeds:
 - **50%**

So, why do we care
about thinning bones?

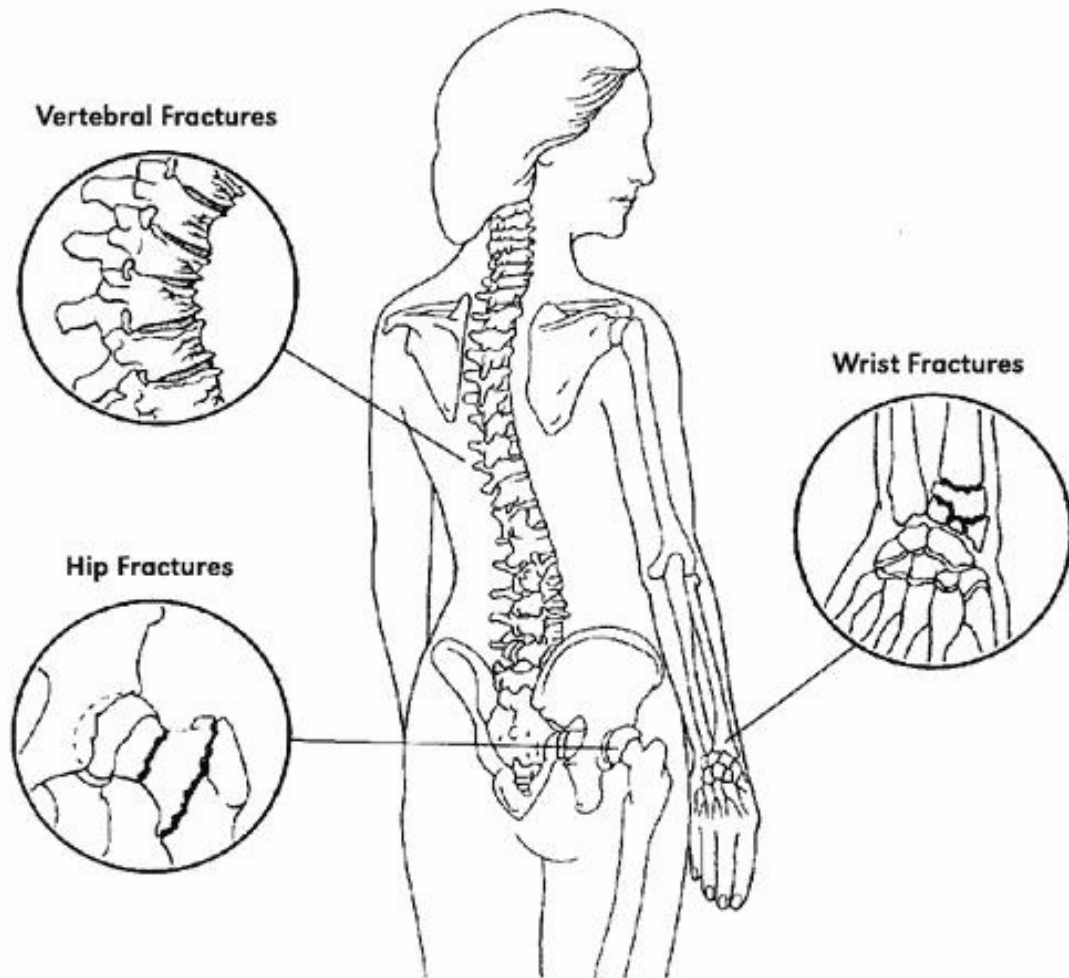
RISK OF FRACTURE

And, why do we care about
FRACTURE?

OSTEOPOROSIS

- Because of the costs - both *human* and *financial*.
- Human costs - morbidity - quality of life - pain, disfigurement, reduction or loss of mobility, and decreased independence.
- 50% of those who survive hip fractures have resultant disability.
- Mortality - Hip fractures result in death in up to 20-30 % of cases due to complications eg. Blood clots, pneumonia, general deconditioning, stressing of pre-existing conditions

Figure 3-1. Bone Fracture Areas in Osteoporosis



Source: NOF 2004.

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HIP FRACTURE



X-Ray of Normal Hip

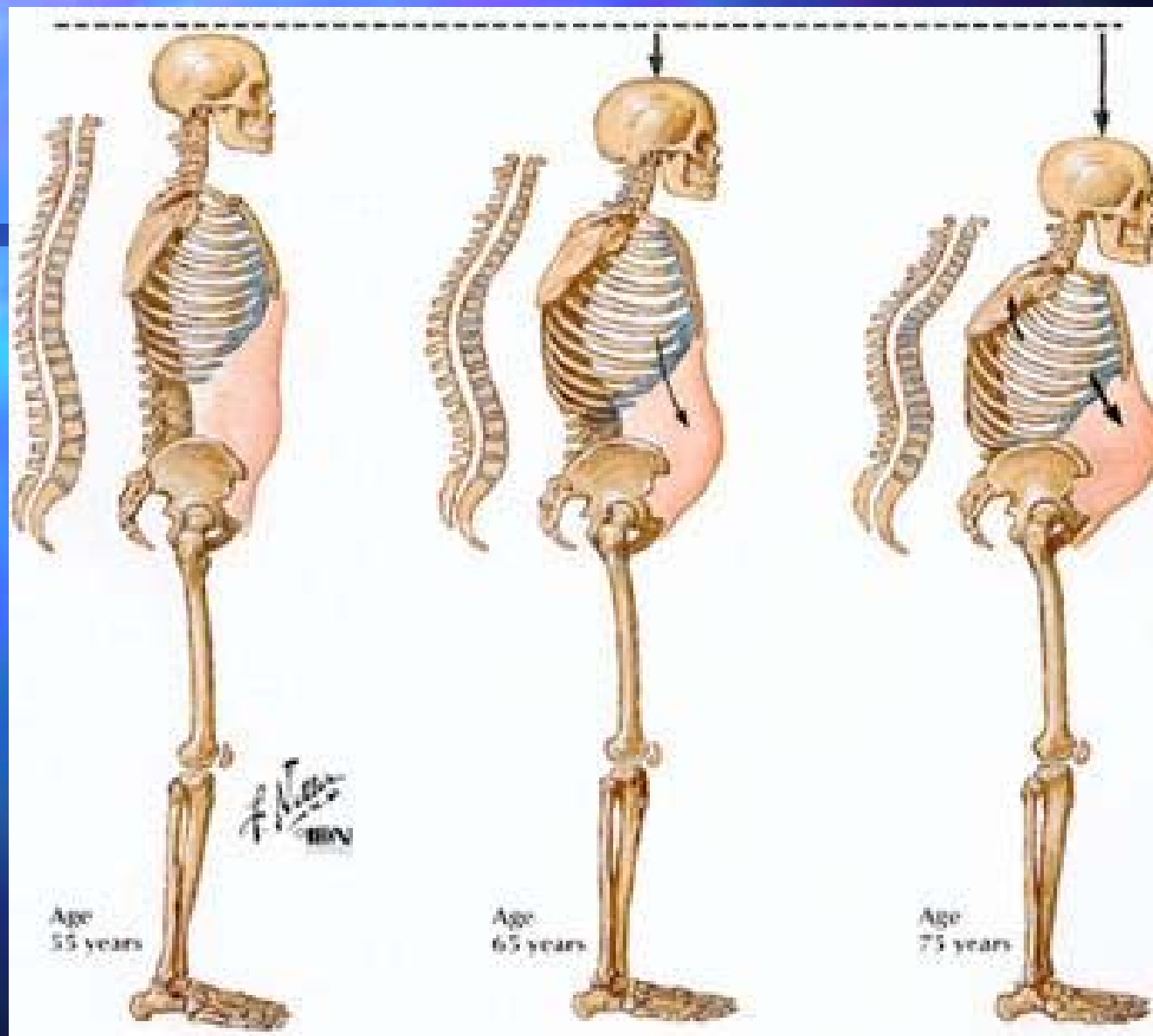


FRACTURE

70% of hip fractures are osteoporosis-related.

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What causes OSTEOPOROSIS?

- Loss of estrogen - menopause
- certain medications
- smoking
- excessive alcohol intake (>2 drinks daily consistently)
- certain endocrine disorders
- excessive caffeine intake
- aging....

OSTEOPOROSIS

- Osteoporosis is less common in men than in women for a number of reasons:
 - Men have greater peak bone mass and do not experience the accelerated bone loss women do at menopause.
 - Men generally do not live as long and are less likely to fall than elderly women.
 - Men are more likely to die after a hip fracture than women.

OSTEOPOROSIS

■ MAJOR RISK FACTORS

- age \geq 65
- vertebral compression fracture
- fragility fracture after age 40
- family history of osteoporotic fracture (esp. maternal hip fracture)
- systemic steroid therapy > 3months (eg. Prednisone)
- malabsorption syndrome
- hyperparathyroidism
- propensity to fall
- osteopenia (thinning bones) seen on xray
- hypogonadism (low levels of male hormones)
- early menopause (before age 45)

OSTEOPOROSIS

■ MINOR RISK FACTORS

- rheumatoid arthritis
- past history of hyperthyroidism (overactive thyroid)
- chronic anti-seizure therapy
- low dietary calcium intake
- smoker
- excessive alcohol intake
- excessive caffeine intake
- weight <57 kg
- weight loss >10% of weight at age 25
- chronic heparin therapy

How do we screen for osteoporosis?

- Bone density assessment

Why measure bone density?

- Bone density accounts for 60-70% of the variance in the strength of bone
- other factors affecting bone fragility - shape of bone, microarchitecture, ability to repair microdamage, material properties of bone itself (minerals, collagen)

OSTEOPOROSIS

- How do we decide who needs to have a bone density assessment?
 - Women and men over age 50 that have 1 major risk factor or 2 minor risk factors should have their bone density assessed

OSTEOPOROSIS

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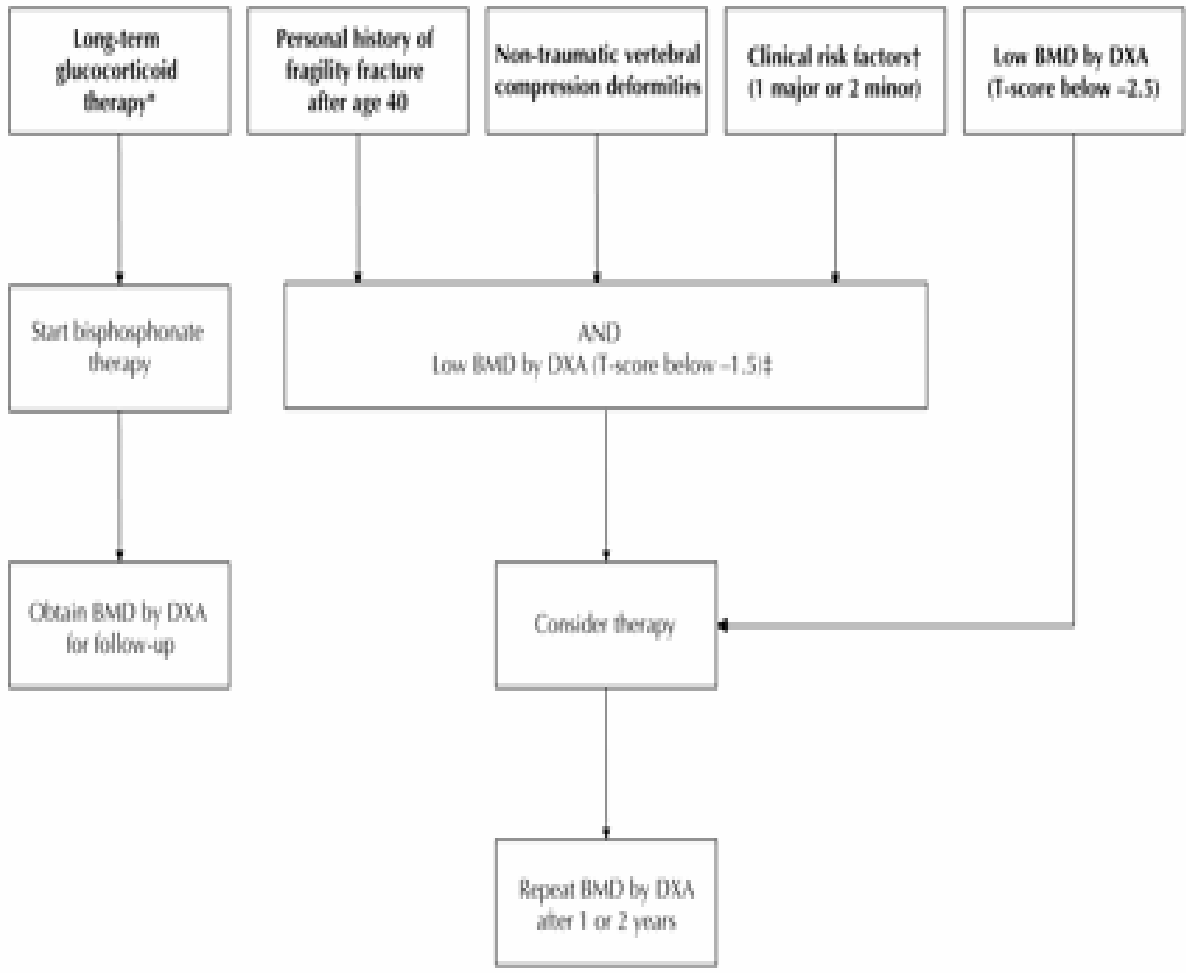
- How do we determine bone density?
 - Bone mineral density test (DEXA scan)
 - this is a specialised radiology test that determines the bone density of the hip and lower spine and interpreted to provide results of bone density - normal, osteopenia (thinning bones), or osteoporosis

OSTEOPOROSIS

- a T-score is assigned and interpreted - this score is based on “standard deviations” (SDs) ie. how far you differ (or deviate) from what is considered normal for a young adult.
- According to World Health Organization (WHO) classifications:
 - osteoporosis: T-score below -2.5 SDs
 - osteopenia (thinning bones): -1 and -2.5 SD
 - normal: no more than 1 SD below the young adult normal value.

OSTEOPOROSIS

- How do we determine who needs treatment?
 - Many factors are taken into account, including bone density testing results as well as other risk factors.



New/Future Recommendations

- Some centres have started reporting bone density analyses to doctors based on identifiable and/or modifiable risk factors (age, sex, prior fracture after age 45, body mass index, medications, secondary osteoporosis eg. Rheumatoid arthritis, parental hip fracture, current smoking and alcohol use) in addition to the bone density reading to provide a 10-year probability of fracture.
- This will aid in the decision-making by your doctor regarding treatment.
- This is still in the implementation process across the province, but will likely become the standard.

Prevention of Osteoporosis

- Adequate calcium and vitamin D intake
- weight-bearing exercise
- modification of modifiable risk factors

Prevention of Fracture

- Adequate calcium and vitamin D intake
- weight-bearing exercise
- modification of modifiable risk factors

Calcium and Vitamin D

- **Calcium** - 1500mg daily (dietary +/- supplements)
- **Vitamin D** - 800-1000 IU daily (dietary +/- supplements)

Food Sources of Vitamin D

<u>Food</u>	<u>Serving</u>	<u>Vitamin D (IU)</u>
■ Milk	1 cup	100
■ Fortified rice or soy beverage	1 cup	80
■ Fortified orange juice	1/2 cup	45
■ Fortified margarine	2 tsp	51
■ Egg yolk	1	25
■ Herring or trout, cooked	75 g	156
■ Mackerel, cooked	75 g	80
■ Salmon, Atlantic, cooked	75 g	225
■ Salmon, canned or cooked*	75 g	608
■ Sardines, Atlantic, canned	75 g	70
■ Sardines, Pacific, canned	75 g	360
■ Tuna, canned, light or white	75 g	41
■ Tuna, canned, yellowfin (albacore, ahi)	75 g	105
■ Tuna, skipjack, cooked	75 g	381
■ Tuna, bluefin, cooked	75 g	690
■ * includes Chinook, Coho, Humpback (pink), Sockeye		

Food Sources of Calcium

<u>Dairy Foods</u>	<u>Serving</u>	<u>calcium (mg)</u>
■ Milk, with added calcium	1 cup	430
■ Milk, whole, 2%, 1% skim	1 cup	300
■ Milk, evaporated	1/2 cup	367
■ Cheese, hard	50 gm	360 (average)*
■ Processed cheese spread	4 Tbsp	348
■ Cheese, processed slices	50 gm	276
■ Cottage cheese, 1 or 2%	2 cups	310
■ Cottage cheese, <0.1%	2 cups	156
■ Yogurt, plain	3/4 cup	290 (average)*
■ Yogurt, fruit bottom	3/4 cup	233 (average)*
■ Frozen yogurt, soft serve	1 cup	218
■ Ice cream	1 cup	194
■ *calcium content varies, check label		

<u>Beans and Bean Products</u>	<u>Serving</u>	<u>calcium (mg)</u>
■ Tofu, medium firm or firm, made with calcium sulphate	150 gm	347
■ Tofu, firm, made with calcium sulphate and magnesium chloride	150 gm	234
■ White beans	3/4 cup	119
■ Navy beans	3/4 cup	93
■ Black turtle beans	3/4 cup	75
■ Pinto beans, chickpeas	3/4 cup	58

Food Sources of Calcium cont'd

<u>Nuts and Seeds</u>	<u>Portion</u>	<u>calcium (mg)</u>
Tahini (sesame seed butter)	2 Tbsp	130
Almonds, dry roast	1/4 cup	93
Almond butter	2 Tbsp	88
Sesame seed kernels, dried	1/4 cup	50

<u>Meats, Fish, and Poultry</u>	<u>Serving</u>	<u>calcium (mg)</u>
Sardines, Atlantic, canned with bones	75 gm	286
Sardines, Pacific, canned with bones	75 gm	180
Salmon, canned with bones	75 gm	208

<u>Grains</u>	<u>Serving</u>	<u>calcium (mg)</u>
Bannock	1 med	84
Oats, instant, regular, no sugar added	1 pouch	165

<u>Non Dairy Drinks</u>	<u>Serving</u>	<u>calcium (mg)</u>
Fortified rice or soy beverage	1 cup	319**
Orange juice fortified with calcium and vitamin D	1/2 cup	165
Regular soy beverage	1 cup	110

***added calcium sometimes settles at the bottom of the container; shake well before drinking*

Food Sources of Calcium cont'd

<u>Vegetables</u> (all measures for cooked vegetables)	<u>Serving</u>	<u>calcium (mg)</u>
■ Turnip greens	1/2 cup	104
■ Chinese cabbage/bok choy	1/2 cup	84
■ Okra, frozen	1/2 cup	65
■ Mustard greens	1/2 cup	55
■ Kale	1/2 cup	49
■ Chinese broccoli (gai lan)	1/2 cup	46
■ Rutabaga	1/2 cup	43
■ Broccoli	1/2 cup	33
■		
<u>Fruit</u>	<u>Serving</u>	<u>calcium (mg)</u>
■ Orange	1 med	52
■		
<u>Other</u>	<u>Serving</u>	<u>calcium (mg)</u>
■ Brown sugar	1 cup	198
■ Blackstrap molasses	1 Tbsp	179
■ Regular molasses	1 Tbsp	44

Prevention cont'd

- Weight-bearing exercise
- falls prevention.....improve balance!

Prevention cont'd

- Modification of modifiable risk factors
 - quit smoking!
 - start exercising
 - moderate alcohol intake
 - moderate caffeine intake
 - review medication use.....

Treatment Medications

AGENT	DOSE	ROUTE OF ADMIN.	MECHANISM	(potential) SIDE EFFECTS
<i>Bisphosphonates</i>			Inhibits bone breakdown	
-Etidronate (Didrocal)	400mg/day x2wks every 3months	Oral		Diarrhea, gastric upset
-Alendronate (Fosamax)	70mg/wk 35mg/wk	Oral		Gastric upset, abdominal pain, bone pain, diarrhea
-Risedronate (Actonel)				
-Zoledronate	5mg/YEAR	IV injection		Flu-like symptoms (resolves within a few days of admin.), osteonecrosis of jaw (rare)
<i>SERMs</i>				
-Raloxifene (Evista)	60mg/day	Oral	Estrogen-like effect on bone (decreases resorption)	Leg cramps, hot flashes, blood clots (rare)
<i>Parathyroid hormone</i> (Forteo)	20ug/day	Daily injection	Increases bone building	Musculoskeletal symptoms, injection site irritation, gastric upset, high calcium
<i>Calcitonin</i> (Miacalcin)	200 IU/day	Nasal spray daily	Inhibits bone breakdown	Rare allergic reaction, nose bleeds, runny nose

Recent Questions in the media.....

- Acid suppressing medications and osteoporosis/fractures
- Osteoporosis treatments and jaw deterioration
- Calcium intake and risk of heart attack and stroke

Acid-Suppressing Medications

- Some patients require acid-suppressing therapy for such problems as acid reflux, peptic ulcers
- recent studies have shown a potential association between these therapies and fractures because of their effect on calcium absorption from the gut
- what should be done?
 - Prescribe the lowest effective dose for the shortest possible time
 - for those who require long-term treatment, ensure appropriate calcium and vitamin D intake, and monitor clinical risks for fractures and bone density
 - Osteoporosis Canada, update Fall 2007

Osteoporosis Treatment and Jaw Deterioration?

- "Is my jaw bone going to rot taking my Actonel?"
- a recent study reported this potential finding (jaw-bone deterioration ie. Osteonecrosis) with bisphosphonate therapies
- what was not reported was a number of clear limitations in their study including if the diagnosis was even correct..., as well as confounding factors such as other medications that can potentiate this effect, other medical diagnoses and treatments that can also contribute to this occurrence eg. cancer

Osteoporosis Treatment and Jaw Deterioration?

- Doses of bisphosphonates used in cancer treatment intravenously in higher doses does have this very rare side effect, but these patients are also very ill, and have usually undergone chemotherapy
- conventional doses used in the osteoporosis population are oral, lower, and general health of such population healthier

Osteoporosis Treatment and Jaw Deterioration?

- What does all this mean?
 - If you have osteoporosis and are on one of the oral bisphosphonate treatments, the benefits of this treatment (prevention of hip, spine and wrist fractures, pain, loss of dependence, disfigurement, complications, death) far outweigh the risk of this *extremely rare* serious side effect
 - always talk to your doctor before discontinuing any medication

Calcium Intake and Risk of Heart Attack or Stroke

- A recent study reported that calcium supplementation may increase the risk of heart attack or stroke in healthy postmenopausal women
- past studies have not found a similar finding
- so then, what is the take-home message?

Calcium Intake and Risk of Heart Attack or Stroke

- Take-home message:
 - take calcium at the current recommended guidelines for daily intake (all sources - dietary and supplements - maximum 1500mg age >50, 1000mg age <50)

Questions?

