Prevention of osteoporosis and osteoporotic fractures in postmenopausal women: recommendation statement from the Canadian Task Force on Preventive Health Care

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Recommendations (see also Fig. 1)

Overall recommendations

- The Canadian Task Force on Preventive Health Care concludes that there is fair evidence to recommend screening postmenopausal women to prevent fragility fractures (no or low trauma) (grade B recommendation). Although there is no direct evidence that screening reduces fractures, there is good evidence that screening is effective in identifying postmenopausal women with low bone mineral density (BMD) and that treating osteoporosis can reduce the risk of fractures (grade A recommendation).
- For women who screen positive for osteoporosis, there is good to fair evidence that therapy with alendronate, risedronate or raloxifene prevents osteoporotic fractures (grade A to B recommendation).
- For women with severe osteoporosis (osteoporosis plus at least 1 fragility fracture), there is good to fair evidence to recommend the use of alendronate, risedronate, parathyroid hormone (limited duration), raloxifene, etidronate and oral pamidronate therapy (grade A to B recommendation). If none of these drugs is tolerated, hormone replacement therapy (HRT) or calcitonin can be considered. (In a recent position statement, the task force recommended against combined estrogen–progestin therapy as well as unopposed estrogen therapy for the primary prevention of chronic diseases [grade D recommendation].[1])
- For women without documented osteoporosis, there is fair evidence that calcium and vitamin D supplementation alone prevents osteoporotic fractures (grade B recommendation). There is fair evidence that combined estrogen–progestin therapy decreases the incidence of total, hip and nonvertebral fractures; however, for most women the risks may outweigh the benefits (grade D recommendation). (As noted above, the task force recently recommended against HRT for the primary prevention of chronic diseases [grade D recommendation].[1])

Manoeuvres

Screening

- There is fair evidence to recommend using history of previous fracture for the prediction of osteoporotic fractures (grade B recommendation).
- There is good evidence to recommend using either the SCORE questionnaire (Appendix 1) or the ORAI instrument (Appendix 2) to predict low BMD (grade A recommendation) and fair evidence to recommend screening using BMD to predict fractures (grade B recommendation).
- There is fair evidence to recommend BMD screening using DEXA (dual energy x-ray absorptiometry) to prevent fractures in postmenopausal women who (a) are 65 years or older, (b) weigh less than 60 kg, (c) have a history of previous fracture, (d) have an ORAI score of 9 or greater, or (e) have a score of 6 or greater on the SCORE questionnaire (grade B recommendation).
- There is insufficient evidence to recommend using bone turnover markers to predict fractures (grade I recommendation).

Primary prevention

For postmenopausal women without documented osteoporosis:

- There is fair evidence to recommend adequate intake of calcium (1000–1500 mg/d) and vitamin D (400–800 IU/d) to all postmenopausal women to prevent nonvertebral fractures (absolute risk reduction [ARR] 7%, number needed to treat [NNT] 15) (grade B recommendation).

- There is fair evidence that HRT prevents total fractures (ARR 2.1%, NNT 48); however, for most postmenopausal women without menopausal symptoms, the risks may outweigh the benefits (grade D recommendation).[1]
- There is insufficient evidence to recommend for or against the use of other pharmacological therapies for the prevention of fractures in postmenopausal women without osteoporosis, especially those less than 65 years old who have T scores greater than –2.0 (grade I recommendation).

Treatment

- There is insufficient evidence that combination therapy regimens are more effective than single therapy regimens in preventing fractures (grade I recommendation) and thus are not recommended as first-line therapy.
- It is unclear how long osteoporotic women should take these therapies. Most trials have fracture data for 5 years or less, with safety data for up to 10 years.

For postmenopausal women with osteoporosis but *without* prevalent fractures:

- There is good evidence that alendronate (grade A recommendation) and fair evidence that risedronate and raloxifene (grade B recommendation) prevent vertebral fractures. [Note: Raloxifene should not be prescribed concurrently with HRT, although low-dose vaginal estrogen (e.g., Estring and Vagifem) can be used concurrently for the relief of postmenopausal vaginal symptoms.]
- There is fair evidence that alendronate and risedronate prevent hip and nonvertebral fractures (grade B recommendation).

For postmenopausal women *with* prevalent fractures:

- There is good evidence that alendronate (grade A recommendation) and fair evidence that raloxifene (see note above), risedronate, etidronate and oral pamidronate therapy (grade B recommendation) prevent vertebral fractures.
- There is fair evidence that alendronate and risedronate prevent hip and nonvertebral fractures (grade B recommendation).
- There is fair evidence that parathyroid hormone therapy prevents vertebral and nonvertebral fractures (grade B recommendation), although long-term safety is unclear.

The recommendations in this statement apply to most postmenopausal women in the general population, including those who have late menarche, early menopause, low calcium intake, low physical activity, high alcohol or caffeine intake, low body weight, a family history of osteoporosis or osteoporotic fractures or a history of hyperthyroidism or who are smokers. However, they do not apply to women who have specific conditions that predispose them to significant increased risk of fractures, including women taking steroids, those with hyperparathyroidism and those in nursing homes. These recommendations are meant to guide physicians in their discussions with their postmenopausal patients, as each individual woman may have unique risks and preferences. The recommended age for initiation of screening is based on the prevalence of osteoporosis and fractures among postmenopausal women in the different age groups (Table 1).

Our recommendations are the most conservative of recent Canadian guidelines (see "Recommendations of others") and are based on fracture data rather than on bone mineral density (BMD) data, since we do not know how short-term BMD differences translate into long-term fracture outcomes, especially among women without osteoporosis. A unique feature of our guidelines is that we do not recommend using drug therapy for the primary prevention of osteoporosis. More than 45% of postmenopausal women have osteopenia.[2] The fracture risk for most of these women is low. Because risk of fracture increases with age, it may be reasonable to consider prescribing drug therapy for women who are 65 or older and who have a T score below –2.0.

Background

Burden of illness

Osteoporosis affects 1 in 6 Canadian women over the age of 50.[2] The Canadian Multicentre Osteoporosis Study (CaMOS), a prospective population-based mixed cohort study involving 9423 Canadians over 25, showed the prevalence of osteoporosis among Canadian women 50 years and older to be 12.1% in the lumbar spine and 7.9% in the femoral neck, for a combined prevalence of 15.8%. The prevalence of osteopenia at the femoral neck among these women was 45.9%. Osteopenia and osteoporosis affect more women than men, usually in their postmenopausal years because of the lack of estrogen. The loss of bone mass occurs when there is more bone-

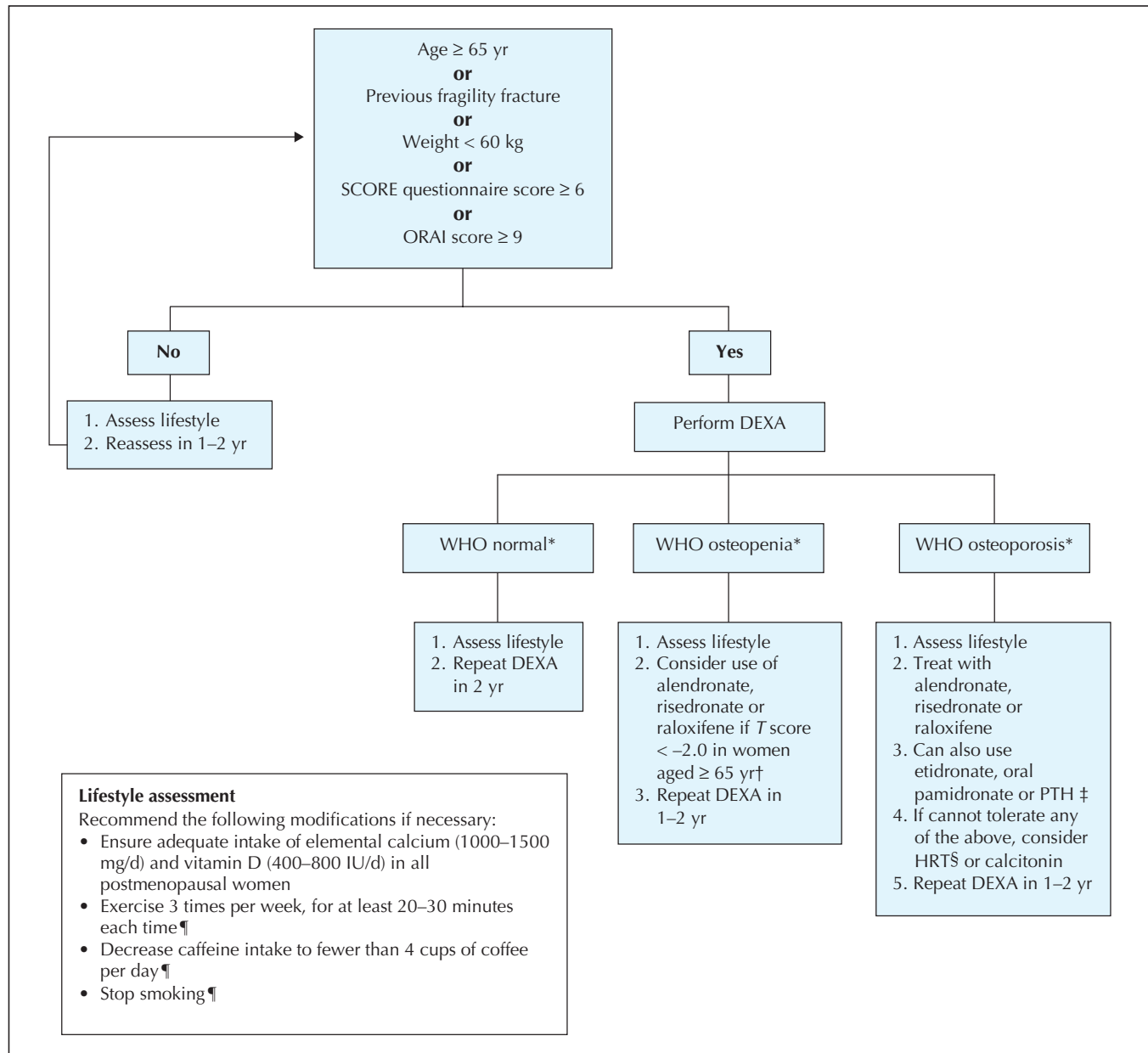**Table 1: Prevalence of osteoporosis, by age group**

Age group, yr	Prevalence, %	NNS
50–54	4.0	3125
65–69	14.4	588
75–79	27.0	303
85–89	45.1	128

Note: NNS = number needed to screen to prevent 1 vertebral fracture.

resorptive than bone-formation activity, as in the case of post-menopausal osteoporosis.[2]

Osteoporotic fracture is the main consequence of osteoporosis. About 40% of 50 year-old white women in Canada will have a clinical osteoporotic fracture during their remaining lifetime: 15.6% will experience a vertebral fracture, 16.0% a wrist fracture and 17.5% a hip fracture.[3] Only one-third of vertebral fractures present as clinical fractures, the remainder going undiagnosed. Thus, vertebral fractures are the most common osteoporotic fracture in postmenopausal women; 46.8% of 50-year-old white women will experience 1 or more vertebral fractures in their remaining lifetime.

Age ≥ 65 yr
or
Previous fragility fracture
or
Weight < 60 kg
or
SCORE questionnaire score ≥ 6
or
ORAI score ≥ 9

No

1. Assess lifestyle
2. Reassess in 1–2 yr

Yes

Perform DEXA

WHO normal*

WHO osteopenia*

WHO osteoporosis*

1. Assess lifestyle
2. Repeat DEXA in 2 yr

1. Assess lifestyle
2. Consider use of alendronate, risedronate or raloxifene if *T* score < –2.0 in women aged ≥ 65 yr†
3. Repeat DEXA in 1–2 yr

1. Assess lifestyle
2. Treat with alendronate, risedronate or raloxifene
3. Can also use etidronate, oral pamidronate or PTH ‡
4. If cannot tolerate any of the above, consider HRT§ or calcitonin
5. Repeat DEXA in 1–2 yr

Lifestyle assessment
Recommend the following modifications if necessary:
• Ensure adequate intake of elemental calcium (1000–1500 mg/d) and vitamin D (400–800 IU/d) in all postmenopausal women
• Exercise 3 times per week, for at least 20–30 minutes each time¶
• Decrease caffeine intake to fewer than 4 cups of coffee per day¶
• Stop smoking¶

Fig. 1: Recommendations of the Canadian Task Force on Preventive Health Care for the prevention of osteoporotic fractures in postmenopausal women. This algorithm excludes women with secondary osteoporosis (e.g., those who have hyperparathyroidism or are taking steroids). *World Health Organization (WHO) definitions: normal = T score ≥ –1.0; osteopenia = T score < –1.0 and > –2.5; osteoporosis = T score ≤ –2.5, where the T score is the standard deviation above or below the mean bone mineral density for young adults. †Published data have not shown any reduction in clinical fracture in this group of postmenopausal women. ‡Evidence to support the use of these medications is limited to postmenopausal women with osteoporosis and prevalent fractures. §For most postmenopausal women without menopausal symptoms, the risks may outweigh the benefits. ¶These recommendations are not based on fracture data. DEXA = dual energy x-ray absortiometry. SCORE and ORAI are two risk assessment tools (available online). PTH = parathyroid hormone.

Postmenopausal women who have sustained multiple vertebral fractures are at risk of restrictive lung disease, early satiety, low self-esteem, chronic pain and depression. Even vertebral fractures that are evident only on radiographs are associated with decreased quality of life and increased rates of hospital admission and death. Women with hip fractures have pain, decreased mobility, fear of falling and loss of independence, and up to 20% of them die within 1 year. Both hip and vertebral fractures have been shown to decrease 5-year survival to a similar extent.[4,5]

In 1993, over 60 000 women were estimated to have osteoporosis-related fractures in Canada.[6] These fractures were responsible for more than 29 000 hospital admissions and 643 000 hospital days. An additional 47 000 fractures required outpatient care, and nearly 23 000 women were in either long-term or chronic care facilities because of osteoporotic fractures. In 1992, 1390 people in Canada died of complications associated with osteoporotic fractures. These numbers are expected to increase exponentially as our elderly population grows. By 2041, the costs of hip fractures alone are expected to rise to $2.4 billion.[7]

Definitions

Osteoporosis is a systemic disease characterized by low bone mass and microarchitectural deterioration of bone tissue, resulting in bone fragility and an increased risk of fractures.[8] Diagnostic criteria for osteoporosis in postmenopausal women are based on BMD, although the recent National Institutes of Health definition for osteoporosis incorporates bone quality.[9] A BMD value greater or equal to 2.5 standard deviations (SD) below the mean for young adults is defined as *osteoporosis*, and a BMD value between 1 and 2.5 SD below the mean for young adults is defined as *osteopenia*. The number of SD above (+) or below (–) the mean for young adults is called the *T score*, and the number of SD above or below the mean for one's own age group is called the *Z score*. A woman who has a T score of –2.0 and a Z score of –1.0 has a bone density that is 2 SD below the mean for young adults and 1 SD below the mean for her age-matched control group. Thus, postmenopausal women with T scores of –2.5 or below are classified as having osteoporosis. Although these diagnostic criteria have been widely adopted in clinical practice and research, their significance is not entirely clear because a "fracture threshold" does not exist.

The term *severe osteoporosis* is used to describe the condition of anyone who has osteoporosis and has had an *osteoporotic fracture* (often a fragility, low-trauma or atraumatic fracture that occurs when a minor loading force exceeds the strength of the bone). The occurence of a fracture depends not only on the biomechanical (e.g., BMD) and geometric properties of the bone but also on the magnitude, rate and direction of the loading force and the soft-tissue padding at the impact site. By convention, we define any spontaneous fractures, any fractures resulting from activities of daily living and any fractures resulting from a fall from standing height as fragility fractures. Common osteoporotic fractures include Colle's (or wrist) fractures, vertebral compression fractures and hip fractures.

Manoeuvres

Screening

- Using risk indicators and assessment tools to determine who should undergo bone densitometry
- Using bone densitometry or bone turnover markers, or both, to assess fracture risk

Prevention of osteoporosis and osteoporotic fractures

- Calcium and vitamin D supplementation
- Exercise
- Hormone replacement therapy (HRT)
- Therapy with selective estrogen receptor modulator (raloxifene)
- Therapy with bisphosphonates (etidronate, alendronate, risedronate, pamidronate, clondronate)
- Calcitonin therapy
- Fluoride therapy
- Parathyroid hormone therapy

Potential benefits

- Bone mass protection
- Fracture prevention

Potential harms

- Costs and radiation exposure from unnecessary BMD tests
- Side effects of specific treatments

Recommendations of others

The US Preventive Services Task Force recommends that women 65 and older be screened routinely for osteoporosis and that those at increased risk of osteoporotic fractures, especially those with low body weight (wt < 70 kg) begin screening at age 60 (grade B recommendation).[30]

The recent Osteoporosis Society of Canada guidelines recommend screening with DEXA (dual energy x-ray absorptiometry) for postmenopausal women who have 1 major and 2 minor clinical risk factors (Box 1) or for those 65 and over.[31] They also recommend using bisphosphonates and raloxifene as first-line therapy for the prevention and treatment of osteoporosis, HRT as first-line therapy for the prevention of osteoporosis and as second-line therapy for the treatment of osteoporosis (although risks may outweigh benefits) and nasal calcitonin therapy as second-line therapy for the treatment of osteoporosis. In addition, they recommend using parathyroid hormone as first-line therapy for the treatment of severe osteoporosis.

The Society of Obstetricians and Gynaecologists of Canada (SOGC) guidelines, published before the release of the Women's Health Initiative (WHI) results, recommend using HRT, raloxifene and the bisphosphonates (all grade 1 recom-

Evidence and clinical summary

Screening

- Although there is no direct evidence that screening reduces the incidence or severity of osteoporotic fractures, there is fair evidence that specific risk factors (Box 1), especially history of previous fracture, predict future fractures (RR [relative risk] 4.5–7.4).[10–12] There is also good evidence that the SCORE questionnaire[13] (Appendix 1) and the ORAI instrument[14] (Appendix 2), which are used to screen for risk by determining combinations of identified risk factors, predict low BMD and that screening using BMD predicts fractures (RR 1.5–2.3).[15] It is unclear whether screening using bone turnover markers predicts fractures.
- The ability of BMD to predict fractures is greater than that of blood pressure to predict stroke and of cholesterol to predict cardiovascular disease. DEXA is the current "gold standard" for assessing BMD; it is easy to administer, the dose of radiation is low (equivalent to one-fifth to half of the dose used for a chest x-ray depending on the machine used and number of sites measured). Quantitative CT is not recommended for routine clinical use because it is time-consuming, requires much larger doses of radiation and is more costly than DEXA. Although quantitative ultrasonography is cheap and does not involve radiation, it has poorer precision than DEXA (i.e., it is not a good tool for following changes in BMD over time). Neither quantitative CT nor quantitative ultrasonography is currently covered by any provincial health insurance plan.

Primary prevention

- Calcium and vitamin D supplementation prevent nonvertebral fractures (absolute risk reduction [ARR] 7%, number needed to treat [NNT] 15).[17]
- HRT prevents total fractures (ARR 2.1%, NNT 48); however, for most postmenopausal women without menopausal symptoms, the risks may outweigh the benefits.[1]
- Whether exercise, raloxifene, bisphosphonates, calcitonin, parathyroid hormone, fluoride or combination therapy prevents osteoporotic fractures in postmenopausal women without osteoporosis is unclear.

Secondary prevention

- For postmenopausal women with osteoporosis but no prevalent fractures, the agents listed in Table 2 prevent fractures. Appropriate calcium and vitamin D supplementation should be used with these agents.
- Whether exercise, HRT, calcitonin, parathyroid hormone, fluoride or combination therapy prevents osteoporotic fractures in this population is unclear.

Tertiary prevention

- For postmenopausal women with osteoporosis who have prevalent fractures, the agents listed in Table 3 prevent fractures. Appropriate calcium and vitamin D supplementation should be used with these agents.
- Whether exercise, HRT, calcitonin, fluoride or combination therapy prevents osteoporotic fractures in this population is unclear.

Table 2: Drug treatment used to prevent fractures in women with osteoporosis who have no prevalent fractures

Drug	Vertebral fractures ARR, %	NNT	Nonvertebral fractures ARR, %	NNT	Hip fractures ARR, %	NNT
Bisphosphonates						
Alendronate[18–20]	1.7–3.0	33–58	2.0	50	1.2	81
Risedronate[21,22]	6.8	15	2.3	44	1.3	77
SERMs						
Raloxifene[11]	3.0	45	-	-	-	-

Note: SERMs = Selective Estrogen Receptor Modulators, ARR = absolute risk reduction, NNT = number needed to treat, NA = not available.

Table 3: Drug treatment used to prevent fractures in women with osteoporosis who have prevalent fractures

Drug	Vertebral fractures ARR, %	NNT	Nonvertebral fractures ARR, %	NNT	Hip fractures ARR, %	NNT
Bisphosphonates						
Etidronate[23]	5.2	19	-	-	-	-
Alendronate[24,25]	2.2–7.0	13–37	-	-	1.1	90
Pamidronate[28]	22.3	5	-	-	-	-
Risedronate[22,26,27]	5.0–11.0	10–20	3.0	32	1.3	77
SERMs						
Raloxifene[11]	17.0	16	-	-	-	-
Parathyroid hormone[29]	9.0	11	3.0	33	-	-

Box 1: Risk factors for osteoporotic fractures in postmenopausal women

Major

- Age ≥ 65 yr
- Vertebral compression fracture
- Fragility fracture after age 40 yr
- Family history of osteoporotic fracture (especially hip fracture in mother)
- Systemic glucocorticoid therapy ≥ 3 mo
- Malabsorption syndrome
- Primary hyperparathyroidism
- Propensity to fall
- Appearance of osteopenia on radiograph
- Hypogonadism and early menopause (< 45 yr)

Minor

- Rheumatoid arthritis
- History of clinical hyperthyroidism
- Long-term anticonvulsant therapy
- Weight loss > 10% of body weight at age 25 yr
- Weight < 57 kg
- Smoking
- Excess alcohol intake
- Excess caffeine intake
- Low dietary calcium intake
- Long-term heparin therapy

These risk factors were taken from the Osteoporosis Society of Canada 2002 clinical practice guidelines. Additional risk factors for osteoporotic fractures include: being white Caucasian or Asian, not on HRT, having low BMI, low physical activity, impaired vision, dementia, recent falls, poor health and being frail.

mendations) as well as calcium and vitamin D supplementation and exercise (all grade 2 recommendations) for the primary prevention of osteoporosis. They also recommend raloxifene, alendronate, risedronate, calcitonin and combination therapy (all grade I recommendations) and HRT and etidronate (grade II recommendations) for the treatment of osteoporosis. Since publication of the WHI results, the SOGC has revised its recommendation on combined estrogen–progestin therapy, stating that the overall risks may outweigh the benefits for postmenopausal women without menopausal symptoms and that other therapies should be considered first.[32]

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Please note that the two appendices appear on the following two pages.

Appendix 1: Simple Calculated Osteoporosis Risk Estimation (SCORE) questionnaire

1. What is your current age? ☐ ☐ years | Take the number in the shaded area, multiply by 3, and enter | _____

2. What is your race or ethnic group? (check one)
    - ☐ Black | Enter 0
    - ☐ Caucasian or Asian | Enter 5
    - ☐ Native Canadian / First Nation or Other | Enter 5 | _____

3. Have you ever been treated for or told you have rheumatoid arthritis?
    - ☐ Yes   ☐ No | If yes, enter 4 [If no, enter 0] | _____

4. Since the age of 45, have you experienced a fracture (broken bone) at any of the following sites?

    Hip   ☐ Yes   ☐ No | If yes, enter 4 [if no, enter 0] | _____

    Rib   ☐ Yes   ☐ No | If yes, enter 4 [if no, enter 0] | _____

    Wrist ☐ Yes   ☐ No | If yes, enter 4 [if no, enter 0] | _____

    | Subtotal | _____

5. Do you currently take or have you ever taken estrogen? (Examples include Premarin, conjugated estrogens, Estraderm, Estrace, Estinyl, Ogen, Estracomb)
    - ☐ Yes   ☐ No | If no, enter 1 [if yes, enter 0] | _____

Add SCORE from questions 1 to 5 | **Subtotal** _____

6. What is your current weight? (convert from kilograms) ☐ ☐ ☐ pounds | Take the numbers in the shaded area and **subtract** from subtotal

Final SCORE ☐

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Appendix 2: Osteoporosis Risk Assessment Instrument (ORAI)

Variable	Score	
Age, yr		
≥ 75	15	
65–74	9	
55–64	5	
45–54	0	_____
Weight, kg		
< 60	9	
60–69	3	
≥ 70	0	+ _____
Current estrogen use		
No	2	
Yes	0	+ _____
	Total	☐

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Note: Women with a total score of 9 or greater would be selected for bone densitometry.