

Table 1 Who should be assessed for osteoporosis*?

Major risk factors

- Age 65 or older
- Vertebral compression fracture
- Fragility fracture after age 40**
- Family history of osteoporotic fracture (especially maternal hip fracture)
- Systemic glucocorticoid therapy of at least 3 months duration
- Malabsorption syndrome
- Primary hyperparathyroidism
- Propensity to fall
- Appearance of osteopenia on radiograph
- Hypogonadism
- Early menopause (before age 45)

Minor risk factors

- Rheumatoid arthritis
- History of clinical hyperthyroidism
- Long-term anticonvulsant therapy
- Weight loss greater than 10% of weight at age 25
- Weight less than 57 kg
- Smoking
- Excess alcohol intake
- Excess caffeine consumption
- Low dietary calcium intake
- Long-term heparin therapy

* Postmenopausal women and men over age 50 with at least 1 major or 2 minor risk factors should be considered candidates for bone densitometry

**Fragility fracture should be regarded as independent evidence of osteoporosis

Contraindications for bone densitometry

- Pregnancy
- Recent gastrointestinal contrast studies and nuclear medicine tests (suggested wait of at least 72 hours before a central bone densitometry scan, or 7 days for long-lived isotopes such as gallium)

Table 2 Common secondary causes of bone loss

- Hypogonadism
- Primary hyperparathyroidism
- Thyrotoxicosis
- Hypercortisolism
- Vitamin D deficiency
- Malignancy
- Malabsorption
- Renal disease
- Liver disease
- Drugs (e.g., glucocorticoids, long-term anticonvulsants, chemotherapy)

References

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Members of the Canadian Panel of the ISCD

Aliya A. Khan, MD (Chair)
McMaster University

Jacques P. Brown, MD (Vice-chair)
Laval University

David L. Kendler, MD (Board Representative)
University of British Columbia

E. Michael Lewiecki, MD (ISCD President)
University of New Mexico

David A. Hanley, MD
University of Calgary

Anthony B. Hodsman, MD
University of Western Ontario

Robert G. Josse, MD
University of Toronto

Brian C. Lentle, MD
University of British Columbia

William D. Leslie, MD
University of Manitoba

Timothy M. Murray, MD
University of Toronto

R. Lawrence Nicholson, MD
University of Western Ontario

Christopher O'Brien, MD
Canadian Association of Nuclear Medicine

Wojciech P. Olszynski, MD
University of Saskatchewan

Diane Theriault, MD
Dartmouth General Hospital

Chui Kin Yuen, MD
University of Manitoba



Canadian Physician pocket guide to BMD testing

The Canadian Panel of the ISCD has established the minimum acceptable standards for the performance of bone mineral density (BMD) testing in women, men and children. These documents were based on a review of the published scientific literature and reflect the consensus of Canadian and international experts. They complement the Osteoporosis Society of Canada (OSC) guidelines and the *International Society for Clinical Densitometry* Official Positions statements. This pocket guide presents key messages from Standards I and Standards II.

Who should undergo BMD testing?

Postmenopausal women

- With 1 major or 2 minor osteoporosis risk factors (Table 1)
- Age 65 or older
- Having diseases or on medications that predispose them to bone loss or increased fracture risk (Table 2)

Men

- Age 50 or older with 1 major or 2 minor risk factors (Table 1)
- Age 65 or older
- Younger men with low-trauma fractures
- Having diseases or on medications that predispose to bone loss or increased fracture risk (Table 2)
- Most men less than age 50 do not need BMD testing

Premenopausal women

- In the presence of low-trauma fractures
- Having conditions (including premature ovarian failure) or on medications that predispose to bone loss or increased fracture risk (Table 2)
- Most premenopausal women do not need BMD testing

Children

- BMD testing is difficult to interpret in children and should be ordered by specialists

Who should be treated for osteoporosis?

In evaluating fracture risk, bone density should be considered in conjunction with other clinical risk factors for fracture. Important independent risk factors include low body weight, history of postmenopausal fracture, family history of fracture and poor neuromuscular function. Intervention should be based on fracture risk as determined by a combined assessment of BMD, age and other clinical risk factors for fracture. Treatment decisions should be based on fracture risk.

- Postmenopausal women with T-score equal to or less than -2.5 , or less than -1.5 with 1 major or 2 minor osteoporosis risk factors (Table 1)
- Men over age 50 with T-score less than -2.5 or presence of fragility fractures
- Individuals on long-term glucocorticoid therapy (prednisone at more than 7.5 mg per day for 3 months or longer)
- The presence of a fragility fracture is independent evidence of osteoporosis and an indication for further investigation and treatment

Serial BMD monitoring

- Repeat BMD at 1–3 years to monitor therapy
- Perform on same machine
- Stable or improving BMD confirms response to treatment
- Interpretation of the significance of serial change requires the precision error of the BMD machine used. Each centre should perform its own precision study and make this information available to reporting and referring physicians. For example, if the precision error is 0.01 gm/cm^2 at the spine, then the least significant change would be 0.03 gm/cm^2 . The serial change at the lumbar spine would have to be greater than 0.03 gm/cm^2 to be statistically significant. Similarly, if the precision error is 0.02 gm/cm^2 at the femoral neck, the least significant change is 0.06 gm/cm^2 , requiring the serial change at the femoral neck to be greater than 0.06 gm/cm^2 to be statistically significant
- If significant bone loss is present, adherence to therapy (including calcium and vitamin D intake) should be assessed. If compliance is not a factor, review management and exclusion of secondary causes of bone loss

WHO diagnostic criteria for BMD (applicable to postmenopausal Caucasian women)

Normal BMD: T-score between $+2.5$ and -1.0 , inclusive (2.5 SD above and 1.0 SD below the young adult mean)

Osteopenia (low BMD): T-score between -1.0 and -2.5

Osteoporosis: T-score equal to or less than -2.5

Severe osteoporosis: T-score equal to or less than -2.5 plus fragility fracture

Pitfalls in interpretation

BMD is falsely high if artifacts are present, including:

- Degenerative spine changes
- Vascular calcification
- Compression fractures
- Metal artifact (e.g., navel ring)

Improper positioning of the proximal femur can falsely raise or lower BMD

What should the BMD report include?

- Comment on the validity of the scan
- T-score (World Health Organization [WHO] classification) for postmenopausal women and men age 65 or over
- Actual BMD in gm/cm^2
- Fracture risk assessment and reference to other clinical risk factors for fracture
- Interpretation of serial BMD change (confirming if change is within the precision error or is a true statistically significant change)
- Diagnosis is based on the lowest T-score at the following sites:
 - posterior-anterior (PA) spine, L1–L4 (all evaluable vertebrae)
 - total hip
 - femoral neck
 - trochanter
 - one-third or 33% radius