The Definition and Epidemiology

**DEFINITION**

Osteoporosis is characterized by the loss of bone density over time as a consequence of an unbalance between osteoclastic (bone removal) and osteoblastic (bone replacement) activity. The World Health Organization defines osteoporosis as a Body Mass Density (BMD) at the hip or spine that is less than or equal to 2.5 standard deviations below the young normal mean reference population.

**EPIDEMIOLOGY**

The National Osteoporosis Foundation has estimated that more than 10 million Americans have osteoporosis. Moreover, 1 out of 2 white women will experience an osteoporosis-related fracture. And 1 in 5 men will experience an osteoporosis-related fracture. Reducing this morbidity (and mortality) is vitally important in family medicine.
WHO TO SCREEN FOR OSTEOPOROSIS?

Screening recommendations vary slightly depending on the organization:

**USPSTF**
The United States Preventative Services Task Force (USPSTF) recommends screening women:

- Aged 65 years or older
- Younger women whose fracture risk is equal to or greater than that of a 65-year-old white woman (i.e. a FRAX score > 9.3%).

The World Health Organization (WHO) has developed a tool to evaluate the fracture risk of patients called The FRAX (Fracture Risk Assessment Tool). After entering that patient’s risk factors, the tool outputs a 10-year probability of a major osteoporotic fracture. This tool is free and can be accessed on-line at [http://www.shef.ac.uk/FRAX/](http://www.shef.ac.uk/FRAX/). The tool utilizes clinical data such as age, body mass index (BMI), family history, and tobacco and alcohol use. A Dual-energy x-ray absorptiometry (DXA) measurement is not necessary to assess risk.

**ACPM**
American College of Preventive Medicine (ACPM) recommends screening:

- All women age ≥ 65 (LOE1a)
- Women aged 50-65 if they have at least one major or two minor risk factors (see table on next page)

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**JOSEPHINE**

Josephine is a 82 year old female who has been remarkably healthy. She is on no medications and she does not smoke or drink.

**PLAN:** FRAX score does not need to be calculated since patient is ≥ 65. Proceed with screening.

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**VICTORIA**

Victoria is a 55 year old female who has been healthy. Her mom recently had a hip fracture and she is wondering if she should be screened for osteoporosis. She is healthy and has no prior history of fractures. She does not smoke or drink. Weight is 155 pounds. Height is 66 inches.

**PLAN:** FRAX score is 10% which is > 9.3%. Proceed with screening.

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**ANNETTE**

Annette is a 46 year old female with history of rheumatoid arthritis currently treated with low dose prednisone. She does not smoke or drink. She has never had a vertebral or hip fracture, but her mother had a hip fracture last year. Height is 66 inches. Weight is 145 pounds.

**PLAN:** FRAX score is 12% which is > 9.3%. Proceed with screening.
The diagnosis of osteoporosis is established by measurement of BMD, in addition to a detailed history and physical examination.\(^1\)

Dual-energy x-ray absorptiometry (DXA) measurements of the hip and spine are the preferred method to establish or confirm a diagnosis of osteoporosis. The WHO has established the following definitions based on BMD measurement at the spine, hip or forearm by DXA devices:

- **Normal**: BMD is within 1 SD of a “young normal” adult (T-score at -1.0 and above).
- **Low bone mass (“osteopenia”)**: BMD is between 1.0 and 2.5 SD below that of a “young normal” adult (T-score between -1.0 and -2.5).
- **Osteoporosis**: BMD is 2.5 SD or more below that of a “young normal” adult (T-score at or below -2.5).

When should we use the Z-Score?

In assessing and following certain populations, the T-score should not be used alone:

- Premenopausal women
- Men less than 50 years of age
- Children

The International Society for Clinical Densitometry (ISCD) recommends that instead of T-scores, ethnic or race adjusted Z-scores should be used, with Z-scores of -2.0 or lower defined as either “low bone mineral density for chronological age” or “below the expected range for age” and those above -2.0 being “within the expected range for age.”

**Major Risk Factors**
- Fragility/compression fracture
- Family history of osteoporotic fracture
- Glucocorticoid therapy > 3 months
- Malabsorption syndrome
- Primary hyperparathyroidism
- Fall risk
- Hypogonadism
- Early menopause (< age 45)

**Minor Risk Factors**
- Rheumatoid arthritis
- Past history of hyperthyroidism
- Anticonvulsant therapy
- Low dietary calcium intake
- Smoker or excessive alcohol
- Excessive caffeine
- Weight < 127 lbs or >10% loss
- Chronic heparin therapy
The choice of therapy should be based on the patient’s clinical situation and the tradeoffs between benefits and harms. Patients that should be considered for pharmacological treatment include postmenopausal women and men age 50 and older presenting with:

- A hip or vertebral fracture
- T-score ≤ -2.5 at the femoral neck or spine after appropriate evaluation to exclude secondary causes
- Osteopenia (T-score between -1.0 and -2.5 at the femoral neck or spine) and a 10-year probability of a hip fracture ≥ 3% or a 10-year probability of a major osteoporosis-related fracture ≥ 20% based on the FRAX score.

### Prevention and Treatment of Steroid-Induced Osteoporosis

Bisphosphonate therapy should be considered in all patients on steroid therapy (prednisone ≥ 7.5 mg) for longer than 3 months and in high risk patients on prednisone ≥ 5 mg daily.

### General Recommendations for Prevention of Fractures

- Women older than age 50 should consume at least 1,200 mg per day of elemental calcium and of 800 to 1,000 international units (IU) of vitamin D per day.
- Recommend regular weight-bearing and muscle-strengthening exercise to reduce the risk of falls and fractures.
- Fall prevention: checking and correcting vision and hearing, evaluating any neurological problems, reviewing prescription medications for side effects that may affect balance and providing a checklist for improving safety at home.
- Avoid tobacco smoking
- Recognize and treat patients with excessive alcohol intake

### Monitoring Treatment

Measurements for monitoring patients should be performed every two years. DXA scan is the “gold standard” for serial assessment of BMD.

### How Long to Treat with Bisphosphonates

Consider stopping bisphosphonates after 3 to 5 years for most patients. Continue in patients at high risk for fracture. Recheck BMD every 2-3 years after discontinuing therapy and restart medications if BMD drops significantly.

### PHARMACOLOGICAL TREATMENT OPTIONS

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
<th>Route</th>
<th>Fracture type</th>
<th>Cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fosamax (Alendronate)</td>
<td>Prevention Treatment</td>
<td>Oral weekly</td>
<td>Hip, vertebral, and non-vertebral</td>
<td>$9-10</td>
</tr>
<tr>
<td>Actonel/Atelvia (Risedronate)</td>
<td>Prevention Treatment</td>
<td>Oral weekly or monthly</td>
<td>Hip, vertebral, and non-vertebral</td>
<td>$119 to 126</td>
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<tr>
<td>Boniva (Ibandronate)</td>
<td>Prevention Treatment</td>
<td>Oral monthly</td>
<td>Vertebral</td>
<td>$100</td>
</tr>
<tr>
<td>Boniva (Ibandronate)</td>
<td>Treatment</td>
<td>IV q 3 months</td>
<td>No data</td>
<td>$162</td>
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<tr>
<td>Reclast (Zoledronic Acid)</td>
<td>Prevention Treatment</td>
<td>IV q year</td>
<td>Hip, vertebral, and non-vertebral</td>
<td>$104</td>
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<tr>
<td>Miacalcin (Calcitonin)</td>
<td>Treatment</td>
<td>Nasal</td>
<td>Vertebral</td>
<td>$126</td>
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<tr>
<td>Forteo (Teriparatide)</td>
<td>Treatment</td>
<td>Subcut. daily</td>
<td>Vertebral and non-vertebral</td>
<td>$675</td>
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<td>Prolia (Denosumab)</td>
<td>Treatment</td>
<td>Subcut. q 6 months</td>
<td>Vertebral and non-vertebral</td>
<td>$137</td>
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</tbody>
</table>

References


9. Sweet MG et al. Diagnosis and Treatment of Osteoporosis. AFP 2009; 79(3) 193-200
