## OSTEOPOROSIS

AGS Geriatrics Evaluation and Management Tools (Geriatrics E&M Tools) support clinicians and systems that are caring for older adults with common geriatric conditions.

### SCREENING DEFINITION

#### U.S. Preventive Services Task Force Guidelines: Indications for Osteoporosis Screening

<table>
<thead>
<tr>
<th>Classification</th>
<th>Bone Mineral Density</th>
<th>T-Score</th>
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</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Within one SD of young adult mean</td>
<td>≥ −1.0</td>
</tr>
<tr>
<td>Osteopenia (low bone mass)</td>
<td>More than 1 but less than 2.5 SD below young adult mean</td>
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<tr>
<td>Osteoporosis</td>
<td>2.5 or more SD below young adult mean</td>
<td>≤ −2.5</td>
</tr>
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<td>Severe (established) osteoporosis</td>
<td>Below 2.5 SD of young adult mean in the presence of one or more fragility fractures</td>
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### WHO Bone Mineral Density Definitions

- **Normal**: Within one SD of young adult mean
- **Osteopenia (low bone mass)**: More than 1 but less than 2.5 SD below young adult mean
- **Osteoporosis**: 2.5 or more SD below young adult mean
- **Severe (established) osteoporosis**: Below 2.5 SD of young adult mean in the presence of one or more fragility fractures

### Common Causes of Secondary Osteoporosis

- Male hypogonadism
- Vitamin D insufficiency
- Idiopathic hypercalciuria
- Multiple myeloma
- Oral glucocorticoids (>7.5 mg/d × 3 months)
- Hyperthyroidism
- Primary hyperparathyroidism
- Solid organ transplantation
- Malabsorption (often celiac disease)

### RISK FACTORS

- Age (postmenopausal in women, >70 years old in men)
- Female sex
- Low body weight (BMI <20 kg/m²)
- 10% decrease in weight (from usual adult body weight)
- Physical inactivity
- Oral glucocorticoids (>7.5 mg/d × 3 months)
- Previous fragility fracture as adult
- Parental history of hip fracture
- White or Asian race
- Current smoking
- Low dietary calcium
- Alcohol intake ≥3 drinks a day
- Rheumatoid arthritis

### MEDICATIONS

Medications that may increase the risk of osteoporosis include:

- Glucocorticoids
- Anticonvulsants
- Cancer chemotherapeutic agents
- Long-term heparin
- Proton-pump inhibitors
- Excess thyroid hormone replacement
- Gonadotropin-releasing hormone agonists (used for prostate cancer)
- Aromatase inhibitors (used for breast cancer)
- Antiretroviral agents

### PHYSICAL EXAMINATION

Comprehensive physical examination with focus on musculoskeletal examination:

- BMI <20 kg/m²
- Gait and balance
- Dental examination (for patients who will receive antiresorptive drugs)
- Palpation of spine for point tenderness
- Strength
- Kyphosis
- Height loss >4 cm in women and >6 in men from peak young adult height is suggestive of previous vertebral fracture

### ADDITIONAL TESTING

Recommended initial testing for those with osteoporosis:

- Fasting comprehensive metabolic panel (including albumin and alkaline phosphatase)
- Serum phosphorus
- 25(OH)D concentration
- TSH
- 24-hour urine collection for calcium and creatinine
- CBC
- Serum parathyroid hormone or serum testosterone may be helpful in some patients
**MODIFICATIONS TO REDUCE RISK**

- Encourage regular, weight-bearing exercise at least 5 times/week for 30 min.
- Recommend the total daily requirement of calcium. *
  - Women >50 years old: 1,200 mg/d
  - Men 51–70 years old: 1,000 mg/d
  - Men >70 years old: 1,200 mg/d
- Use medications that can increase risk of osteoporosis with caution.

*Refer to the Geriatrics Review Syllabus chapter on Osteoporosis for lists of calcium-containing foods. Calcium supplements are carbonate (40% elemental) and citrate (21% elemental). Absorption of either is best in dosages ≤600 mg elemental calcium at one time. Dietary intake is preferred to reach daily goals. Use the lowest dose of supplementation necessary.

**PHARMACOLOGIC MANAGEMENT**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Approved for</th>
<th>Observed Beneficial Treatment Outcomes</th>
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<tbody>
<tr>
<td><strong>Bisphosphonates (should not be used if CrCl &lt;30 mL/min)</strong></td>
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<tr>
<td>Alendronate (adherence to dosing instructions required)</td>
<td>70 mg/wk; 35 mg/wk for prevention</td>
<td>Osteoporosis prevention in postmenopausal women</td>
<td>Vertebral fracture: ARR=71%, NNT=14 over 3 years Hip fracture: ARR=11%, NNT=91 over 3 years</td>
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<tr>
<td>Risedronate (adherence to dosing instructions required)</td>
<td>35 mg/wk or 150 mg/mo</td>
<td>Osteoporosis prevention in postmenopausal women</td>
<td>Vertebral fracture: ARR=5%, NNT=20 over 3 years Nonvertebral fracture: ARR=4%, NNT=25 over 3 years</td>
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<tr>
<td>Ibandronate (adherence to dosing instructions required)</td>
<td>150 mg/mo or 3 mg IV every 3 mo (treatment only)</td>
<td>Osteoporosis prevention and treatment in postmenopausal women</td>
<td>Vertebral fracture: ARR=4.9%, NNT=20 over 3 years</td>
</tr>
<tr>
<td>Zoledronic acid (adherence to dosing instructions required)</td>
<td>5 mg/year IV; 5 mg every 2 years for prevention</td>
<td>Osteoporosis prevention and treatment in postmenopausal women</td>
<td>Morphometric vertebral fracture: ARR=7.6%, NNT=13 over 3 years Clinical vertebral fracture: ARR=2.1%, NNT=48 over 3 years All nonvertebral fractures: ARR=2.7%, NNT=37 over 3 years Hip fracture: ARR=1.1%, NNT=91 over 3 years</td>
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<tr>
<td><strong>Parathyroid hormone</strong></td>
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<tr>
<td>Teriparadite</td>
<td>20 mcg/d SC</td>
<td>Men and women at risk of osteoporotic fracture and unable to tolerate or take other approved agents Men receiving androgen-deprivation therapy Preferred treatment of glucocorticoid-induced osteoporosis</td>
<td>Vertebral fracture: ARR=9%, Nonvertebral fracture: ARR=3%, NNT=11 over 21 months NNT=33 over 21 months</td>
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<tr>
<td><strong>Selective estrogen-receptor modulator</strong></td>
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<tr>
<td>Raloxifene</td>
<td>60 mg/d</td>
<td>Prevention and treatment of osteoporosis in postmenopausal women Breast cancer prevention</td>
<td>Vertebral fracture: ARR=3.5%, NNT=29 over 3 years</td>
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<td><strong>RANK ligand inhibitor</strong></td>
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<td>Denosumab</td>
<td>60 mg SC every 6 months</td>
<td>Postmenopausal women at high risk of fracture or in whom other therapies for osteoporosis have failed or who are otherwise intolerant of other medication</td>
<td>New vertebral fractures: ARR=4.9%, NNT=20 over 3 years Nonvertebral fractures: ARR=1.5%, NNT=67 over 3 years</td>
</tr>
</tbody>
</table>

**FOLLOW-UP**

- Patients receiving treatment for osteoporosis commonly undergo serial BMD measurements at least every 2 years to assess effectiveness (currently covered by Medicare).
- This interval is not a universal recommendation; there is not sufficient evidence to date to support modifying treatment based on BMD response.
- Changes in bone density over short periods are often smaller than the measurement error of most DXA scanners; therefore, frequent testing (eg, <2 years) is unnecessary in most patients.
- Serial BMD measurement is generally used to identify patients who are losing BMD and thus may not be adhering to treatment, who have an underlying secondary cause of bone loss that is undermining therapy, or in whom the prescribed osteoporosis treatment is failing.

**CHOOSING WISELY**

- Do not routinely request BMD measurement more than once every 2 years.