

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.

From the AMERICAN GERIATRICS SOCIETY

Geriatrics Evaluation & Management Tools

DEFINITION AND SCREENING

Osteoporosis is defined by a bone mineral density (BMD) of ≤ -2.5 standard deviations below the young adult reference (T-score ≤ -2.5) or a nonpathologic minimal trauma fracture of the spine, proximal humerus, hip, and/or forearm.

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

- Women
- ≥ 65 years old without previous known fractures or secondary causes of osteoporosis
 - < 65 years old whose 10-year fracture risk is equal to or greater than that of a 65-year-old white woman without any additional risk factors (according to FRAX-US, 10-year fracture risk is 9.3% for a 65-year-old white woman without any additional risk factors for osteoporosis)
- Men
- USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis to prevent osteoporotic fractures in men.
 - It is reasonable to screen men > 50 years old with risk factors for osteoporosis.

- Preferred method of BMD measurement is central DXA (proximal femur and lumbar spine BMD).
- The FRAX is a free online clinical tool (www.shef.ac.uk/FRAX) that estimates the 10-year probability of fracture at the hip or major osteoporotic fracture.

WHO Bone Mineral Density Definitions

Classification	Bone Mineral Density	T-Score
Normal	Within one SD of young adult mean	≥ -1.0
Osteopenia (low bone mass)	> 1 but < 2.5 SD below young adult mean	Between -1.0 and -2.5
Osteoporosis	≥ 2.5 SD below young adult mean	≤ -2.5
Severe osteoporosis	< 2.5 SD of young adult mean in the presence of one or more fragility fractures	≤ -2.5

Causes of Secondary Osteoporosis

- Hypogonadism, early menopause
- Hyperthyroidism
- Hypercortisolism
- Hyperparathyroidism
- Insulin-dependent diabetes mellitus
- Idiopathic hypercalciuria
- Malabsorption (celiac)
- Alcoholism
- Vitamin D insufficiency
- Chronic liver disease
- Multiple myeloma, leukemia, lymphoma, thalassemia
- Solid organ transplantation

RISK FACTORS

- Age (postmenopausal in women, > 70 years old in men)
- Female sex
- BMI < 20 kg/m²
- 10% decrease in weight (from usual adult body weight)
- Physical inactivity
- 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
- SSRIs
- SGLT2 inhibitors
- Thiazolidinediones
- Methotrexate
- Heparin

PHYSICAL EXAMINATION

Comprehensive physical examination with focus on musculoskeletal examination:

- BMI < 20 kg/m² or 10% weight loss
- Gait and balance
- Dental examination (for patients who will receive antiresorptive drugs)
- Palpation of spine for point tenderness
- Strength
- Kyphosis (wall to occiput distance > 0 cm)
- 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
- Serum phosphorus
- 25(OH)D concentration
- TSH
- 24-hour urine collection for calcium and creatinine
- CBC
- Serum parathyroid hormone

MODIFICATIONS TO REDUCE RISK

- Weight-bearing exercise for 30 min \geq 5 times/week
- 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
- Medications that increase osteoporotic risk
- Adequate intake of vitamin D
 - Women and men 51–70 years old: 600 IU/d
 - Women and men >70 years old: 800 IU/d
 - May require more supplementation to achieve serum 25(OH)D \geq 30 ng/mL
- Smoking cessation
- Avoid excessive alcohol intake.

*Calcium supplements are carbonate (40% elemental) and citrate (21% elemental). Absorption of either is best in dosages \leq 600 mg elemental calcium at one time. Dietary intake is preferred to reach daily goals. Use the lowest dose of supplementation necessary.

PHARMACOLOGIC MANAGEMENT

Medication	Dosage	FDA Indication	Adverse Effects/Risks
Bisphosphonates			
Alendronate	Treatment: 70 mg/wk po Prevention: 35 mg/wk po	<ul style="list-style-type: none"> PMO prevention; PMO, male, and GIOP treatment 	<ul style="list-style-type: none"> Take oral bisphosphonates on empty stomach with limited water. Sit up and wait at least 30 minutes before any oral intake. <i>Adverse effects:</i> upper GI symptoms, musculoskeletal pain, esophagitis, acute-phase response Rare: ONJ, atypical femur fractures <i>Contraindication:</i> GFR \leq30 mL/min
Risedronate	35 mg/wk or 150 mg/mo po	<ul style="list-style-type: none"> PMO prevention; PMO, male, and GIOP treatment 	
Ibandronate	150 mg/mo or 3 mg IV every 3 mo (treatment only)	<ul style="list-style-type: none"> PMO prevention; PMO treatment 	<ul style="list-style-type: none"> Use ibandronate only for vertebral fractures. <i>Adverse effects:</i> musculoskeletal pain, hypocalcemia, increased acute-phase response with zoledronic acid (premedication with acetaminophen helps) Rare: ONJ, atypical femur fractures <i>Contraindications:</i> GFR \leq30 mL/min for ibandronate; GFR \leq35 mL/min for zoledronic acid
Zoledronic acid	Treatment: 5 mg/yr IV Prevention: 5 mg every 2 yrs	<ul style="list-style-type: none"> PMO and GIOP prevention; PMO, male, and GIOP treatment 	
RANKL inhibitor			
Denosumab	60 mg SC every 6 months	<ul style="list-style-type: none"> PMO, male treatment 	<ul style="list-style-type: none"> <i>Adverse effects:</i> eczema, injection site reaction, hypocalcemia, increased infection risk (especially of skin) Rare: ONJ, atypical femur fractures To maintain BMD gain, switch to other osteoporosis medication at treatment completion.
Parathyroid hormone			
Teriparatide	20 mcg/d SC	<ul style="list-style-type: none"> PMO, male, and GIOP treatment 	<ul style="list-style-type: none"> <i>Adverse effects:</i> potential for osteosarcoma based on animal studies, hypocalcemia, nausea, vomiting, injection site reaction, fatigue Do not use for >2 years; black box warning for patients with high risk of osteosarcoma.
Abaloparatide	80 mcg/d SC	<ul style="list-style-type: none"> PMO treatment 	
Selective estrogen-receptor modulator			
Raloxifene	60 mg/d PO	<ul style="list-style-type: none"> PMO prevention and treatment 	<ul style="list-style-type: none"> <i>Adverse effects:</i> risk of venous thromboembolism, fatal stroke, flu-like symptoms, hot flashes, leg cramps, peripheral edema Mainly used for patients in need of breast cancer prevention or treatment.
Calcitonin			
Calcitonin	200 IU intranasally once daily; 100 IU SC every other day	<ul style="list-style-type: none"> PMO treatment in women \geq5 years after menopause 	<ul style="list-style-type: none"> <i>Adverse effects:</i> hypocalcemia, nausea, vomiting, allergic reaction, possible risk of cancer Do not use as first-line treatment because of malignancy risk and limited efficacy.

NOTE: PMO = postmenopausal osteoporosis, GIOP = glucocorticoid-induced osteoporosis, ONJ = osteonecrosis of the jaw

FOLLOW-UP

- Serial BMD measurement can identify patients who are losing BMD despite treatment, indicating poor treatment adherence, an underlying secondary cause of bone loss, or failure of the osteoporosis treatment.
- Medicare currently covers serial BMD measurements every 2 years, but this interval is not a universal recommendation and evidence is insufficient to support modifying treatment based on BMD response.

CHOOSING WISELY

- Do not routinely request BMD measurement more than once every 2 years.
- Do not perform population-based screening for vitamin D deficiency.