

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

SCREENING DEFINITION

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**
- Current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis in men.
 - It is reasonable to screen men > 50 years old with risk factors for osteoporosis or who have common causes of secondary osteoporosis.
- The preferred method of bone mineral density (BMD) measurement is central DXA, which measures BMD of the proximal femur and lumbar spine.
 - 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)	More than 1 but less than 2.5 SD below young adult mean	Between -1.0 and -2.5
Osteoporosis	2.5 or more SD below young adult mean	≤ -2.5
Severe (established) osteoporosis	Below 2.5 SD of young adult mean in the presence of one or more fragility fractures	≤ -2.5

Common Causes of Secondary Osteoporosis

- Male hypogonadism
- Vitamin D insufficiency
- Idiopathic hypercalciuria
- Multiple myeloma
- Oral glucocorticoids (> 7.5 mg/d $\times 3$ 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 $\times 3$ 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.
- Encourage 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 between 20 and 40 ng/mL
- Encourage smoking cessation.
- Avoid excessive alcohol intake.

*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 \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	Approved for	Observed Beneficial Treatment Outcomes
Bisphosphonates (should not be used if CrCl <30 mL/min)			
Alendronate (adherence to dosing instructions required)	70 mg/wk; 35 mg/wk for prevention	<ul style="list-style-type: none"> Osteoporosis prevention in postmenopausal women Osteoporosis treatment in both men and women Treatment of glucocorticoid-induced osteoporosis 	Vertebral fracture: ARR=7.1%, NNT=14 over 3 years Hip fracture: ARR=1.1%, NNT=91 over 3 years
Risedronate (adherence to dosing instructions required)	35 mg/wk or 150 mg/mo	<ul style="list-style-type: none"> Osteoporosis prevention in postmenopausal women Osteoporosis treatment in both men and women Treatment of glucocorticoid-induced osteoporosis 	Vertebral fracture: ARR=5%, NNT=20 over 3 years Nonvertebral fracture: ARR=4%, NNT=25 over 3 years
Ibandronate (adherence to dosing instructions required)	150 mg/mo or 3 mg IV every 3 mo (treatment only)	<ul style="list-style-type: none"> Osteoporosis prevention and treatment in postmenopausal women 	Vertebral fracture: ARR=4.9%, NNT=20 over 3 years
Zoledronic acid (adherence to dosing instructions required)	5 mg/year IV; 5 mg every 2 years for prevention	<ul style="list-style-type: none"> Osteoporosis prevention and treatment in postmenopausal women Patients after osteoporotic hip fracture Treatment of osteoporosis in men Prevention of osteoporosis in men and women who are expected to receive \geq12 months of glucocorticoid therapy 	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
Parathyroid hormone			
Teriparatide	20 mcg/d SC	<ul style="list-style-type: none"> 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 	Vertebral fracture: ARR=9%, Nonvertebral fracture: ARR=3%, NNT=11 over 21 months NNT=33 over 21 months
Selective estrogen-receptor modulator			
Raloxifene	60 mg/d	<ul style="list-style-type: none"> Prevention and treatment of osteoporosis in postmenopausal women Breast cancer prevention 	Vertebral fracture: ARR=3.5%, NNT=29 over 3 years
RANK ligand inhibitor			
Denosumab	60 mg SC every 6 months	<ul style="list-style-type: none"> Postmenopausal women at high risk of fracture or in whom other therapies for osteoporosis have failed or who are otherwise intolerant of other medication 	New vertebral fractures: ARR=4.9%, NNT=20 over 3 years Nonvertebral fractures: ARR=1.5%, NNT=67 over 3 years

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.