

Osteoporosis

Who to Screen

The U.S. Preventive Services Task Force (2025):

- Women ≥ 65
- Postmenopausal women < 65 years at increased risk using a clinical risk assessment tool†
- Insufficient evidence for screening for osteoporosis in men (I)

AACE (2020) and BHOE (2022) - same as USPSTF plus

- Men ≥ 70 years
- Younger men with RF

† A healthy 65 year old woman has a 10 year fracture risk score of 8.5% (based on FRAX risk calculator)

Bone Mineral Density*

Normal	≥ -1.0
Osteopenia	Between -1.0 to -2.5
Osteoporosis	≤ -2.5

* BMD should be measured at the forearm (1/3 radius) when:

- The hip and lumbar spine cannot be accurately measured due to structural changes (i.e., osteophytes)
- Weight limitations

FRAX: Major osteoporotic fracture probability ≥20% or hip fracture probability ≥3% is a common treatment threshold.

Diagnosis

- T score ≤ -2.5
- H/o fragility fracture of hip or spine (regardless of T-score)
- Elevated FRAX Score (or if available TBS adjusted FRAX) **PLUS** Osteopenia
- H/o fracture at proximal humerus, distal forearm or pelvis **PLUS** Osteopenia

Parameter	Trabecular Bone Score	DXA (Dual-Energy X-ray Absorptiometry)
Definition	Measure of trabecular bone quality	Standard method for assessing bone mineral density (BMD)
Focus	Bone microarchitecture	Overall bone density
Scoring Range	-2 to +2	T-scores (compared to young adult reference)

When to Repeat BMD

Initial BMD Result (T-score)	Follow-Up Interval, years	Initial hip fracture risk, %
≥ -1.0	> 10	< 0.8
-1.0 to -1.4	5-10	0.8 to 1.4
-1.5 to -1.9	3-5	1.5 to 2.2

Leslie WD, Crandall CJ. JAMA. 2021 Oct 26;326(16):1622-3.

Vertebral Fracture Assessment (VFA)

What is it?

- A diagnostic test using dual-energy X-ray absorptiometry (DXA) to detect vertebral fractures from the thoracic to lumbar spine.
- Provides a low-radiation alternative to traditional spine X-rays.
- Can be performed simultaneously with a DXA scan, allowing both bone density and fracture assessment in one visit.

Why VFA is Important:

- Detects silent vertebral fractures, which often go unnoticed but increase future fracture risk.
- Helps refine fracture risk assessment and guides osteoporosis treatment plans.

When to order:

- Significant Height Loss:
- Loss of >4 cm historically or >2 cm recently may suggest vertebral fractures.
- History of Fractures or Kyphosis:
- Patients with previous fractures, especially after age 50, or visible spine curvature.
- Other High Fracture Risk Factors:
- Conditions like long-term glucocorticoid use, rheumatoid arthritis, or frailty.

Labs

- AACE 2020: CBC, CMP, vitamin D, PTH, phosphate, 24-hour urine collection for calcium, sodium, creatinine, consider: TSH, celiac Ab, UPEP/SPEP
- The minimum: vitamin D, calcium, creatinine

When to Repeat BMD once Treatment is Started

No clear consensus

- No need to repeat DEXA until 5 years of treatment (3 yrs if treating w/ Zoledronic acid) (ACP)
- Perform BMD testing 1 to 2 years after initiating or changing medical therapy for osteoporosis and at appropriate intervals thereafter according to clinical circumstances (BHOE 2022)
- 1-2yrs after starting drug holiday (BHOE, AACE)

Classification

Primary Osteoporosis - bone loss not due to underlying medical conditions.

Causes:

- Postmenopausal (estrogen deficiency) or Age-related (senile osteoporosis).
- Risk Factors: Age, gender, family history, low body weight, sedentary lifestyle, smoking, excessive alcohol intake.

Secondary Osteoporosis - bone loss due to identifiable medical conditions or medications.

Common Causes:

- Endocrine Disorders: Hyperthyroidism, hyperparathyroidism, Cushing’s syndrome.
- Chronic Diseases: Rheumatoid arthritis, chronic kidney disease, multiple myeloma
- Medications: Long-term use of glucocorticoids, certain anticonvulsants.

Lifestyle Interventions

- 1200mg of calcium (BHO)
- Vitamin D 800-1000 IU (25mcg – BHO)
- Exercise: 2 days strength
- Fall risk
- Consider PT
- Limit drinking
- Quit smoking

Medication Classes

Anti-resorptives

- Bisphosphonates
- RANKL-i: Prolia or denosumab
- SERM/estrogen

Anabolics

- PTH Analogs (Forteo or teriparatide, Tymlos or abaloparatide)
- Sclerostin Inhibitors (Evenity or romusosumab)

Treatment of Osteoporosis – First Line: Bisphosphonates

Mechanism of Action:

- Inhibit osteoclast-mediated bone resorption, leading to increased bone density and decreased fracture risk.

Common Medications:

- Alendronate (Fosamax): Oral, weekly (preferred)
- Risedronate (Actonel): Oral, weekly or monthly.
- Ibandronate (Boniva): Oral monthly or IV every 3 months (*no proven reduction of hip fractures)
- Zoledronic acid (Reclast): IV, once yearly.

Side effects: GI upset, esophageal irritation, ONJ (rare), AFF (rare)

Consider a drug holiday after 3-5 years in low-risk patients.

Treatment of Osteoporosis – Second Line: Denosumab

Mechanism of Action:

- Monoclonal antibody that inhibits RANK ligand, preventing the formation and activity of osteoclasts, reducing bone resorption and increasing bone density.

Administration:

- Subcutaneous injection every 6 months (60 mg).
- Administered by healthcare providers in a clinical setting.

Efficacy:

- Proven to significantly reduce the risk of vertebral, hip, and nonvertebral fractures.
- Increases bone mineral density (BMD) at the spine, hip, and forearm.

Side Effects:

- Hypocalcemia: Monitor calcium levels, especially in patients with renal impairment.
- Osteonecrosis of the jaw (ONJ) and atypical femur fractures (AFF) are rare but possible (similar to bisphosphonates).

Discontinuation Risks:

- Rapid bone loss after stopping; consider transitioning to another therapy (e.g., bisphosphonates) after discontinuation to maintain bone density.

Treatment of Osteoporosis - Very High Risk

Medication	Mechanism of Action	Indications	Dosing	Efficacy	Side Effects/Warnings
Teriparatide (Forteo)	Parathyroid hormone analog	Severe osteoporosis, high fracture risk	Daily subcutaneous injection (20 mcg) for up to 2 years	Increases BMD, reduces vertebral and non-vertebral fractures	Hypercalcemia, leg cramps, dizziness
Abaloparatide (Tymlos)	PTH-related peptide analog	Severe osteoporosis in postmenopausal women, high fracture risk	Daily subcutaneous injection (80 mcg) for up to 2 years	Reduces vertebral fractures, increases BMD in spine and hip	Dizziness, nausea, increased uric acid levels
Romosozumab (Evenity)	Sclerostin inhibitor	Severe osteoporosis, previous fractures, high fracture risk	Monthly subcutaneous injections (210 mg) for 12 months	Reduces vertebral, hip, and non-vertebral fractures, significantly increases BMD	Cardiovascular events (stroke, heart attack risk), avoid in stroke patients

SERMs (e.g., raloxifene)	- Reduces vertebral fracture risk in postmenopausal women. - May reduce breast cancer risk (selective estrogen modulation)	- Limited efficacy for hip fracture reduction. - Increases risk of VTE and hot flashes.	- Postmenopausal women with mild osteoporosis or those at increased breast cancer risk
Estrogen	- Reduces vertebral and hip fractures. - May provide relief from menopausal symptoms (hot flashes, vaginal dryness).	- Increased risk of breast cancer, stroke, VTE, and cardiovascular disease. - Often used only short-term.	- Postmenopausal women with osteoporosis and significant menopausal symptoms; often as short-term therapy
Calcitonin	- Reduces vertebral fracture risk. - May provide short-term pain relief in acute vertebral fractures.	- Limited overall fracture efficacy (not shown to reduce hip fractures). - Potential increased risk of cancer with long-term use.	- Rarely used; may be considered for acute pain relief in recent vertebral fractures

ACP Guidelines

First Line -----> bisphosphonates

Second-Line -----> denosumab

High-Risk* Postmenopausal Women -----> romusozumab or teriparatide, followed by bisphosphonate

* High-risk: Multiple spine fracture and T-score ≤ -2.5, fracture during treatment for osteoporosis, fracture while taking medications that cause skeletal harm (e.g., long-term glucocorticoids), T-score < -3.0, FRAX > 4.5% for hip fracture or > 30% for major osteoporotic fracture