

Essentials of Osteoporosis: Early Prevention, Screening, and Management of this Silent Disease



Kimberly Banh, MMS (c)
Faculty Advisor: Dr. Kevin Basile MD, PT
Department of Medical Science

Abstract

Osteoporosis is a common skeletal condition caused by loss of bone mineral density. The progressive thinning places patients at increased risk of fractures over time. Current guidelines suggest screening for osteoporosis at 65 years of age or earlier if risk factors are present. **Without early recognition of risk factors, however, many individuals go undiagnosed for years until a potentially life-threatening fracture occurs.** The incidence of fractures is only expected to rise with the growth of the aging population. Thus, **early recognition of risk factors is critical for initiating timely care to prevent fractures.** This article is intended to educate clinicians on often overlooked risk factors of osteoporosis and the appropriate screening and treatment tools to prevent future fractures.

Key Points

- Osteoporosis is a common, but often missed, condition that can result in debilitating and life-threatening fractures.
- The ability to collect a comprehensive patient history and recognize risk factors can guide providers in the diagnosis and management of osteoporosis.
- Early detection and management of osteoporosis is key in preventing fractures

Epidemiology

Fractures are often the initial presenting symptom of osteoporosis. This leads to unexpected hospitalizations, pain, disability, decreased quality of life, and increased mortality.¹ Of note:

- Nearly 1 in 3 women will have an osteoporotic-fracture in their lifetime.²
- Only 15% will have had a prior diagnosis of osteoporosis.³
- Why is this important? Up to 30% of patients who suffer from osteoporotic-related hip fractures in the United States will die within the first year following the fracture.⁴

The gap between clinical manifestation and diagnosis highlights the underlying urgency to detect and screen for osteoporosis before fractures occur.

Risk Factors

Non-Modifiable^{5,6}

- > 50 years old
- Female sex
- Caucasian / Asian
- Menopause
- Family history of osteoporosis
- Family history of fractures

Modifiable^{7, 8}

- Low body weight (< 127 lbs)
- Low physical activity
- Tobacco use
- Alcohol consumption (> 3 drinks / day)

Endocrine disorders⁹

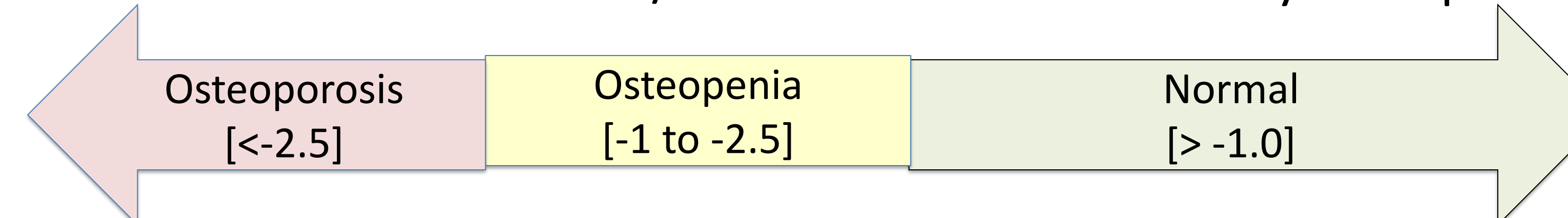
- Hyperparathyroidism
- Diabetes
- Hyperthyroidism
- Hypogonadism

Medications⁹

- Chronic corticosteroid use
- SSRIs
- Loop diuretics

Deficiencies^{10, 11}

- Vitamin D
- Estrogen
- Food intolerances / diseases that affect dietary absorption



Clinical Presentation

- Asymptomatic
- Fractures^{1,12}
 - Low trauma and low energy settings
 - i.e. slipping from a standing position
 - Most commonly occur in the hip and distal radius.
- Non-specific symptoms:⁸
 - Height loss
 - Kyphosis
 - Chronic back pain

Screening Tools

Dual Energy X-Ray Absorptiometry^{7,8}

- Gold standard tool
- Measures an individual's bone mineral density (BMD) and compares it to the BMD of an average healthy 30-year-old individual (T-score)
- National Osteoporosis Foundation recommends DEXA screening for women at age 65 and for men at age 70. This age threshold drops to 50 for postmenopausal women or men with risk factors.

Fracture Risk Assessment Tool (FRAX)⁸

- 10-year risk assessment tool that accounts for:
 - Patient demographics (age, sex, weight, height)
 - Personal and family history of fractures
 - Tobacco and alcohol use
 - Corticosteroid use
 - Medical conditions associated with osteoporosis
 - Femoral neck bone mineral density from prior DEXA scan
- 10-year risk that exceeds 3% for hip fractures and 20% for major osteoporotic fracture should prompt initiation of pharmaceutical therapy

Labs^{8, 13}

- 25-hydroxy vitamin D → vitamin D deficiency
- PTH → hyperparathyroidism
- TSH and T4 → hyperthyroidism
- CBC → anemia or multiple myeloma
- CMP → assess kidney and liver function
- 24-hour urinary calcium → excess loss of calcium

Therapeutics

- Non-Pharmaceuticals^{12, 14, 15}
 - Weight bearing exercise
 - Calcium intake (1000 mg/day)
 - Vitamin D3 supplementation (1000 to 2000 IU/day)
- Pharmaceuticals^{16, 17}
 - Antiresorptive agents (bone-preserving)
 - Bisphosphonates [1st line]
 - Alendronate (Fosamax)
 - Zoledronic acid (Reclast)
 - Anabolic agents (bone-building)
 - Teriparatide (Forteo)
 - Denosumab (Prolia) → injection

References

1. Golchin MM, Heidari L, Ghaderian SM, Akhavan-Niaki H. Osteoporosis: A Silent Disease with Complex Genetic Contribution. *Journal of Genetics and Genomics*. 2016;43(2):49-61. doi:10.1016/j.jgg.2015.12.001.
2. Matzkin EG, DeMaio M, Charles JF, Franklin CC. Diagnosis and Treatment of Osteoporosis: What Orthopaedic Surgeons Need to Know. *Journal of the American Academy of Orthopaedic Surgeons*. 2019;27(20):902-912. doi:10.5435/JAAOS-D-18-00600.
3. Hachula M, Pietrzyk B, Gruszka W, Cedrych I, Chudek J. High rates of undiagnosed and untreated osteoporosis in postmenopausal women receiving medical services in the area of Upper Silesia. *Menopausal Review*. 2020;19(2):72-79. doi:10.5114/pm.2020.97844.
4. US Preventive Services Task Force. Screening for Osteoporosis to Prevent Fractures: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2018;319(24):2521-2531. doi:10.1001/jama.2018.7498.
5. Wright NC, Looker AC, Saag KG, et al. The recent prevalence of osteoporosis and low bone mass in the United States based on bone mineral density at the femoral neck or lumbar spine. *J Bone Miner Res*. 2014;29(11):2520-2526. doi:10.1002/jbmr.2269.
6. Bijelic R, Milicevic S, Balaban J. The Influence of Non-preventable Risk Factors on the Development of Osteoporosis in Postmenopausal Women. *Mater Sociomed*. 2019;31(1):62-65. doi:10.5455/msm.2019.31.62-65.
7. Cosman F, de Beur SJ, LeBoff MS, et al. Clinician's Guide to Prevention and Treatment of Osteoporosis. *Osteoporos Int*. 2014;25(10):2359-2381. doi:10.1007/s00198-014-2794-2.
8. Lewiecki M. Osteoporosis: Clinical evaluation. *Endotext* [Internet]. <https://www.ncbi.nlm.nih.gov/books/NBK279049/>. Published June 7, 2021. Accessed January 8, 2022.
9. Mirza F, Canalis E. Management of endocrine disease: Secondary osteoporosis: pathophysiology and management. *Eur J Endocrinol*. 2015;173(3):R131-R151. doi:10.1530/EJE-15-0118.
10. Ji MX, Yu Q. Primary osteoporosis in postmenopausal women. *Chronic Dis Transl Med*. 2015;1(1):9-13. doi:10.1016/j.cdtm.2015.02.006.
11. Sizar O, Khare S, Goyal A, et al. Vitamin D Deficiency. *StatPearls* [Internet]. <https://www.ncbi.nlm.nih.gov/books/NBK532266/?report=classic>. Published July 21, 2021. Accessed January 6, 2022.
12. Kammerlander C, Erhart S, Doshi H, Gosch M, Blauth M. Principles of osteoporotic fracture treatment. *Best Pract Res Clin Rheumatol*. 2013; 27: 757-769. doi:10.1016/j.berh.2014.02.005.
13. Sheu A, Diamond T. Secondary osteoporosis. *Aust Prescr*. 2016;39(3):85-87. doi:10.18773/austprescr.2016.038.
14. Tong X, Chen X, Zhang S, et al. The effect of exercise on the prevention of osteoporosis and bone angiogenesis. *BioMed Research International*. 2019;2019:1-8. doi:10.1155/2019/8171897.
15. Zhu K, Prince RL. Calcium and bone. *Clinical Biochemistry*. 2012;45(12):936-942. doi:10.1016/j.clinbiochem.2012.05.006.
16. Tu KN, Lie JD, Wan CKV, et al. Osteoporosis: A Review of Treatment Options. *P T*. 2018;43(2):92-104. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5768298/>. Accessed January 18, 2022.
17. Khosla S, Hofbauer LC. Osteoporosis treatment: recent developments and ongoing challenges. *Lancet Diabetes Endocrinol*. 2017;5(11):898-907. doi:10.1016/S2213-8587(17)30188-2.