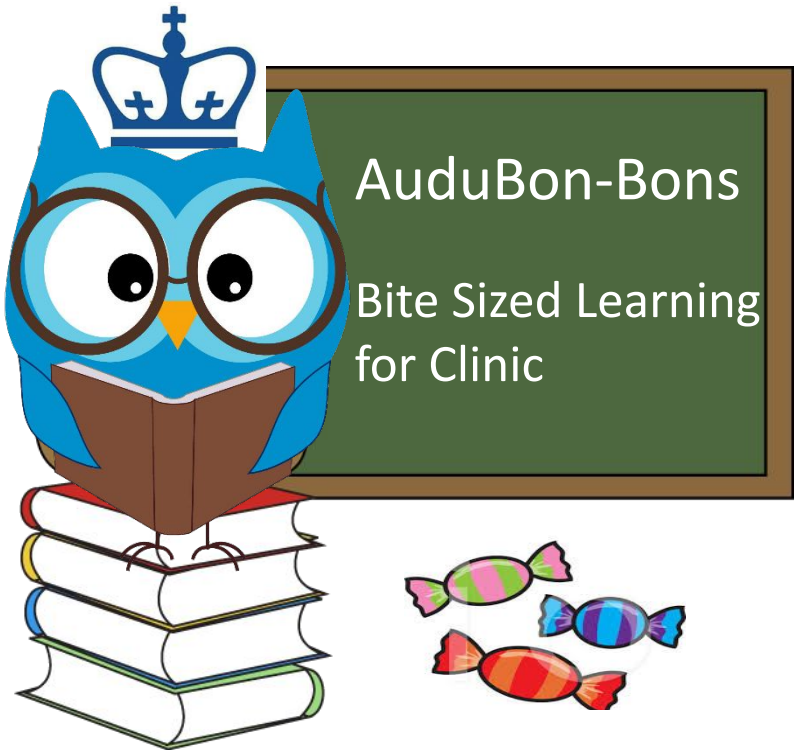
OSTEOPENIA/OSTEOPOROSIS



Week 1

Prepared By: **Annie Fu, MD**

Reading Assignment:
ACOG Practice Bulletin No. 129, “Osteoporosis”

LEARNING OBJECTIVES

- Understand basic bone physiology and pathophysiology of osteoporosis
- Understand screening recommendations for osteoporosis
- Learn how to diagnose and treat osteoporosis

CASE VIGNETTE

- Patient is a 66-year-old G7 P5025 woman who presents for a well-woman visit. She reports she is in good health. She is concerned about bone health as she is post-menopausal; she states that all of her sisters are on medications for osteoporosis.

FOCUSED HISTORY

What elements of this patient's history are most relevant?

- **PMH:** Denies
- **PSH:** Abdominal myomectomy
- **POBH:** 5x FT NSVD, 1x ectopic treated with methotrexate, 1x EPF
- **PGYNH:** **Menopause at 50 y.o.**; denies STIs, abnormal paps, cysts; history of fibroids
- **MEDS:** Multivitamin
- **ALL:** None
- **FAM:** 2 older sisters with osteoporosis; mother deceased from complications of hip fracture at 76 yo
- **SOCIAL:** **1 pack of cigarettes per day x 50 years**; social etoh; no recreational drugs; retired nurse; lives with wife and son; denies IPV

PERTINENT PHYSICAL EXAM FINDINGS

What elements of this patient's physical exam are most relevant?

VS: BP 130/78, P 80, RR 12, T 37.0, height 165 cm, weight 110 kg, **BMI 40.4 kg/m^2**

- **General:** NAD, A&Ox3
- **Breasts**: symmetric, nontender; no masses, skin changes, nipple discharge
- **HEENT**: clear oropharynx, trachea midline, no lymphadenopathy
- **Chest**: CTAB
- **CVS:** RRR
- **Abdominal Exam**: Nontender, nondistended, no rebound/guarding, no hepatosplenomegaly/masses; well healed midline vertical scar
- **Pelvic Exam**:
  - **External**: NEFG, no lesions, erythema, discharge
  - **Speculum exam**: atrophic vaginal epithelium; small, atrophic cervix, no CMT; uterus 6 week size, nontender, mobile, anteverted; no adnexal masses
- **Extremities**: WWP; normal ROM

BACKGROUND

What is osteoporosis?

- A skeletal disorder characterized by bone loss, microarchitecture deterioration, and a decline in bone quality; this leads to bone fragility and increased risk of fracture

What is normal bone physiology?

- Peak bone mass: ~19 y.o. in females
- Peak bone mass determined by heritable, environmental, health, and lifestyle factors
- Osteoclast (resorption) and osteoblast (formation)-mediated bone remodeling and repair differs by age; young adults have negligible net gain/loss of bone but in midlife, bone resorption activity is greater than formation
- Rate of bone loss determined by genetic predisposition, endogenous estrogen levels, and other factors
- Time of most rapid bone loss observed with rapid decline of estrogen during menopause, starting 1 year prior to final menses and lasting 3 years
- Hypoestrogenic states implicated in pathophysiology, along with increase in reactive oxygen species with aging

BACKGROUND (cont'd)

What modifiable factors impact bone health?

- Physical activity (weight-bearing, resistance, aerobics, walking), adequate nutrition (Vitamin D and calcium), and general good health

Epidemiology:

- Varies by ethnicity: higher risk in white than black, Asian, Hispanic populations
- Fivefold greater prevalence in women than men
    - Women account for 80% of hip fractures
- US: 10.2 million older adults with osteoporosis, 42 million with low bone mass (2010 NHANES data)

Secondary causes of osteoporosis

Table 2. Conditions, Diseases, and Medications That Cause or Contribute to Osteoporosis and Fractures ⇦

Rheumatic and autoimmune diseases		
• Ankylosing spondylitis	• Lupus	• Rheumatoid arthritis
Endocrine disorders		
• Adrenal insufficiency	• Diabetes mellitus	• Thyrotoxicosis
• Cushing's syndrome	• Hyperparathyroidism	
Gastrointestinal disorders		
• Celiac disease	• Inflammatory bowel disease	• Primary biliary cirrhosis
• Gastric bypass	• Malabsorption	
• GI surgery	• Pancreatic disease	
Lifestyle factors		
• Low calcium intake	• Vitamin D insufficiency	• Excess vitamin A
• High caffeine intake	• High salt intake	• Aluminum (in antacids)
• Alcohol (3 or more drinks/d)	• Inadequate physical activity	• Immobilization
• Smoking (active or passive)	• Falling	• Thinness
Medications		
• Anticoagulants (heparin)	• Cancer chemotherapeutic drugs	• Gonadotropin releasing hormone agonists
• Anticonvulsants	• Cyclosporine A and tacrolimus	• Lithium
• Aromatase inhibitors	• Depo-medroxyprogesterone	
• Barbiturates	• Glucocorticoids (≥5 mg/d of prednisone or equivalent for ≥3 mo)	
Genetic factors		
• Cystic fibrosis	• Homocystinuria	• Osteogenesis imperfecta
• Ehlers-Danlos	• Hypophosphatasia	• Parental history of hip fracture
• Gaucher's disease	• Idiopathic hypercalciuria	• Porphyria
• Glycogen storage disease	• Marfan syndrome	• Riley-Day syndrome
• Hemochromatosis	• Menkes steely hair syndrome	
Hypogonadal states		
• Androgen insensitivity	• Hyperprolactinemia	• Turner's syndrome and Klinefelter's syndrome
• Anorexia nervosa and bulimia	• Panhypopituitarism	
• Athletic amenorrhea	• Premature ovarian failure	
Miscellaneous conditions and diseases		
• Alcoholism	• Emphysema	• Muscular dystrophy
• Amyloidosis	• End stage renal disease	• Parenteral nutrition
• Chronic metabolic acidosis	• Epilepsy	• Post-transplant bone disease
• Congestive heart failure	• Idiopathic scoliosis	• Prior fracture as an adult
• Depression	• Multiple sclerosis	• Sarcoidosis
Hematologic disorders		
• Hemophilia	• Multiple myeloma	• Systemic mastocytosis
• Leukemia and lymphomas	• Sickle cell disease	• Thalassemia

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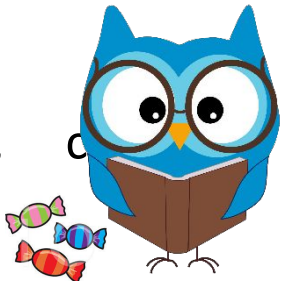
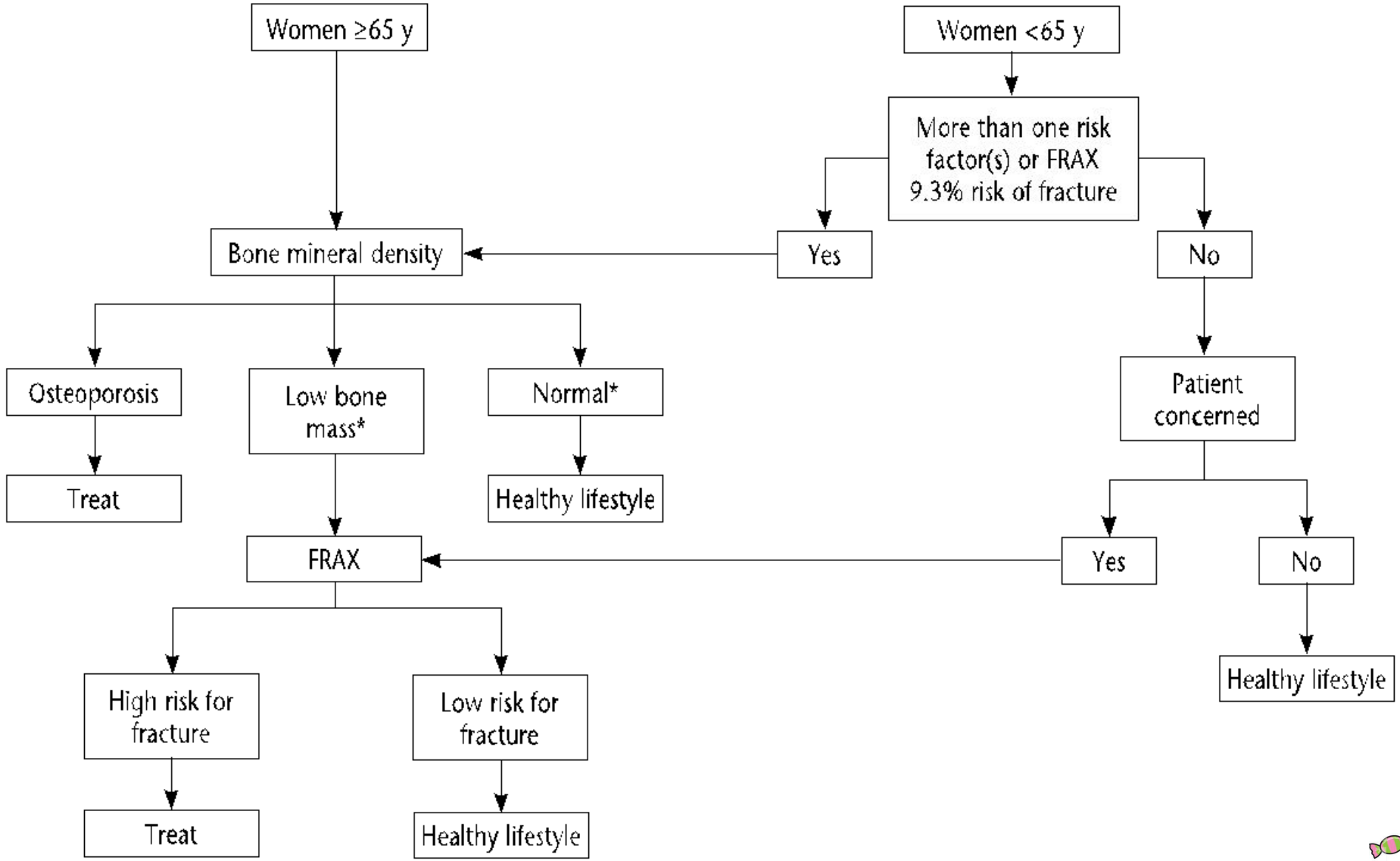
EVALUATION AND DIAGNOSIS

- All patients should be assessed for bone health status
- All patients should undergo risk evaluation for fracture at 50+ years
- All women should undergo screening with a dual-energy X-ray absorptiometry (DXA) scan starting at age 65
- DXA scans should be considered for postmenopausal women < 65 y.o. with risk factors
  - **Risk factors: medical history of fragility fracture, body weight < 127 lbs, medical causes of bone loss (medications, disease, steroid use), parental history of hip fracture, current smoker, alcoholism, rheumatoid arthritis**
  - Fracture Risk Assessment Tool (FRAX) can be used for postmenopausal women 40-64 y.o. with risk factors
    - 10-year risk of major osteoporotic fracture of 9.3% refer for DXA
- If concerned for secondary causes of osteoporosis, can order
  - CBC, metabolic profile, 24-hour urinary calcium level, 25-hydroxyvitamin D level, TSH, c panel, serum electrophoresis





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EVALUATION AND DIAGNOSIS (cont'd)

How do you diagnose osteoporosis?

- DXA of the lumbar spine and hip
- T-score (comparing BMD measurement of femoral neck, total hip, and lumbar spine to the mean BMD of a young, healthy cohort of females)
  - Z-Score (comparing BMD measurement to that of an average person of the same age and sex) is not used for diagnosis, but can be useful for assessment of severity of BMD loss

Table 1. Diagnosing Osteoporosis Using Bone Densitometry Criteria Developed by the World Health Organization ⇦

Category	T Score*
Normal	Greater than or equal to –1.0
Low Bone Mass (osteopenia)	Less than –1 to greater than –2.5
Osteoporosis	Less than or equal to –2.5

*T-score is the number of standard deviations above or below the mean average bone density value for young adult women.

- Diagnosis can also be made clinically with a low-trauma fracture in an at-risk woman

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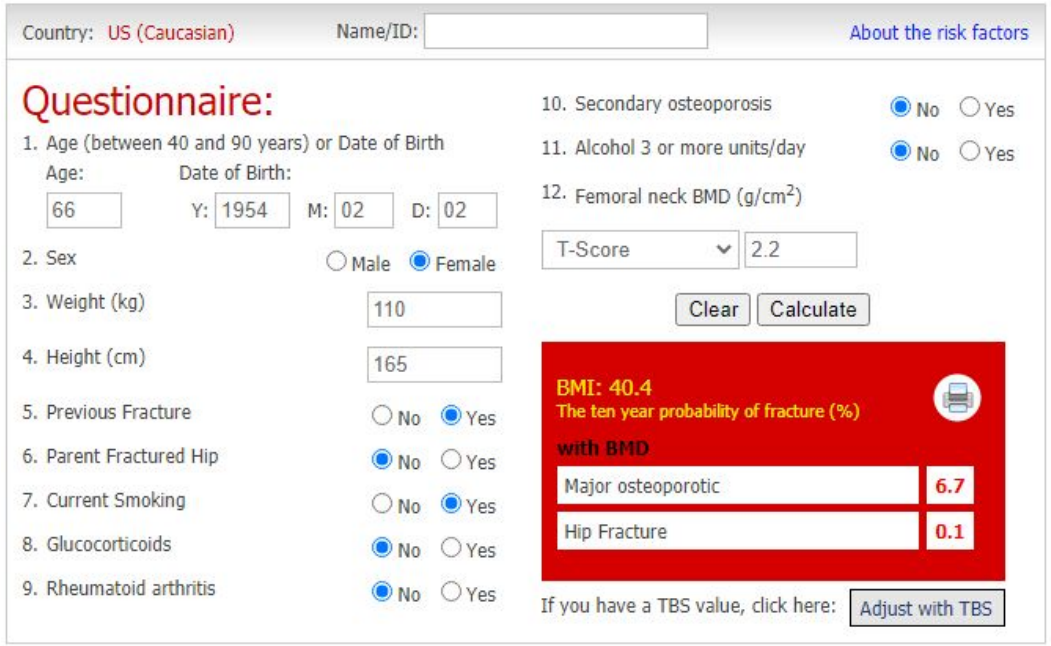
FRAX TOOL

- Validated tool
- Parameters: age, sex, BMI, prior fragility fracture, parental hip fracture, current smoking status, corticosteroid use, alcohol intake >/= 3 drinks qd, rheumatoid arthritis, other secondary causes of osteoporosis
- Specific for gender and race



https://www.sheffield.ac.uk/FRAX/tool.aspx?country=9

TREATMENT

Who should receive treatment for osteoporosis?

1. Women with a T-score of -2.5 or less
2. Women with a history of low-trauma/fragility fracture
3. Women with a T-score in osteopenia range (-1 to -2.5) and FRAX score >/= 3% risk of hip fracture AND/OR >/= 20% risk of major osteoporotic fracture in the next 10 years

TREATMENT (cont'd)

What FDA-approved medications are available to treat osteoporosis?

- **Bisphosphonates** (alendronate, risedronate, ibandronate, zoledronate): **First-line**, antiresorptive medications (inhibit osteoclasts)
  Risks: osteonecrosis of the jaw, seizures, atypical fractures, esophageal irritation/cancer
- **Raloxifene**: antiresorptive SERM, benefit of breast cancer reduction; used more commonly in younger postmenopausal women to prevent prolonged bisphosphate use
  *Risks: VTE, leg cramps, *death* from stroke*
- **Denosumab**: antiresorptive monoclonal antibody to RANKL; requires q 6month SC injections
- **Calcitonin**: antiresorptive, used in women >5 years from menopause;
  Risks: irritation at site of administration, flushing, nausea
- **Teriparatide**: anabolic recombinant PTH 1-34 and 1-84;
  osteosarcoma with >2 years of treatment, nausea, hypercalcemia, muscle cramps

TREATMENT (cont'd)

What are other interventions?

- Hormone therapy for prevention of fracture and increased risk of osteoporosis
  - E+ P can be used 3-5 years before increased risk of breast cancer
  - E alone can be used for a longer period
  - Quick loss of benefit w/in 1-2 years of discontinuation
- Lifestyle modifications including exercise, nutrition, vitamin D and calcium supplementation, reduce cigarette/EtOH use, adopting fall-prevention strategies

What is the recommended Vitamin D and calcium intake for women?

Table 4. Institute of Medicine Recommended Dietary Allowances for Calcium and Vitamin D ⇦

Age (yr)	Calcium Recommended Dietary Allowance (mg/day)	Vitamin D Recommended Dietary Allowance (international units/day)
9–18	1,300	600
19–50	1,000	600
51–70	1,200	600
71 and older	1,200	800

Data from Institute of Medicine. Dietary reference intakes: calcium, vitamin D. Washington, DC: National Academies Press; 2011.

MANAGEMENT

What is the recommended interval for DXA screening?

- If undergoing treatment:
  - No sooner than 2 years after initiation; can be done q1-2 years
  - Not required after BMD improves/stabilizes and no new risk factors are present
- If not undergoing treatment
  - No sooner than every 2 years; up to every 15 years

SOCIAL DETERMINANTS OF HEALTH

Osteoporosis is a disease process that disproportionately affects our patient population

- Women with osteoporosis, regardless of whether or not they have a history of fracture, report reduced quality of life compared to women without osteoporosis
- Women of lower socioeconomic status are more likely to have risk factors predisposing them to developing osteoporosis
- One study demonstrated that 1/3 of Medicare patients had low-adherence to medication, significantly increasing their risk for osteoporotic fracture and its associated morbidity/mortality

Educate your patients on good preventive measures, importance of adherence to screening recommendations and medication administration

EPIC .PHRASE

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Description: Osteoporosis screening, counseling, treatment

We reviewed screening recommendations for osteoporosis, including the recommendation for a DXA scan starting at 65 years old, or in women under 65 with risk factors for osteoporosis.

We discussed the importance of good bone health and the risks of decreased bone mineral density in older adults and postmenopausal women. We reviewed maintenance strategies for good bone health, including 1) regular exercise, including weight-bearing and stretching exercises; 2) vitamin D and calcium intake; 3) adopting fall prevention strategies; ***4) smoking cessation; ***5) reduced alcohol intake.

***We reviewed the findings on the patient's DXA scan, which showed a T-score of ***, diagnostic of osteoporosis. We discussed the implications of this result, namely the increased risk of fracture and the significant morbidity and mortality risks associated with fracture. We discussed management strategies, including medications such as bisphosphonates. We provided the patient with a referral to Endocrinology for long-term management. Patient opts to start *** for management of osteoporosis.

CODING/BILLING

- ICD-10 Diagnosis Code:
  - M81.0: Age-related osteoporosis without current pathological fracture
  - M81.8: Other osteoporosis without current pathological fracture
  - M85.80: Other unspecified disorders of bone density and structure, unspecified site
  - M80.08XA: Age-related osteoporosis with current pathological fracture, vertebra(e), initial encounter for fracture
  - Z13.80: Encounter for screening for osteoporosis

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