Improving Your Bone Health

Review of Current Guidelines for Osteoporosis

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February 24, 2015

Disclosure Statement

- The speaker has no conflict of interest to disclose

Objectives

- Review the pathophysiology of osteoporosis
- List risk factors that cause or contribute to osteoporosis and fractures
- Describe diagnostic tests utilized in the diagnosis and management of osteoporosis
- List preventive strategies and treatments for osteoporosis
- Discuss pharmacological therapy for the treatment of osteoporosis

Osteoporosis[1]

- Bone disorder characterized by
  - Low bone density
  - Impaired bone architecture
  - Compromised bone strength
  - All factors increase risk of fracture
    - Risk of fractures highest in those with the lowest bone mineral density (BMD)

Osteoporosis[1,2]

- Major public health threat
  - 55% of Americans 55 years of age and older are expected to have the disease
  - In the US, 8 million women and 2 million men are estimated to have osteoporosis
  - About one out of every two Caucasian women will experience an osteoporosis-related fracture at some point in her lifetime, as will approximately one in five men
  - Osteoporosis is less frequent in African Americans, however those with osteoporosis have the same elevated fracture risk as Caucasians

Osteoporosis[1]

- Fractures and their complications are the relevant clinical sequelae of osteoporosis
  - Common fractures are those of vertebrae (spine), proximal femur (hip) and distal forearm (wrist)
- A recent fracture at any major skeletal site in an adult over 50 years of age should be considered a significant event for the diagnosis of osteoporosis

Select Medications Associated with Increased Bone Loss and/or Fracture Risk[2]

Medications	Comments
Anticonvulsant therapy (phenytoin, carbamazepine, phenobarbital, valproic acid)	↓ BMD and ↑ fracture risk; increased vitamin D metabolism leading to low 25(OH) vitamin D concentrations
Aromatase inhibitors (e.g., letrozole, anastrozole)	↓ BMD and ↑ fracture risk; reduced estrogen concentrations
Furosemide	↑ Fracture risk; increased calcium renal elimination
Glucocorticoids (chronic oral therapy)	↓ BMD and ↑ fracture risk; dose and duration dependent; see special populations section
Gonadotropin-releasing hormone agonists or analogs (e.g., leuprolide, goserelin)	↓ BMD and ↑ fracture risk; decreased sex hormone production
Heparin (unfractionated) or low-molecular-weight heparin	↓ BMD and ↑ fracture risk (unfractionated >>> low molecular weight) with long-term use (e.g., >6 mo); decreased osteoblast function and increased osteoclast function
HIV medications Nucleoside reverse transcriptase inhibitors (antiretroviral therapy) (zidovudine, didanosine, lamivudine)	↓ BMD (ART > PI), no fracture data; increased osteoclast activity and decreased osteoblast activity
Protease inhibitors (nelfinavir, indinavir, saquinavir, ritonavir, lopinavir)	
Medroxyprogesterone acetate depot administration	↓ BMD, no fracture data; possible BMD recovery with discontinuation; central DXA monitoring of BMD recommended with ≥2 years of use; decreased estrogen concentrations
Proton pump inhibitor therapy (long-term therapy)	↑ Vertebral and hip fracture risk; possible calcium malabsorption secondary to acid suppression for carbonate salts
Selective serotonin reuptake inhibitors	↑ Hip fracture risk; decreased osteoblast activity
Thiazolidinediones (pioglitazone, rosiglitazone)	↓ BMD and ↑ fracture risk; risk may be greater in women than men; decreased osteoblast function
Thyroid hormone: excessive supplementation	↓ BMD and ↑ fracture risk (> in men); risk increases with TSH concentration <0.1 mIU/L; possible increase in bone resorption
Vitamin A: excessive intake (≥1.5 mg of retinol form)	↓ BMD and ↑ fracture risk; decreased osteoblast activity and increased osteoclast activity

ART, antiretroviral therapy; BMD, bone mineral density; DXA, dual-energy x-ray absorptiometry; HIV, human immunodeficiency virus; PI, protease inhibitors; TSH, thyroid stimulating hormone

Osteoporosis[1]

- Annually, 2 million fractures are attributed to osteoporosis in the US
  - 432,000 hospital admissions
  - 2.5 million medical office visits
  - 180,000 nursing home admissions
- By 2025, the cost of care is expected to rise to $25.3 billion
- Only 23% of women age 67 or older who have an osteoporosis-related fracture receive either a BMD test or a prescription for a medication to treat osteoporosis in the 6 months after the fracture

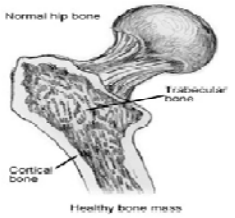
Pathophysiology[1,2]

Two types of bone in the human body

- Cortical
- Trabecular

Bone is composed of collagen and mineral compounds

- Collagen gives bone flexibility and energy-absorbing capability
- Mineral component gives bone stiffness and strength

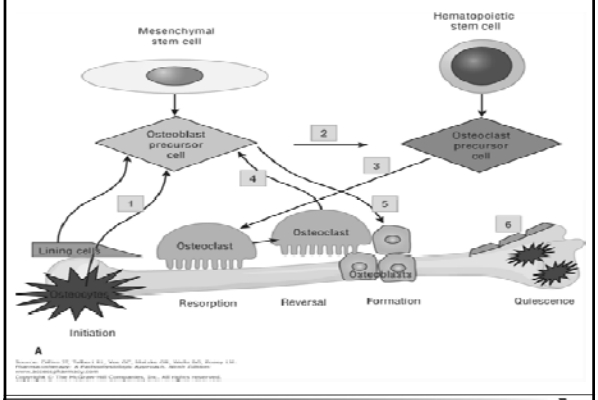


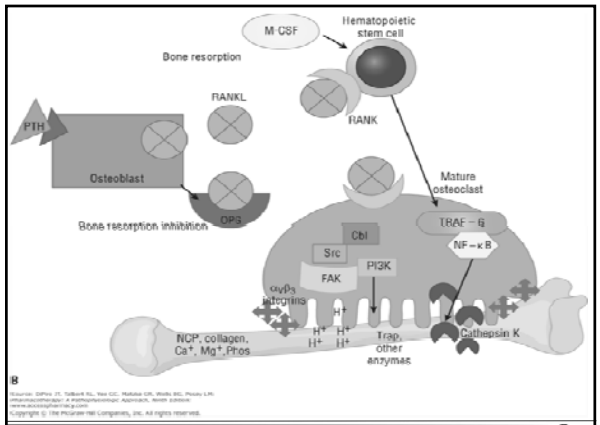
Trabecular and cancellous bone
http://emedicine.medscape.com/article/1948532-overview#aw2aab6b3

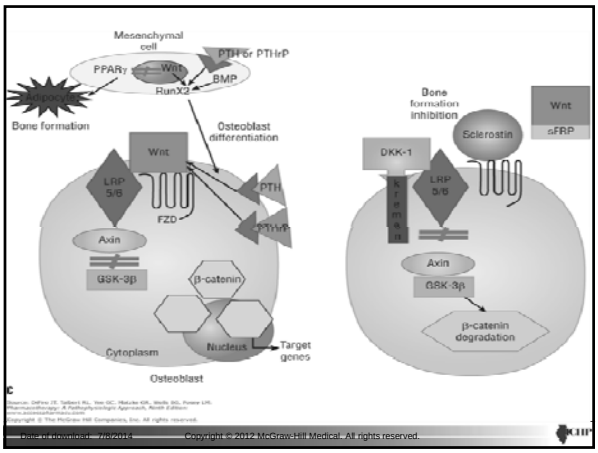
Pathophysiology[2]

- Bone strength is the integration of bone mass and bone quality
- Bone mass increases rapidly throughout childhood and adolescence
- Peak bone mass around age 18-21 years
  - 60-80% genetic factors
  - 20-40% modifiable factors
    - nutritional intake, exercise, adverse lifestyle, hormonal status, certain disease and medications

Prevent osteoporosis ⇨ Optimize peak bone mass







Pathophysiology[2]

- Estrogen
  - Helps to maintain a normal bone resorption rate
  - Suppresses the proliferation and differentiation of osteoclasts and increases osteoclast apoptosis
- Testosterone
  - Most of the bone effects relate to its metabolism to estradiol
  - Inhibits OPG production, which will inhibit bone resorption

Pathophysiology[2]

- Vitamin D and Parathyroid Hormone
  - Work together to maintain calcium homeostasis
  - Sources of Vitamin D
    - Ultraviolet B light
    - Dietary vitamin D and supplements
- Calcium
  - Normal absorption is 30-40%
    - Decreases to 10-15% with low vitamin D concentrations

Postmenopausal Osteoporosis[2]

- Estrogen deficiency causes significant bone density loss and compromises bone architecture
- Estrogen loss increases calcium excretion and decreases calcium gut absorption
- Accelerated bone loss begins during perimenopause and continues for 3-4 years after menopause
- Annual bone loss can be as high as 2%
  - Total BMD loss is 6-7%

Male Osteoporosis[2]

- Decreased testosterone leads to decreased bone loss
- Men are at lower risk for developing osteoporosis and osteoporotic fractures but have a higher mortality rate after a fracture than women

Risk Factors for Osteoporosis and Fractures[1,2]

- **Lifestyle Factors**
  - Alcohol abuse
  - Frequent falling
  - Inadequate physical activity
  - Vitamin D insufficiency
  - High salt intake
  - Low calcium intake
  - Smoking (active or passive)

Risk Factors for Osteoporosis and Fractures[1,2]

- **Genetic Diseases**
  - Cystic Fibrosis
  - Parental history of hip fracture
- **Hypogonadal states**
  - Androgen insensitivity
  - Anorexia nervosa
  - Premature menopause (<45 yrs)
- **Endocrine Disorders**
  - Obesity
  - Hyperparathyroidism
  - Diabetes mellitus (Types 1 & 2)

Risk Factors for Osteoporosis and Fractures[1,2]

GI Disorders

- Celiac Disease
- Gastric bypass
- Gastrointestinal surgery
- Inflammatory bowel disease
- Malabsorption
- Pancreatic disease

Hematologic Disorders

- Hemophilia
- Multiple Myeloma
- Leukemia and lymphomas
- Sickle Cell Disease

Risk Factors for Osteoporosis and Fractures[1,2]

Rheumatologic and Autoimmune Diseases

- Rheumatoid arthritis
- Systemic lupus

Neurological and Musculoskeletal Conditions

- Epilepsy
- Multiple sclerosis
- Muscular dystrophy
- Parkinson's disease
- Spinal cord injury
- Stroke

Risk Factors for Osteoporosis and Fractures[1,2]

- **Miscellaneous conditions and diseases**
  - AIDS/HIV
  - Alcoholism
  - Chronic obstructive lung disease
  - Congestive heart failure
  - Depression
  - End stage renal disease
  - Weight loss
- **Medications**
  - Aluminum
  - Anticoagulants
  - Anticonvulsants
  - Aromatase Inhibitors
  - Barbiturates
  - Chemo drugs
  - Depo-medroxyprogesterone
  - Glucocorticoids
  - GnRH agonists
  - Methotrexate
  - Parental nutrition
  - Proton pump inhibitors
  - Tamoxifen
  - Thiazolidinediones

Diagnosis of Osteoporosis[1,2]

- Established by measurement of BMD or by the occurrence of adulthood hip or vertebral fracture in the absence of a major trauma
- Many vertebral factures are asymptomatic
- Some fractures present with moderate-to-severe back pain that radiates down the leg
- Multiple vertebral fractures decrease height and sometime curve the spine with or without back pain

Clinical Presentation[2]

- Many patients are unaware that they have osteoporosis until testing for a fracture
- Fractures can occur after bending, lifting, or falling, or independent of any activity

Symptoms	Signs
Frequently asymptomatic	Shortened stature (>1.5 –inch loss), kyphosis, or lordosis
Pain	Atraumatic vertebral, hip, wrist, or forearm fracture
Immobility	
Depression, fear, and low self-esteem from physical limitations and deformities	

Diagnostic Tests[1,2]

- Dual-energy x-ray absorptiometry (DXA) scan
  - Used to diagnosis osteoporosis, predict future fracture risk and monitor patients
  - Measures a patient's BMD by aiming two x-ray beams with different energy levels at their bones
    - When soft tissue absorption is subtracted out, the BMD can be determined from the absorption of each beam by bone

http://www.cutting-edgeortho.com/osteo.php

WHO Definition of Osteoporosis Based on BMD[1]

Classification	BMD	T-score
Normal	Within 1 SD of the mean level for a young-adult reference population	T-score at -1.0 and above
Low Bone Mass (Osteopenia)	Between 1.0 and 2.5 SD below that of the mean level for a young-adult reference population	T-score between -1.0 and -2.5
Osteoporosis	2.5 SD or more below that of the mean level for a young-adult reference population	T-score at or below -2.5
Severe or Established Osteoporosis	2.5 SD or more below that of the mean level for a young-adult reference population	T-score at or below -2.5 with one or more fractures

- Applies to postmenopausal women and men age 50 years and older
- International Society for Clinical Densitometry (ISCD) recommends ethnic or race adjusted Z-scores be used for premenopausal women, men less than 50 years of age and children

BMD Testing[1]

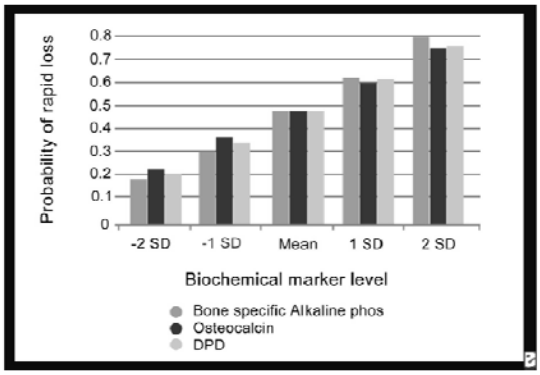
- BMD testing recommended for the following individuals
  - Women age 65 and older and men age 70 and older, regardless of clinical risk factors
  - Younger postmenopausal women, women in the menopausal transition and men age 50-69 with clinical risk factors for fracture
  - Adults who have a fracture after age 50
  - Adults with a condition or taking medications associated with low bone mass or bone loss

Biochemical Markers of Bone Turnover[1-3]

- Bone remodeling occurs throughout life to repair fatigue damage and microfractures in bone and to maintain mineral homeostasis
- Biochemical markers allow for a specific and sensitive assessment of the rate of bone formation and bone resorption of the skeleton
- **Resorption markers**
  - Urinary or serum C-telopeptide (CTX)
  - Urinary N-telopeptide (NTX)
  - Urinary free deoxypyridinoline (DPD)
- **Formation markers**
  - Serum bone specific alkaline phosphatase (BSAP),
  - Serum osteocalcin (OC)
  - Serum aminoterminal propeptide of type 1 procollagen (P1NP)
- Useful in select cases to improve the assessment of individual fracture risk when BMD measurement does not provide a clear answer
  - Laboratory testing is recommended in the morning while patients are fasting

Biochemical Markers of Bone Turnover[1]

- May predict risk of fracture independently of bone density in untreated patients
- May predict rapidity of bone loss in untreated patients
- May predict extent of fracture risk reduction when repeated after 3-6 months of treatment with FDA-approved therapies
- May predict magnitude of BMD increases with FDA-approved therapies
- May help determine adequacy of patient compliance and persistence with osteoporosis therapy
- May help determine duration of 'drug holiday' and when and if medication should be restarted



Prediction of bone loss with biochemical bone markers. Adapted from Ross PD, Knowlton W. Rapid bone loss is associated with increased levels of biochemical markers. (DPD stands for deoxypyridinoline.) J Bone Miner Res 1998 Feb; 13(2): 297-302.

WHO Fracture Risk Algorithm[1]

- World Health Organization (WHO) developed FRAX® to calculate the 10-year probability of a hip fracture and the 10-year probability of a major osteoporotic fracture
- Available at www.nof.org and www.shef.ac.uk/FRAX
- Intended for postmenopausal women and me age 50 and older
- FRAX model has not been validated in patients currently or previously treated with pharmacotherapy for osteoporosis

Preventive Strategies for Preserving Bone Health

Ways to Preserve Bone Strength[1,2]

Bone Healthy Lifestyle

- Adequate intake of calcium and vitamin D
- Regular exercise including both weight-bearing and muscle-strengthening
- Smoking cessation
- Avoidance of excessive alcohol intake
- Fall prevention

Calcium and Vitamin D[1]

- Adequate amounts reduce fracture risk
- Sources provided through a well balanced diet
  - Low-fat dairy products
  - Fruits
  - Vegetables
- Dietary supplementation is recommended if adequate dietary calcium cannot be obtained

Calcium Intake Recommendations[1,2]

- Men
  - Age 50-70: 1000mg per day
  - Age 71 and greater: 1200mg per day
- Women
  - Age 51 and older: 1200mg per day
- There is no evidence that amounts greater than these provide additional bone strength
- Average daily dietary intake in adults age 50 and older is 600-700mg per day
  - Dietary supplementation is indicated up to the recommended daily intake

Estimating Daily Dietary Calcium Intake[1]

Step 1: Estimate calcium intake from calcium-rich foods*			
Product	# of Servings/day	Estimated calcium/serving, in mg	Calcium in mg
Milk (8 oz)	_____	X 300	=_____
Yogurt (6 oz)	_____	X 300	=_____
Cheese (1 oz or 1 cubic in)	_____	X 200	=_____
Fortified foods or juices	_____	X 80 to 1,000**	=_____
		Subtotal:_____	
Step 2: Add 250mg for non-diary sources to subtotal above		+ 250	
		TOTAL Calcium, in mg = _____	

*About 75-80% of calcium consumed in American diets is from dairy products
** Calcium content of fortified foods is variable

Dietary Calcium[4]

Dairy Foods	Nondairy Foods	Soy Products
Yogurt (1 cup)- 350mg	Black beans (1 cup)- 100mg	Soy milk, calcium-enriched (1 cup)- 300mg
Milk (1 cup)- 300mg	Broccoli (1 cup, cooked)- 150mg	Soy yogurt, calcium-enriched (3/4 cup)- 300mg
Cheddar cheese (1oz)- 200mg	Orange juice, calcium-fortified (6oz)- 350mg	Tofu, firm or extra firm (1/4 cup)- 250mg
Part skim ricotta cheese (1/4 cup)- 170mg	Turnip greens, cooked (1/2 cup)- 100mg	
Cottage cheese (1 cup)- 150mg	Pink salmon with bones, cooked (3oz)- 180mg	

Calcium Supplementation[4]

- Calcium carbonate (40% elemental calcium)
  - Take with meals and needs acidic environment for absorption
- Calcium citrate (21% elemental calcium)
  - Easily absorbable and does not need an acidic environment for absorption
  - Less GI side effects
- Calcium phosphate, calcium lactate, and calcium gluconate are not recommended due to having small amounts of elemental calcium

Vitamin D[1]

- Aids in calcium absorption, bone health, muscle performance, balance and risk of falling
- Daily intake recommendations are 800-1,000 international units (IU) for adults 50 years and older
- Three main sources
  - Sunlight (cholecalciferol, vitamin D_3)
  - Diet
  - Supplements
- Dietary sources
  - Vitamin D-fortified milk
  - Eggs
  - Cereals (40-50 IU per serving or more)
  - Salt-water fish
  - Liver

Vitamin D Deficiency[1]

- Monitoring of serum 25(OH)D levels are recommended in patients at risk of deficiency
  - Malabsorption or other intestinal diseases
  - Chronic renal insufficiency
  - Medications that increase the breakdown of vitamin D
  - Housebound patients
  - Osteoporosis (hip fracture)
- Vitamin D supplementation is recommended to bring serum 25(OH)D level to approximately 30 ng/mL (75 nmol/L) and a maintenance dose to maintain at this level
- Treatment consists of 50,000 IU of vitamin D_2 or vitamin D_3 once a week for 8-12 weeks to achieve a 25(OH)D blood level of approximately 30 ng/mL
  - Maintenance therapy of 1,500-2,000 IU/day

Lifelong Physical Activity[1,2]

- Regular weight-bearing and muscle-strengthening exercise recommended to reduce the risk of falls and fractures
- **Weight-bearing exercise**
  - Walking, jogging
  - Tai-Chi, golf
  - Stair climbing, dancing and tennis
- **Muscle-strengthening exercise**
  - Weight training
  - Resistive exercises: yoga, Pilates, and boot camp programs

Fall Prevention[1,2]

- Maintaining adequate vitamin D levels and physical activity
- Home safety assessment
- Withdrawal of medications that increase the risk of falls
  - Anticonvulsants, antipsychotics, benzodiazepines, nonbenzodiazepine hypnotics, TCAs, SSRIs,
- Correction of visual impairment, low blood pressure, heart rate and rhythm problems

Limiting Substance Use[1,2]

- Smoking Cessation
  - Tobacco products are harmful to the skeleton
  - Counseling on smoking cessation can help optimize peak bone mass and minimize bone loss
- Reducing alcohol consumption
  - Alcohol intake of more than 2 drinks per day for women or 3 drinks per day for men may be detrimental to bone health, increases the risk of falling , and requires further evaluation for potential alcoholism

Pharmacologic Therapy

Treatment Candidates[1,2]

- Postmenopausal women and men age 50 and older presenting with the following:
  - Hip or vertebral fracture
  - T-score ≤ -2.5 at the femoral neck, total hip or lumbar spine
  - Low bone mass (T-score between -1.0 and -2.5 at the femoral neck or lumbar spine) with a 10-year probability of a hip fracture ≥ 3% or a 10-year probability of a major osteoporosis-related fracture ≥20% based on WHO algorithm

FDA Approved Therapies

- Bisphosphonates
- Calcitonin
- Estrogens
- Estrogen agonist/antagonist
- Tissue-selective estrogen complex
- Parathyroid hormone
- RANKL inhibitor

FDA Approved Therapies[1,2]

- Mostly studied in women with postmenopausal osteoporosis
- Limited fracture data in glucocorticoid-induced osteoporosis and in men
- FDA approved drug therapies have been shown to decrease fracture risk in patients who have had fragility fractures and/or osteoporosis by DXA
- May also reduce fractures in patients with osteopenia without fractures

Bisphosphonates

- Alendronate, risedronate, zoledronic acid
  - Indicated for postmenopausal, male, and glucocorticoid-induced osteoporosis
- Ibandronate
  - Indicated only for postmenopausal osteoporosis

Bisphosphonates[1,5]

Medication	Dose	Adverse Effects	Anti-fracture Benefit
Alendronate	**Prevention**: 5mg po daily or 35mg po weekly **Treatment**: 10mg po daily, 70mg po weekly,	Difficulty swallowing, inflammation of the esophagus and stomach Renal Impairment: contraindicated with CrCl<30-35mL/min Osteonecrosis of the Jaw (ONJ): associated with long term use; risk increases with duration of treatment beyond 5 years Atypical femur fracture	Reduces incidence of spine and hip fracture by 50% over 3 years in patients with a prior vertebral fracture or in patients who have osteoporosis at the hip site Reduces the incidence of vertebral fractures by 48% over 3 years in patients without a prior vertebral fracture
Ibandronate	**Treatment**: 150mg po monthly or 3mg IV every 3 months		Reduces the incidence of vertebral fractures by 50% over 3 years
Risedronate	**Prevention and Treatment**: 5mg po daily, 35mg po weekly, 75mg po on 2 consecutive days every month, 150mg po monthly		Reduces the incidence of vertebral fractures by 41-49% and non-vertebral fractures by 36% over 3 years
Zoledronic acid	**Prevention**: 5mg IV every 2 years **Treatment**: 5mg IV annually	Acute phase reaction Renal Impairment: contraindicated with CrCl<35mL/min Atypical femur fracture ONJ	Reduces the incidence of vertebral fractures by 70%, hip fractures by 41% and non-vertebral fractures by 25% over 3 years

Calcitonin[1,5]

- For the treatment of osteoporosis in women who are at least 5 years postmenopausal when alternative treatments are not suitable
- **Miacalcin®**: 100 units daily, IM or SubQ
- **Fortical®, Miacalcin®**: 200 units (1 spray) in one nostril daily, using alternate nostrils each day
- Intranasal calcitonin can cause rhinitis, epistaxis and allergic reactions (history of salmon allergy)
- Risk of malignancy associated with long-term use (6 months-5 years); risk vs benefit
- 30% reduction in vertebral fracture occurrence in those with prior vertebral fractures; no risk reduction of nonvertebral fractures

Estrogen/Hormone Therapy (ET/HT)[1]

- Estrogen therapy
  - Approved for the prevention of osteoporosis
  - Climara®, Estrace®, Estraderm®, Estratab®, Ogen®, Premarin®, Vivelle®
- Hormone therapy (progestin) required for women who have not had a hysterectomy
  - Activella®, Femhrt®, Premphase®, Prempro®
- Women's Health Initiative (WHI) reported that 5 years of Prempro® reduced the risk of clinical vertebral fractures and hip fractures by 34% and other osteoporotic fractures by 23%

Estrogen/Hormone Therapy (ET/HT)[1]

- Wide variety of oral and transdermal preparations available
- When treatment is stopped, bone loss can be rapid, therefore an alternative agent should be considered to maintain BMD
- Due to risk of myocardial infarction, stroke, invasive breast cancer, pulmonary embolism, and deep vein thrombosis, non-estrogen therapy should be considered first for the prevention of osteoporosis

Estrogen Agonist/Antagonist[1,5]

- **Raloxifene**
  - Approved for prevention and treatment of osteoporosis in postmenopausal women
  - Dose is 60mg po daily with or without food
  - Increases risk for DVT or PE and death due to stroke in women with history of coronary heart disease
  - 30% risk reduction of vertebral fractures in patients with a prior vertebral fracture and ~55% risk reduction in patients without a prior vertebral fracture over 3 years

Tissue-Selective Estrogen Complex: Conjugated Estrogens/Bazedoxifene[1,5]

- Approved for the prevention of osteoporosis after menopause in women who still have a uterus
- Combination of conjugated estrogen and bazedoxifene (estrogen agonist/antagonist)
  - Bazedoxifene reduces the risk of endometrial hyperplasia that can occur with the estrogen component of the drug
- Conjugated estrogen and bazedoxifene 0.45mg/20mg is to be taken once daily without regard to meals
  - Common side effects: muscle spasms, nausea, diarrhea, dyspepsia, upper abdominal pain, oropharyngeal pain, dizziness, and neck pain
  - Same warnings as estrogen products
- Significantly increased mean lumbar spine BMD (treatment difference, 1.51%) at 12 months compared to placebo in women who had been postmenopausal between one and five years; also increased total hip BMD (treatment difference, 1.21%)

Parathyroid Hormone: Teriparatide[1,5]

- For the treatment of osteoporosis in postmenopausal women and men with a high risk of fracture; treatment in men and women at high risk of fracture with osteoporosis associated with sustained systemic glucocorticoid therapy
- Recombinant formulation of endogenous parathyroid hormone which stimulates osteoblast function, increases GI calcium absorption, and increases renal tubular reabsorption of calcium
- Given as a 20mcg subcutaneous injection daily
  - Use with caution in patient with cardiovascular disease, renal and liver impairment
  - Increased incidence of osteosarcoma in rats
  - Common side effects: leg cramps, nausea and dizziness
- Treatment duration is recommended not to exceed 18-24 months
  - When treatment is stopped, bone loss can be rapid and an alternative agent should be started to maintain BMD
- Associated with a risk reduction of vertebral fracture by about 65% and non-vertebral fractures by about 53% in patients with osteoporosis, after an average of 18 months of therapy

Receptor Activator of Nuclear Factor kappa-B (RANK) Ligand Inhibitor[1,5]

- **Denosumab (Prolia®)**
  - Approved for the treatment of osteoporosis in men and postmenopausal women at high risk of fracture
  - Prevents osteoclast formation, leading to decreased bone resorption and increased bone mass
  - Given as a 60mg subcutaneous injection every 6 months
  - May cause hypocalcemia; correct prior to starting therapy and monitor thereafter
  - Common side effects include skin rash, arthralgia and limb and back pain
  - When treatment is stopped, an alternative agent should be considered due to rapid bone loss
  - Reduces the incidence of vertebral fractures by 68%, hip fractures by 40% and non-vertebral fractures by about 20% over 3 years

Management Based on BMD[1,2]

Normal BMD **T-score ≥1.0**
▪ Bone healthy lifestyle ▪ Dietary calcium 1,000-1,200mg daily ▪ Vitamin D 800-1000 IU daily ▪ Re-evaluate BMD using DXA in 5 years or as appropriate
Low bone mass (osteopenia) **T-score -1.1 to -2.4 at femoral neck, total hip, or spine and a FRAX 10-yr probability of hip fracture <3% or all major osteoporosis-related fractures <20%**
▪ Bone healthy lifestyle ▪ Dietary calcium 1,000-1,200mg daily ▪ Vitamin D 800-1000 IU daily ▪ Medication therapy to prevent further bone loss can be considered if risk factors exist ▪ Re-evaluate BMD using DXA in ≥ 2 years or as appropriate
Osteoporosis or high fracture risk T-score <-2.5 at femoral neck, total hip, or spine or T-score -1.1 to -2.4 at femoral neck, total hip, or spine and a FRAX 10-yr probability of hip fracture <3% or all major osteoporosis-related fractures ≥20%

▪ Evaluate for secondary causes
▪ Bone healthy lifestyle
▪ Dietary calcium 1,000-1,200mg daily
▪ Vitamin D 800-1000 IU daily
▪ Medication therapy
  ▪ First line: alendronate, risedronate, zoledronic acid or denosumab
  ▪ Alternative therapy: ibandronate, raloxifene, or teriparatide
  ▪ Last line: intranasal calcitonin
▪ Obtain baseline BMD testing for monitoring response to therapy
▪ Re-evaluate BMD using DXA in 1-2 years

Duration of Treatment[1,2]

- Pharmacologic therapy should not be considered indefinite in duration
- All non-bisphosphonates produce temporary effects that wane after discontinuation
- Bisphosphonate therapy may allow residual effects after discontinuation so it may be possible to retain residual benefits against fractures at least for several years
- It is recommended that treatment duration decisions be individualized due to lack of evidence
- After 3-5 years of treatment, patients should undergo a comprehensive risk assessment
  - Include clinical history, BMD testing and vertebral imaging

Patient Follow-Up[1,2]

- At initial evaluation, patients not requiring medical therapies should be clinically re-evaluated when medically appropriate
- Patients taking medication for osteoporosis should have labs and BMD re-evaluated after 2 years or more frequently when medically necessary
- Vertebral imaging should be repeated if there is documented height loss, new back pain, postural change or suspicious finding on chest x–ray since the last imaging test or in patients being considered for temporary discontinuation of drug therapy
- Regularly assess adherence and tolerability of therapeutic regimen

Pharmacists Role[4]

- Increase awareness of bone health
- In the community setting, have an established presence and direct relationship with patients and primary care providers
- Encourage dietary changes to increase calcium intake
- Promote adherence to osteoporosis-related medications

Assessment Question #1

Which of the following aids in optimizing bone mass

A. Calcium
B. Vitamin D
C. Parathyroid hormone
D. All of the above

Assessment Question #2

Which of the following lifestyle factors is NOT a risk factor for osteoporosis and fractures

A. Low calcium intake
B. Alcohol abuse
C. Marathon runner
D. High salt intake

Assessment Question #3

TR is a 55 year old female who recently had a DXA scan to evaluate her bone density. Her T-score at the spine was -1.2 and at the hip was -2.5. Which of the following correctly identifies the assessment of her osteoporosis risk (spine, hip) based on the World Health Organization?

A. Osteopenia, osteopenia
B. Osteoporosis, osteoporosis
C. Normal, osteoporosis
D. Osteopenia, osteoporosis

Assessment Question #4

What is the recommended daily dietary calcium intake for TR?

A. 800mg
B. 1200mg
C. 2000mg
D. 500mg

Assessment Question #5

Which of the following medications is indicated as first line therapy for osteoporosis

A. Intranasal calcitonin
B. Raloxifene
C. Zoledronic acid
D. Teriparatide

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