

# Osteoporosis prevention, screening & treatment

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FAMILY PHYSICIANS

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Dr. Baldor has been teaching for 30 years and practices family medicine at the UMass Memorial Medical Center, Worcester. A member of the Massachusetts Governor's Commission on Intellectual Disability, he has been recognized in *The Best Doctors in America: Northeast Region* and is a past-president of the Massachusetts Academy of Family Physicians. He publishes and presents regularly on a variety of family medicine topics and is an associate editor for *The 5-Minute Clinical Consult*. Dr. Baldor practices family medicine with a special interest in developmental and intellectual disabilities. Throughout the years, he has spoken on a variety of primary care topics at the AAFP's annual meeting.



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**STRONG MEDICINE FOR AMERICA**

# *Learning Objectives...*

1. Practice applying new knowledge and skills gained from Osteoporosis and Osteopenia Prevention and Treatment sessions, through collaborative learning with peers and expert faculty.
2. Identify strategies that foster optimal management of osteoporosis/osteopenia, within the context of professional practice.
3. Formulate an action plan to implement practice changes, aimed at improving patient care.

# Osteoporosis

- Low bone mass & structural deterioration of bone tissue
  - leading to an increased risk of fractures

# Definitions.....

- Osteoporosis (T-score of -2.5 or below)
  - Spine or hip bone mineral density 2.5 standard deviations below mean for healthy, young women
  - Hip DEXA has best correlation with outcomes
- Osteopenia (T-score between -1 to -2.5)
  - Spine or hip BMD between 1 and 2.5 standard deviations below mean for healthy, young women.
  - Not a diagnosis – a descriptor
  - A decision to treat is patient specific

Dual-Energy X-ray Absorptiometry (DEXA)

# Risk Factors

- Low body weight (BMI < 21kg/m<sup>2</sup>)
- White or Asian race
- Sedentary lifestyle
- Tobacco abuse
- Excessive ETOH (> 2drinks daily)
- FH of osteoporotic fracture

# Excessive caffeine intake ???

- Inconsistent evidence - high intake associated w/slight ↓ in BMD in elderly but modest ↑ BMD at younger ages
- Associated with tobacco and alcohol use
- Data suggests intake consumed by the average woman is not an important risk factor



# Screening men..

- Twice the risk of death from hip Fx
- BMD if at increased risk of osteoporosis
  - Age > 70 years
  - Low body wgt (BMI < 20)
  - Recent wgt loss (>10% of usual wgt)
  - Sedentary
  - Previous fragility fracture
  - Corticosteroid use
  - Androgen deprivation therapy

# Men....

- Osteoporotic men should be evaluated for 2<sup>nd</sup> causes
- Bisphosphonates considered 1<sup>st</sup> line
- Testosterone beneficial for osteoporosis and hypogonadism

# Osteoporosis ....

- Primary
  - Bone loss due to age-related decline in gonadal function
- Secondary
  - Chronic disease
  - Endocrine disorders
  - Medication effects
  - Nutritional influences

# Due to Chronic Diseases...

- COPD
- HIV
- Inflammatory bowel diseases
- Liver disease (severe)
- Renal insufficiency or failure
- RA/SLE

# Due to Endocrine Disorders....

- Amenorrhea in athletes
- Diabetes mellitus (type 1)
- Hemochromatosis
- Hyperthyroidism
- Hypogonadism (primary/secondary)

# Medication effects

- Anticonvulsants (phenobarbital, phenytoin)
- Lithium
- Drugs causing hypogonadism (methotrexate)
- Glucocorticoids
- Heparin (long-term)
- Immunosuppressants (cyclosporine, tacrolimus)
- Thyroid hormone (excess)

# PPI's?

FDA labeling advisory ....

- 6 of 7 studies indicate an ↑ risk of spine, hip, wrist fractures with PPI use
  - High doses for a year or longer
  - Over 50 years of age
- Evidence inconclusive to clearly state that PPIs ↑ risk of fracture

# Nutrition

- Anorexia nervosa
- Celiac disease
- Gastric bypass or gastrectomy
- Vitamin D deficiency



# Vitamin D

- Not a Vitamin; but rather a hormone
- Obtained from Diet or Sun Exposure
- Increases the number of  $\text{Ca}^+$  binding proteins in small intestine
- Promotes renal  $\text{Ca}^+$  re-absorption
- Evidence indicates that maintaining a normal level reduces fracture risk

# Calcium

- Bone contains 99% of body  $\text{Ca}^+$  stores
  - Parathyroid hormone (PTH) releases  $\text{Ca}^+$  from bone (primary regulation)
  - Calcitonin promotes  $\text{Ca}^+$  uptake by bone (minimal effect)

# Suspected secondary work-up

- CBC (immune deficiency)
- BUN/Creat/LFT's
- Alk Po4 ( $\uparrow$  Paget's disease)
- Ca<sup>+</sup> ( $\uparrow$ hyperparathyroid; $\downarrow$ malabsorption)
- TSH (hyperthyroid)
- Testosterone/Estradiol (hypogonadism)
- SPEP (multiple myeloma)
- 25-hydroxyvitamin D

# U.S.P.S.T.F. Recommends Screening

- All women  $\geq 65$  years; *and*
- Younger women whose fracture risk is  $\geq$  that of a 65-yo white woman who has no additional risk factors.
  - 10 year risk  $\geq 9.3\%$
- So how do you figure that out???

# The FRAX<sup>®</sup> tool by WHO

- To evaluate fracture risk of patients
- Integrates clinical risk factors with femoral neck BMD
- Calculates 10 yr probability of hip fracture
  - <http://www.shef.ac.uk/FRAX/>

Home Calculation Tool Paper Charts FAQ References English

## Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **Abu Dhabi** Name/ID:  [About the risk factors](#)

**Questionnaire:**

1. Age (between 40-90 years) or Date of birth  
Age:  Date of birth:  /  /

2. Sex  Male  Female

3. Weight (kg)

4. Height (cm)

5. Previous fracture  No  Yes

6. Parent fractured hip  No  Yes

7. Current smoking  No  Yes

8. Glucocorticoids  No  Yes

9. Rheumatoid arthritis  No  Yes

10. Secondary osteoporosis  No  Yes

11. Alcohol 3 or more units per day  No  Yes

12. Femoral neck BMD (g/cm<sup>2</sup>)

Select DXA

**Weight Conversion**  
Pounds Kgs

**Height Conversion**  
Inches Cms

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12. Femoral neck BMD (g/cm<sup>2</sup>)  
 Select DXA

**BMI 30.6**

**The ten year probability of fracture (%)**

**without BMD**


■ Major osteoporotic	<b>5.3</b>
■ Hip fracture	<b>0.3</b>

**Weight Conversion**

Pounds Kgs

**Height Conversion**

Inches Cms



**65 yo Fx risk is 9.3%**  
**Hip risk 1.2%**

# Medication effects...

- Inhibit bone resorption
  - Most treatments
- Stimulate bone formation
  - Only synthetic PTH preparations



# Anti-resorptive medications

## Bisphosphonates:

- alendronate (Fosamax)
- risedronate (Actonel)
- ibandronate (Boniva)
- zoledronic acid (Reclast)

## Other antiresorptives:

- estrogen therapy or hormone therapy
- raloxifene (Evista)
- denosumab (Prolia)

# Bisphosphonates (oral)

(inhibit osteoclasts)

- Alendronate (Fosamax) & risedronate (Actonel)
  - Demonstrated effectiveness at hip, vertebral & wrist
  - Weekly alendronate 70mg; risedronate 35 mg
- Ibandronate (Boniva)
  - Demonstrated effectiveness at the spine only
  - Monthly 150mg

# Oral Bisphosphonates

- Must be taken with a full glass of water.
- 30 - 60 minute wait required before reclining or consuming medications, fluids or food to lower the risk of upper GI adverse effects
- Caution if renal disease (renal excretion)

# IV Bisphosphonates (*treatment*)

- Zoledronic acid (Reclast)
  - 5 mg IV yearly X 3 years (↓ vertebral and hip fractures)
- Ibandronate (Boniva)
  - 3 mg IV every 3 months X 4 doses (shown to ↑BMD)
- Cost is high, consider for high-risk patients who are unable to tolerate oral therapy, or those currently hospitalized for hip fracture.

# Bisphosphonates/ jaw osteonecrosis

- Presence of exposed bone in mouth that fails to heal after several weeks
- 5% of bone cancer patients treated with high doses of IV anti-resorptive agents (bisphosphonates or denosumab), undergoing dental procedures
  - No evidence that stopping med before procedure reduces the risk
- Rare in typical use, but increased incidence with prolonged use (> 5 years)

# Bisphosphonates / subtrochanteric Fx

- Femoral shaft Fx with minimal or no trauma
- Long-term alendronate, sometimes with other antiresorptive drugs, steroids or PPIs
  - causal relationship not established
- Report groin/thigh pain weeks/months before
- ? excessive suppression of bone-turnover prevents remodeling to repair microtrauma, thereby weakening bone

NEJM 5.13.2010

# Bisphosphonates – how long?

- The optimal length of therapy is unknown
- 5 yrs *alendronate* followed by *placebo* for 5 yrs vs. 10 years of *alendronate*:
  - no change in incidence of hip and nonvertebral Fx
  - however an increase in vertebral fractures

ACP 2017 Guideline recommends 5 years of treatment as efficacious - longer use associated with increased side effects

AIM: May 2017

# Raloxifene (Evista)

60mg daily po

## A selective estrogen receptor modulator (SERM)

- Non-steroids w/estrogen agonist activity on bones
  - effective for ↓ incidence of vertebral fractures
  - DVT risk
- 
- Tamoxifen – insufficient data on vertebral fx

NEJM 2.25.2010



# Estrogen Therapy ??

## The Women's Health Initiative

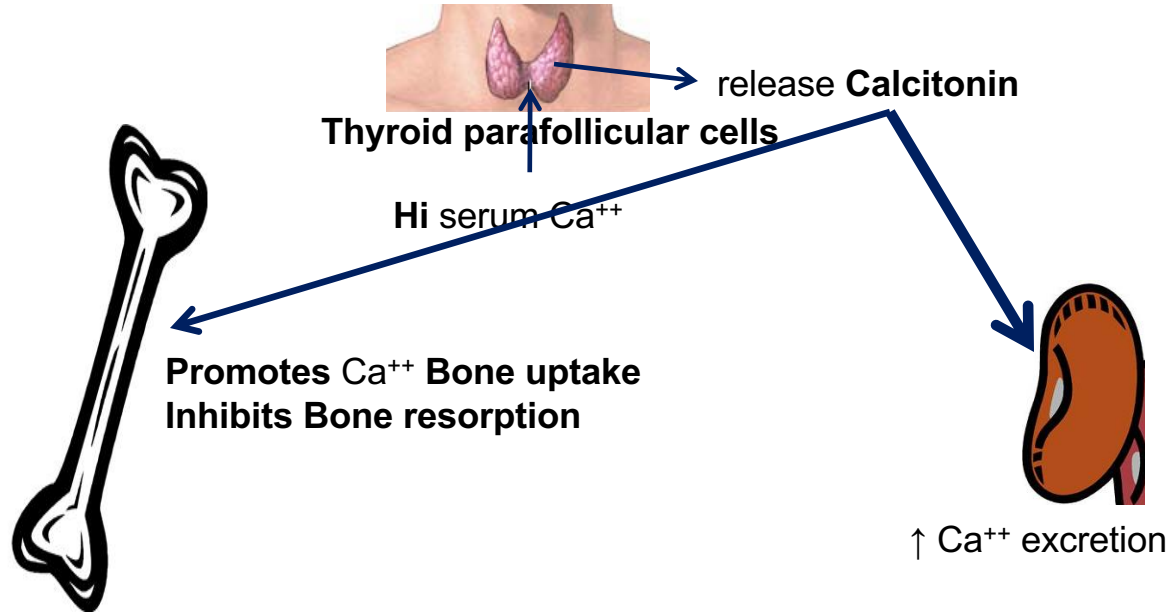
- Slight ↓ risk of hip/vertebral fractures
- Benefit did not outweigh ↑ risk of stroke, DVT, CAD, and breast cancer, *even for women at high risk of fractures*

Short term therapy for women with significant vasomotor symptoms (*benefits outweigh the harms*)

# Calcitonin - *nasal spray, SQ, IM*

- ↓vertebral fractures, but not hip fractures
- Modest analgesic properties in acute & chronic vertebral compression fracture
- Not considered first-line treatment as more effective medications available

# Calcium Metabolism/Calcitonin



# Prolia (denosumab)

- Inhibits Receptor Activator of Nuclear-factor K<sub>B</sub> Ligand (RANKL)
- RANKL mediates osteoclast activity
- Inhibiting RANKL activity ↓ osteoclasts
  - ↓ the development of osteoporotic bone

# Prolia (denosumab)

- 60 mg subcutaneously q 6 months, indefinitely
- Indicated for those with
  - Osteoporotic fracture
  - Failed other agents
- Calcium/Vit D supplement required
- Concern is for immune side effects (severe infections and skin disease)

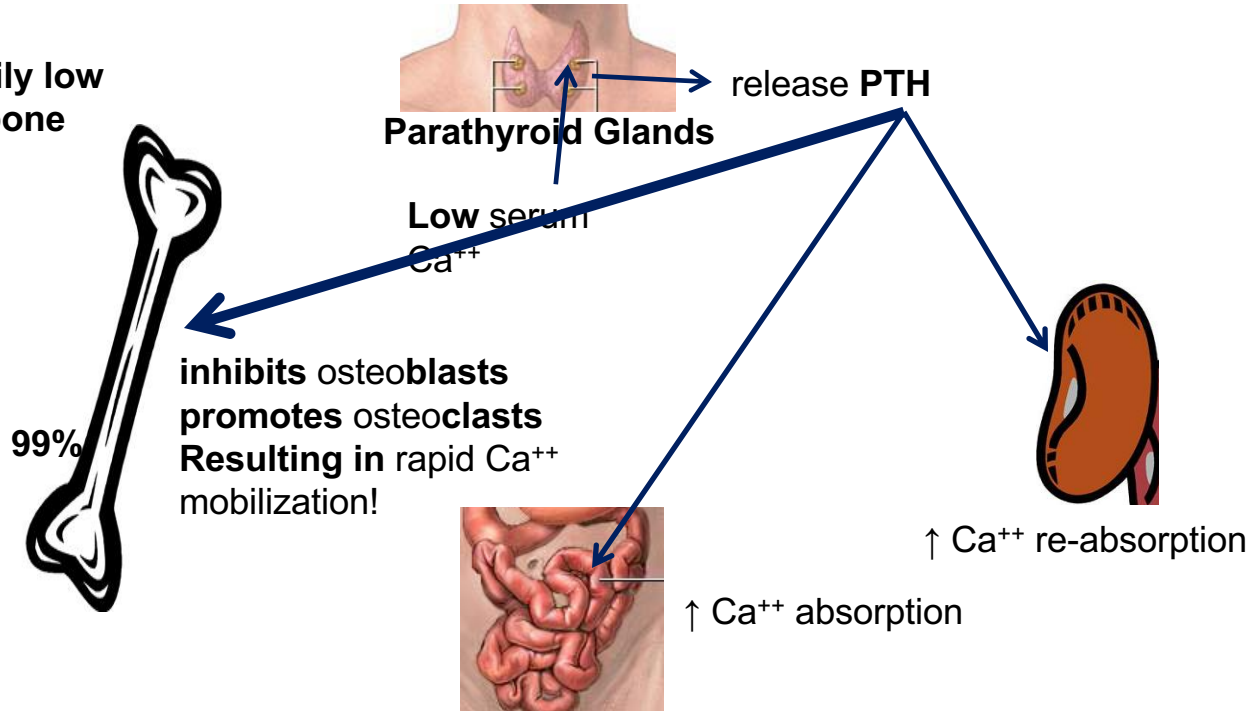
# Recombinant Human PTH

The only medications that stimulate bone formation

- Others inhibit bone resorption
- Effect wanes after 2 years of use
- Recent Lancet review recommended these agents over bisphosphonates for high risk patients

# Calcium Metabolism/PTH

**Bone resorption!**  
**However once daily low doses stimulate bone formation!**



# Recombinant Human PTH ...

Teriparatide (Forteo)

– 20 mcg subq daily

Abaloparatide (Tymlos)

– 80 mcg subq daily

- Adverse effects

- arthralgia's and leg cramps

- osteosarcoma in rats with high doses



# Labs??



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# Serum cross-linked C-telopeptide (CTX)

- Formed during bone resorption
  - High levels post-menopause
- Effective Rx return CTX to pre-menopausal levels after 3-6 months
- Lack of decline may indicate ineffective Rx
- No recommendations for use

# A practical approach ....

- Limit ETOH/Stop smoking
- Walking/Weight training
- Falls prevention strategies
  - rugs, hand rails, PT gait training
- Vitamin D (2,000 IU per day)
- Calcium (1,200 mg per day, divided)

# Calculate Risk/Screen.....

Use FRAX tool to determine 10 year risk

- DEXA (hip or spine)
  - All women  $\geq$  65 years and those younger with an equivalent 10 yr Fx risk
  - Men  $\geq$  70 years
  - No evidence to support repeating DEXA
    - 2017 ACP guideline recommends against repeating

# Medication Considerations

- Data to Rx w/o osteoporosis is lacking!
  - Consider if 10 yr hip Fx probability  $> 3\%$  or any Fx  $\geq 20\%$
- If Osteoporosis start bisphosphonate or denosumab:
  - Alendronate 70 mg weekly (*my choice*)

# References...

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