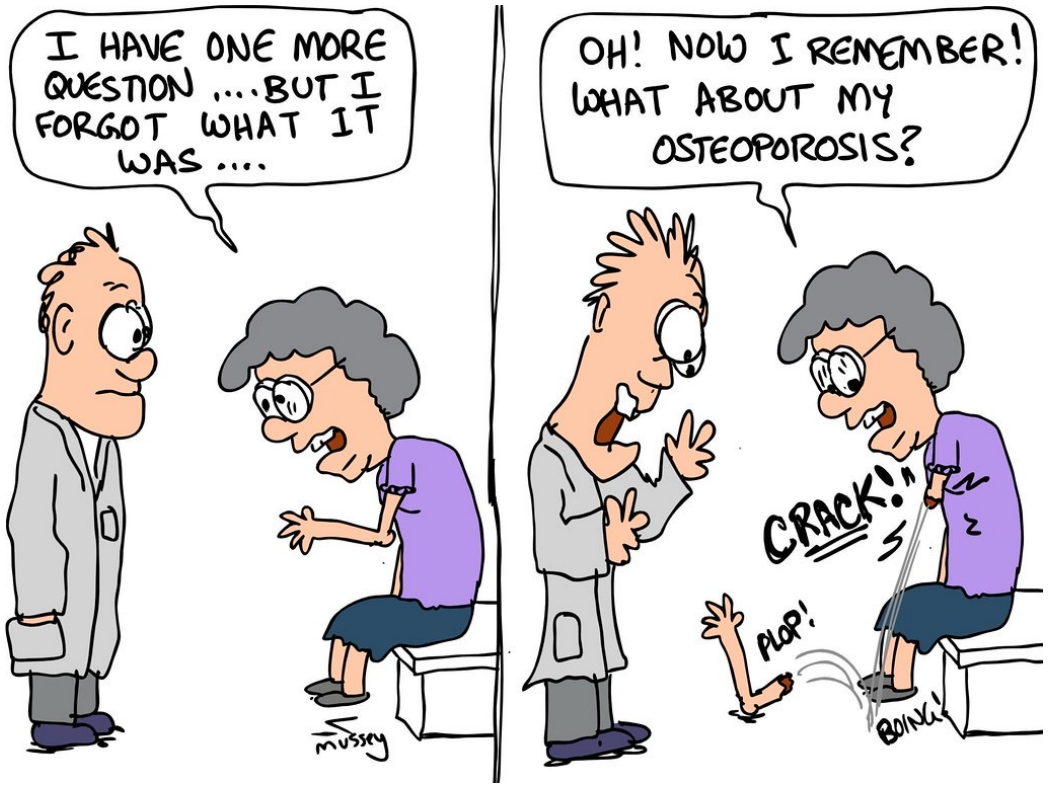
Bone Health: Fragility Fractures Evaluation and Management

Laura Lewis PA-C, MPAS



Disclosures

- I have no disclosures pertaining to this talk

Agenda

- Recognizing Fragility Fractures
- Why Management Is Needed
- Where to Get Started
- 6 Steps to Success

Position Statement 1113

- **Every orthopedic surgeon should work diligently to participate in prevention and treatment of osteoporosis and fragility fracture care.**

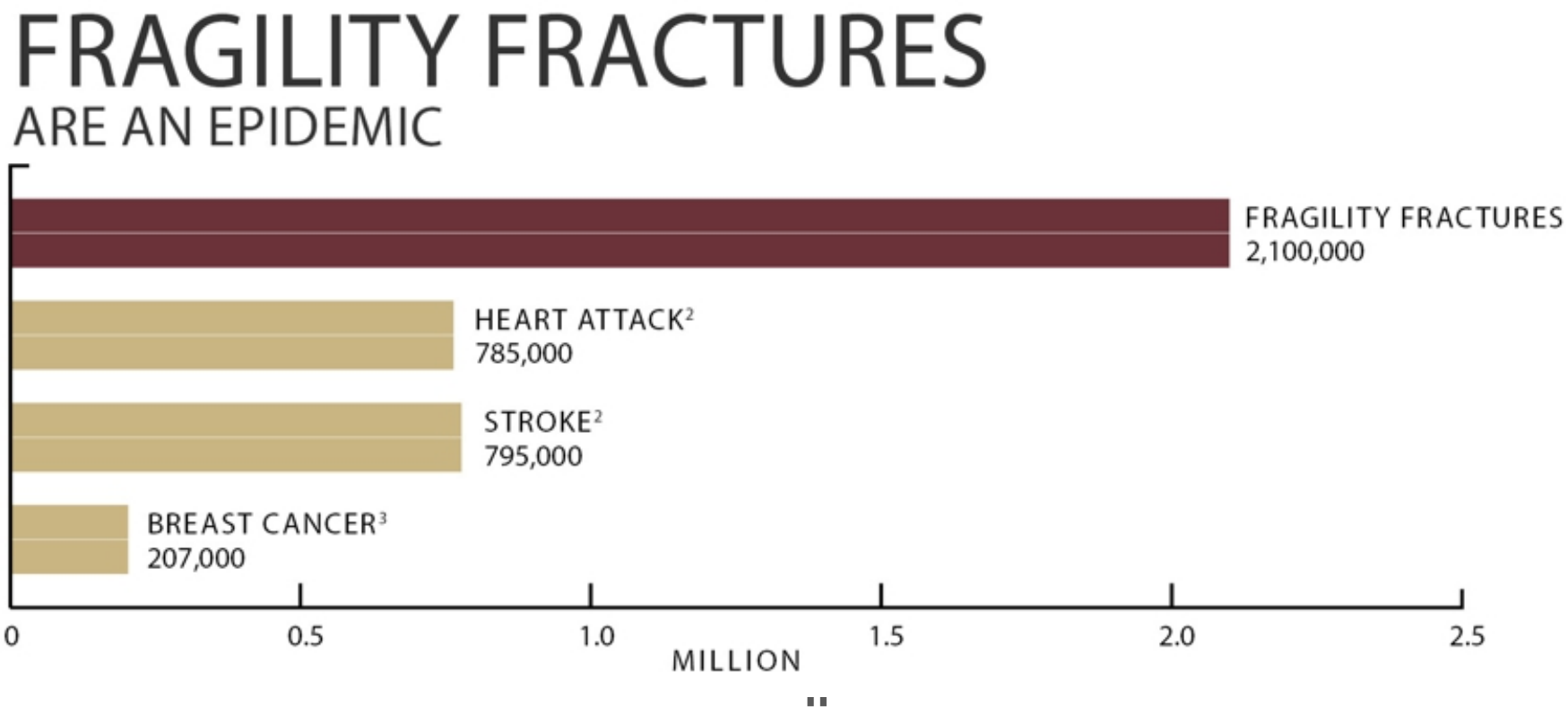
AAOS American Academy of Orthopaedic Surgeons
American Association of Orthopaedic Surgeons

Position Statement

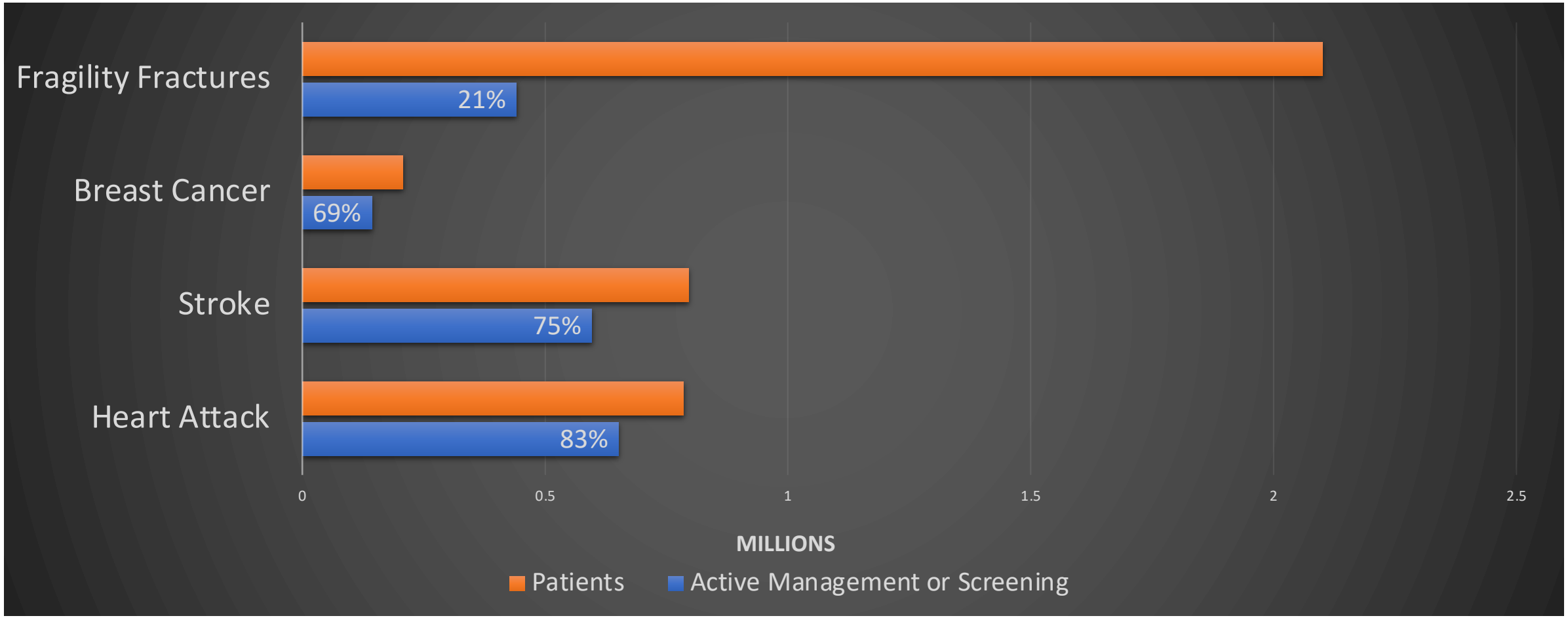
Osteoporosis/Bone Health in Adults as a National Public Health Priority

Recognize the need…

*Data from AOA's Own the Bone



Disparities in Care



1 IN 2

WOMEN OVER AGE 50 WILL BREAK A BONE BECAUSE OF OSTEOPOROSIS

1 IN 4

MEN OVER AGE 50 WILL BREAK A BONE BECAUSE OF OSTEOPOROSIS

50%

OF REPEAT FRACTURES COULD BE AVOIDED

80%

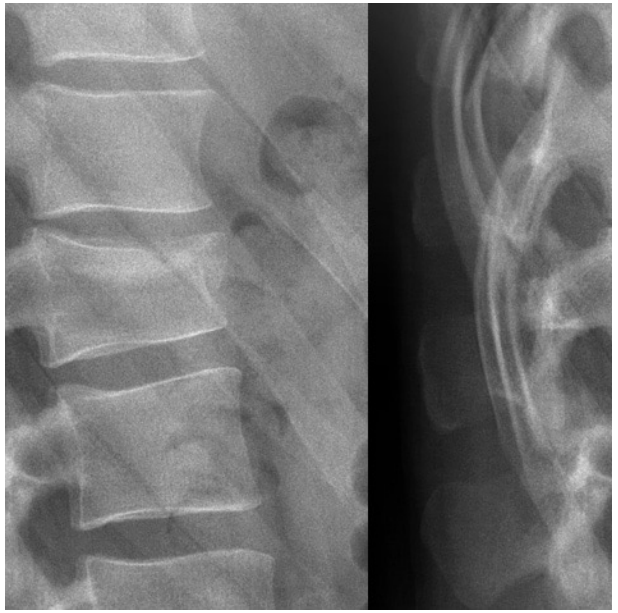
Who have had at least **ONE OSTEOPOROTIC FRACTURE**, are **NEITHER IDENTIFIED NOT TREATED** for osteoporosis

BROKEN A BONE AFTER AGE 50 ?

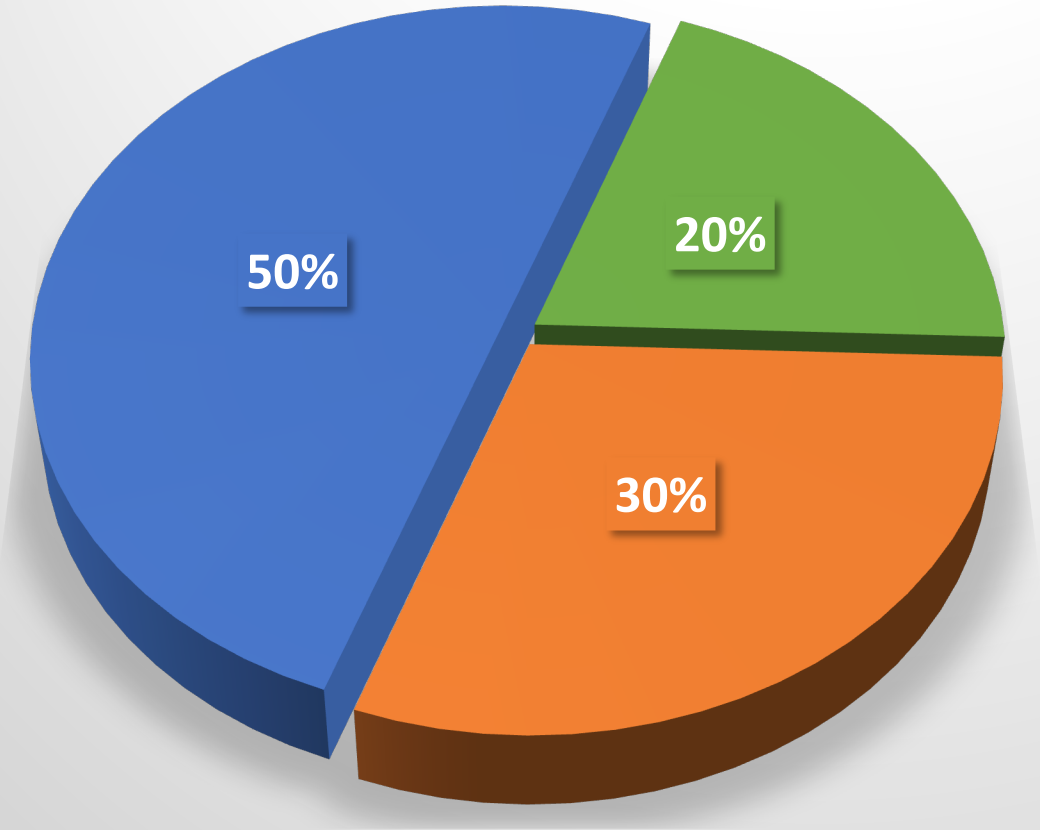
IF YOU'VE SUFFERED 1 FRACTURE

YOU'RE AT **2X THE RISK OF ANOTHER**

What is a Fragility Fracture?



Make Up Of Fragility Fractures Over the Age of 50



- In-Patient Hip Fractures
- In-Patient Non Hip Fractures
- Outpatient Non Hip Fractures

Fragility Fractures: Distal Radius

- 5x more common in women than men
- Occur earlier in life than other fractures
- Wrist fractures are strongly predictive of future fractures

Fragility Fractures: Vertebral Fractures

- Incidence:
  - 25% people over 70 years
  - 50% people over 80 years
- Majority are subclinical
- 700,000 fractures annually
- Major predictors of future fracture risk
  - 5-fold increased risk for subsequent vertebral fracture
  - 2-3-fold increased risk for fractures at other sites

Fragility Fractures: Hip Fractures

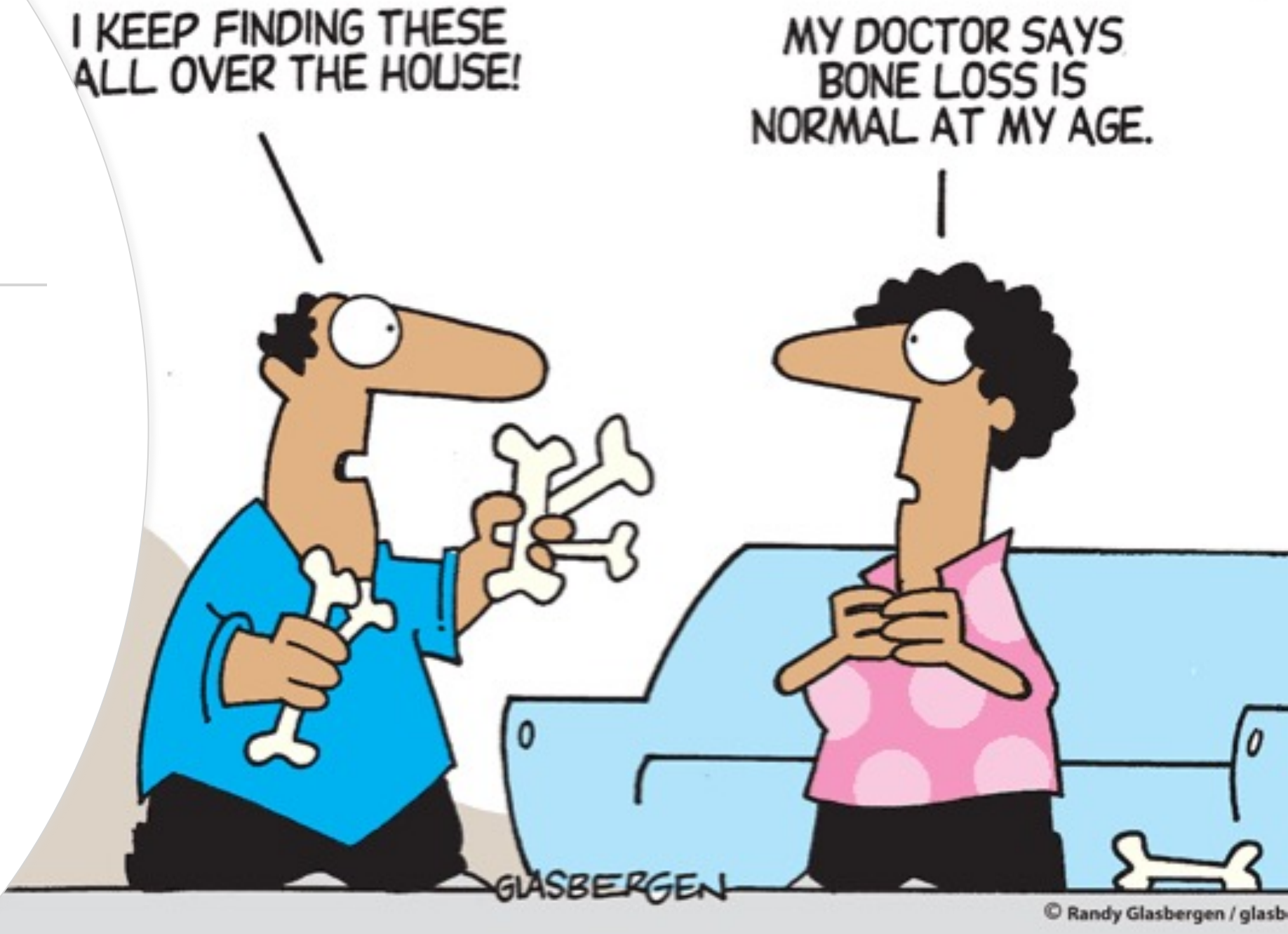
- 1 year mortality 25% women, 37% percent for men
- 1 month mortality 10%
- 20% require long-term nursing home care
- 40% fully regain their pre-fracture level of independence
- 2.5-fold increased risk of future fractures
- 1/3 patients had prior fracture
- Low trauma hip fracture=fragility fracture regardless of DEXA results

Fragility Fractures in Men

- 1 in 4 men will break a bone due to osteoporosis
- 1/3 of all hip fractures worldwide occur in men
- 2x more likely to die after hip fracture than women
- Risk of fracture is 27% higher than developing prostate cancer
- 50% less likely to receive treatment than women
- 79% not screened after wrist fracture

Fragility Fractures

- What are we going to do about them?

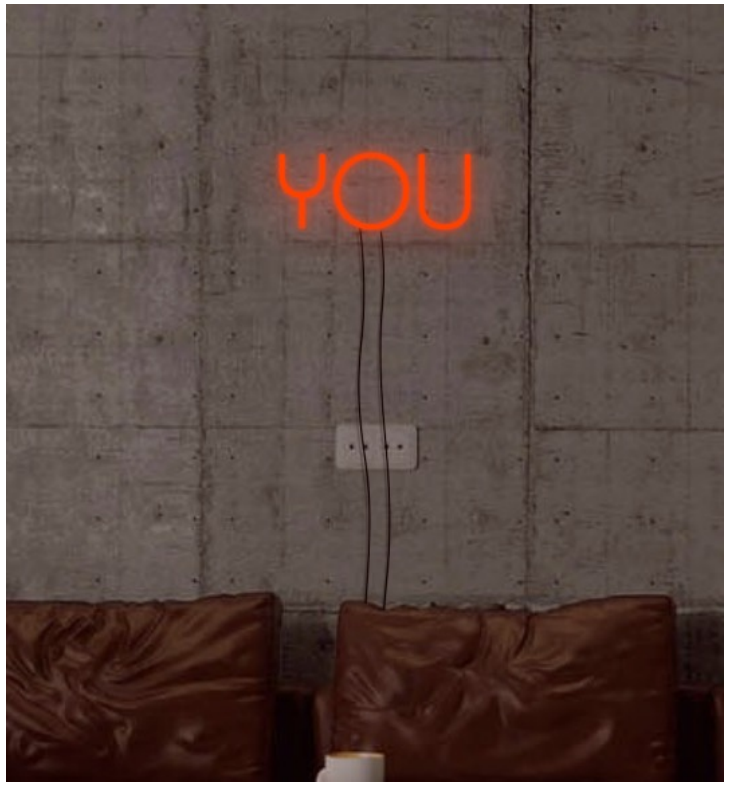


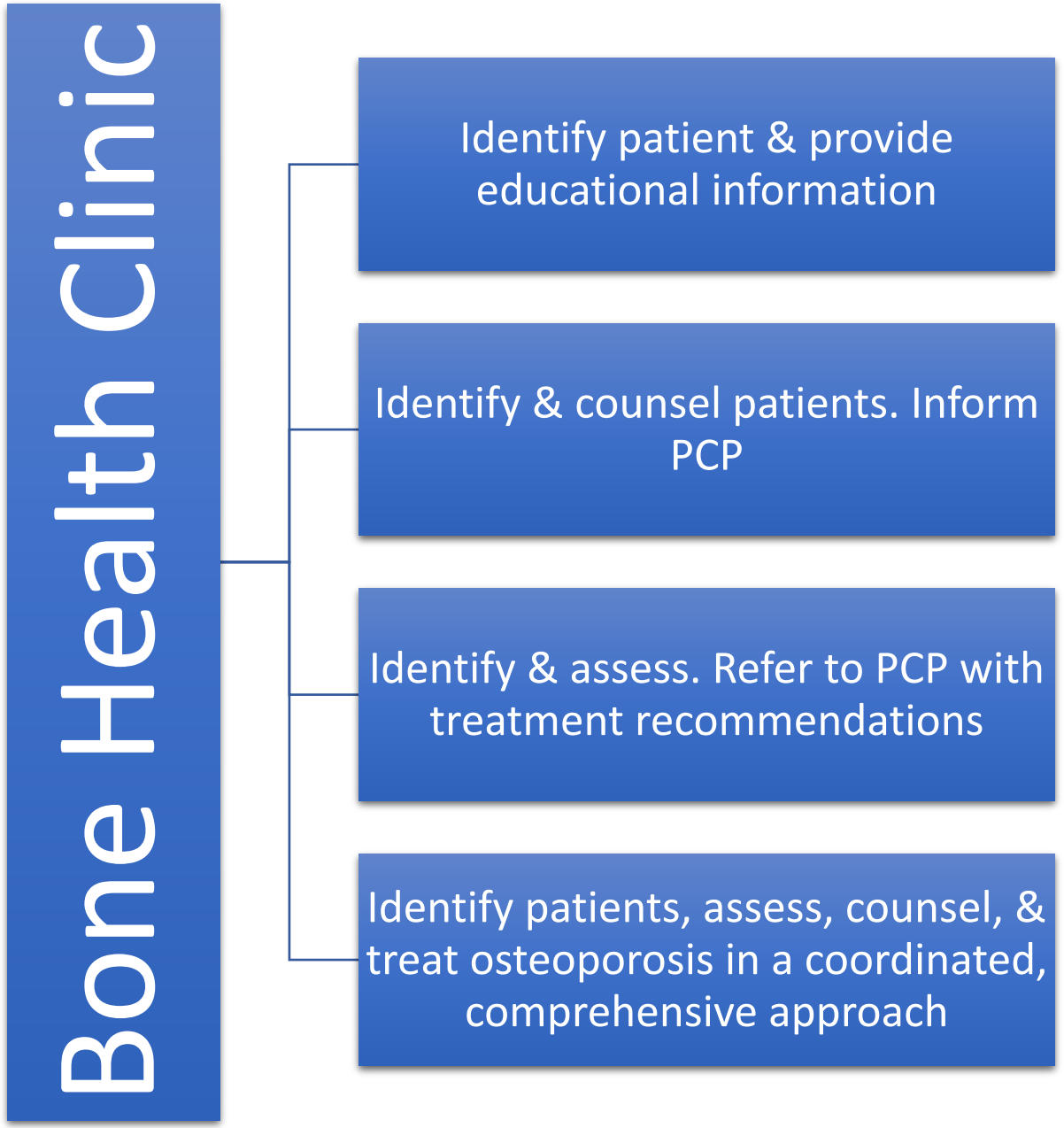
Treatment Conundrum

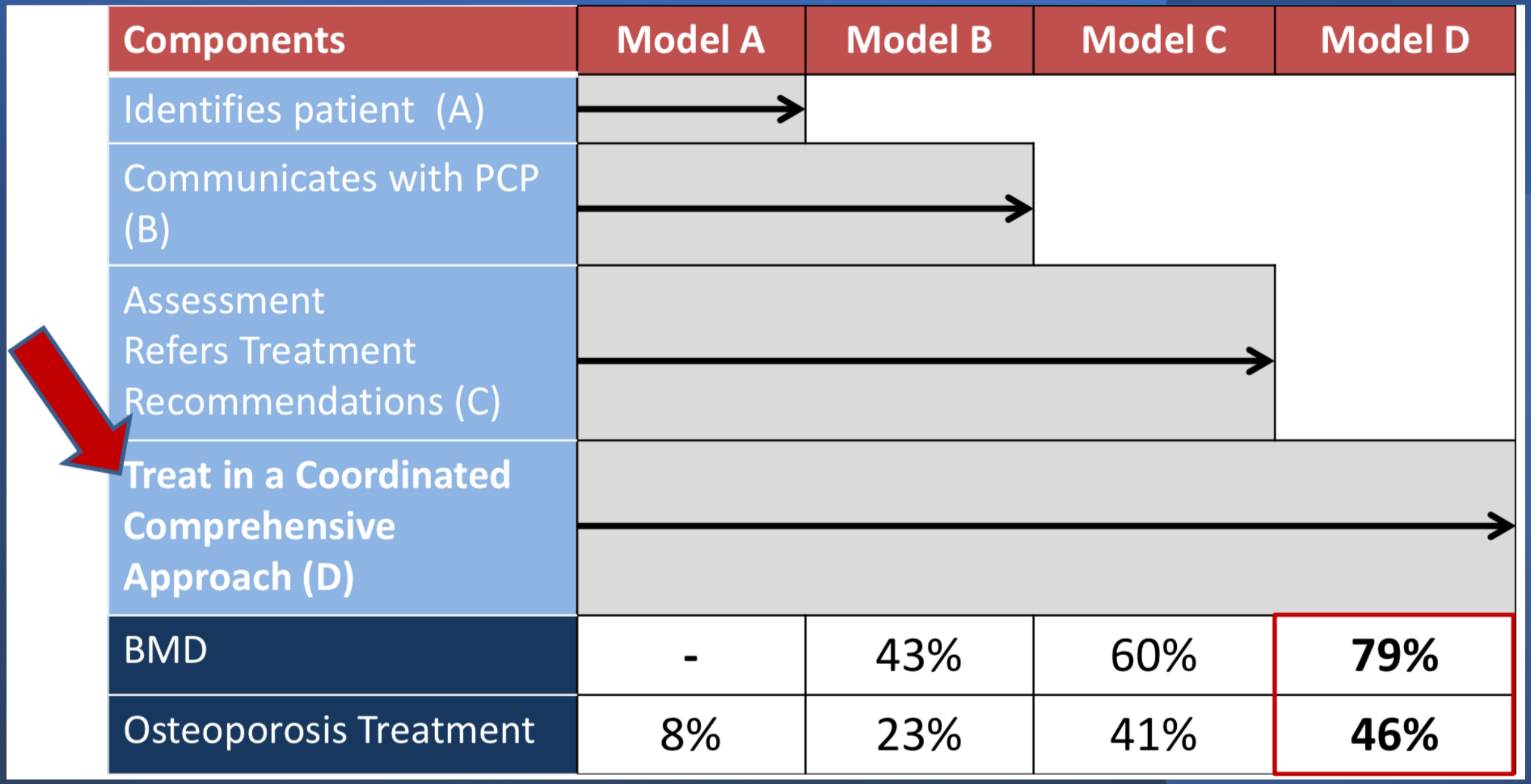
- *Who should evaluate/treat osteoporosis patients?*
  - *Primary Care*
  - *Orthopedic Surgeons/Orthopedic PA's*
  - *Anyone*

Who is Going to Make this Happen?

Who is Going to Make this Happen?




Bone Health Clinic
Identify patient & provide educational information
Identify & counsel patients. Inform PCP
Identify & assess. Refer to PCP with treatment recommendations
Identify patients, assess, counsel, & treat osteoporosis in a coordinated, comprehensive approach


Components
Model A
Model B
Model C
Model D
Identifies patient (A)
Communicates with PCP (B)
Assessment Refers Treatment Recommendations (C)
Treat in a Coordinated Comprehensive Approach (D)
BMD
-
43%
60%
79%
Osteoporosis Treatment
8%
23%
41%
46%

Getting Started

Shadow	• Shadow a program that is already set up
Attend	• Attend an osteoporosis conference
Develop	• Develop inclusion criteria
Set up	• Set up clinic schedule
Determine	• Determine treatment options available
Track	• Develop protocol for how you are going to track patients

AOA 6 Steps of Success

1 - Nutrition

- Vitamin D Supplementation
- Calcium Supplementation

2 - Physical Activity

- Exercise
  - Weightbearing
  - Muscle Strengthening
  - Fall Prevention

3 - Life Style Counseling

- Smoking Cessation
- Limiting Excessive Alcohol Intake
- Limiting Excessive Caffeine Intake

4 - Testing

- Labs
- DEXA
- FRAX

5 - Pharmacology

- Treatment

6 - Communication

- Education

AOA 6 Steps of Success

1 - Nutrition

- Vitamin D Supplementation
- Calcium Supplementation

Calcium Recommendations

WOMEN

Age 50 & younger	1,000 mg* daily
Age 51 & older	1,200 mg* daily

MEN

Age 70 & younger	1,000 mg* daily
Age 71 & older	1,200 mg* daily

iofbonehealth.org/calcium-calculator

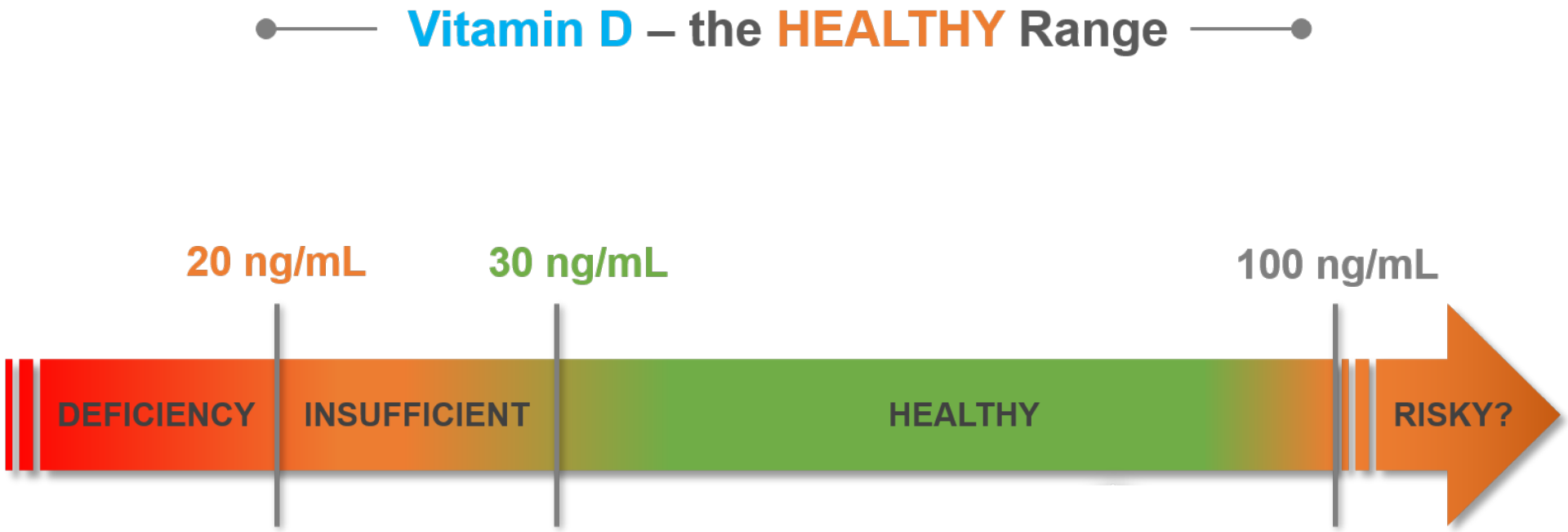
Vitamin D Supplementation

WOMEN AND MEN

Under age 50	400-800 international units (IU) daily**
Age 50 and older	800-1,000 IU daily**

**Some people need more vitamin D. According to the Institute of Medicine (IOM), the safe upper limit of vitamin D is 4,000 IU per day for most adults.

Vitamin D Deficiency



*From **The Endocrine Society Guidelines on Vitamin D Deficiency,** by Michael F. Holick et al., 'Evaluation, Treatment, and Prevention of Vitamin D Deficiency: an Endocrine Society Clinical Practice Guideline', J Clin Endocrinol Metab, July **2011**, vol 96(7) pages 911–1930*

Vitamin D

D2-ergocalciferol

From plants

Cheaper

D3-cholecalciferol

From animals

Appears to be more effective at raising and maintaining Vitamin D levels

AOA 6 Steps of Success

2 - Physical Activity

- Exercise
  - Weightbearing
  - Muscle Strengthening
  - Fall Prevention

• Physical Activity

Exercise

- Weightbearing
- Muscle Strengthening
- Fall Prevention

AOA 6 Steps of Success

3 - Lifestyle Counseling

- Smoking Cessation
- Limiting Excessive Alcohol Intake
- Limiting Excessive Caffeine Intake

Life-Style Counseling- Smoking Cessation

- Reduces blood supply to bones
- Slows production of osteoblasts = less bone formation
- Decreases absorption of calcium
- Breaks down estrogen more quickly

• Lifestyle Counseling-Smoking Cessation

The longer you smoke and the more cigarettes you consume, the greater your risk of fracture.

Older smokers experience significant bone loss.

Smokers who fracture tend to take longer to heal than nonsmokers and they may experience more complications during the healing process.

Exposure to secondhand smoke during youth and early adulthood may increase the risk of developing low bone mass.

Women who smoke may produce less estrogen and tend to experience menopause earlier.

Lifestyle Counseling-Limiting Excessive Alcohol Intake

- Alcohol consumption (>2 units daily) have a 40% increased risk of sustaining any osteoporotic fracture
- High intakes of alcohol cause adverse effects on osteoblasts, on calcium metabolism and poor nutritional status (calcium, protein and vitamin D deficiency)
- Excess alcohol use also increases risk of falling, increasing the risk for fracture

Lifestyle Counseling- Caffeine

- Caffeine produces a small increase in urinary calcium excretion and a very small decrease in calcium absorption
- Body balances this out by reducing calcium excretion later in the day, net effect is negligible
- Caffeine on rates of bone loss in postmenopausal women showed that if calcium intake was sufficient (> 800 mg/day), caffeine intake had no detrimental effects
- If low calcium intake, caffeine intake equivalent to about 3 cups of brewed coffee per day was associated with more bone loss

AOA 6 Steps of Success

4 - Testing

- Labs
- DEXA
- FRAX

Testing: Screening Labs

CBC

CMP

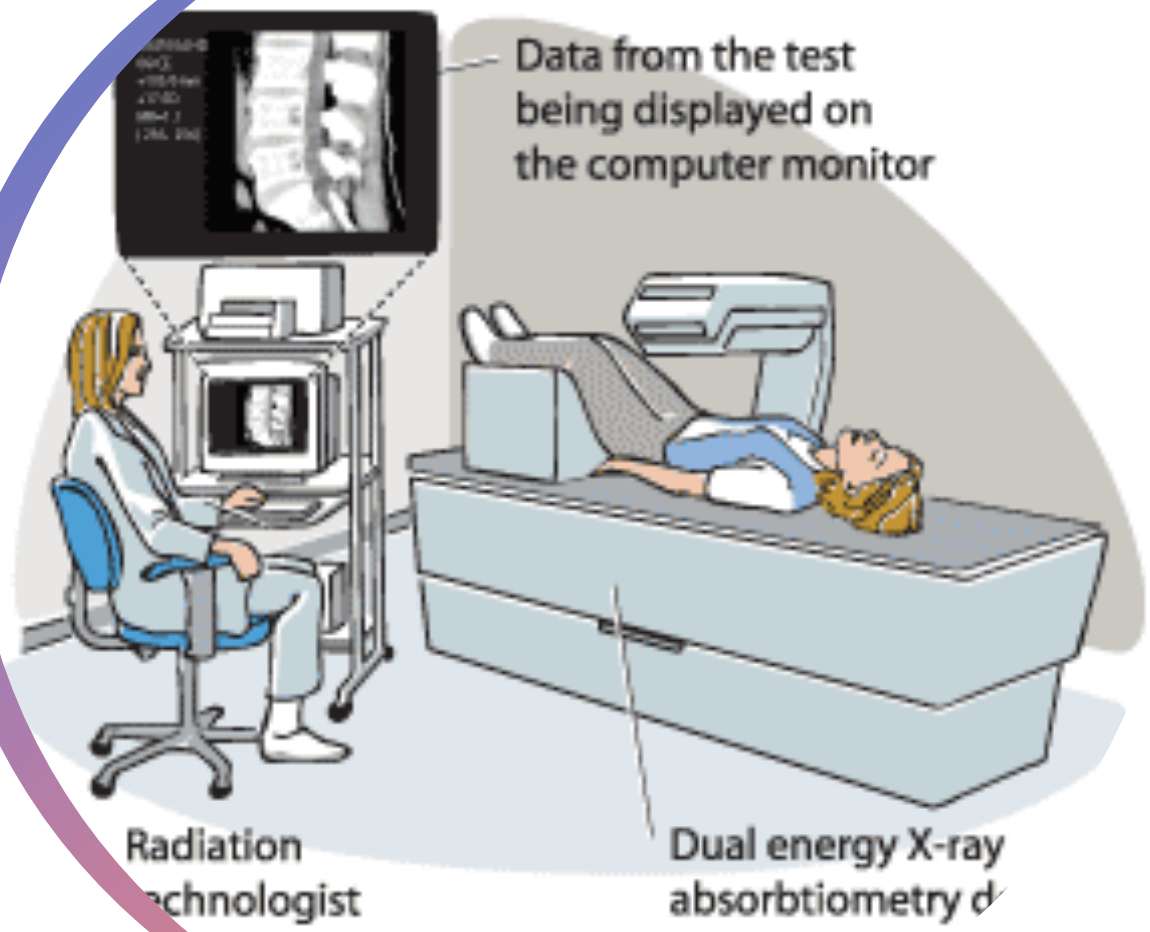
Vit D

PTH

CRP

TSH

Testosterone men



Testing-DEXA

- Bone density test of the hip and spine
- Can also do wrist/forearm

Recommendations for Screening

Table 2

Summary of National Osteoporosis Foundation Screening Recommendations for Patients Based on Age and Risk Factors

Bone Mineral Density Recommended
Women aged ≥65 years and men aged ≥70 years
Postmenopausal women and men aged 50–69 years based on risk factor profile
All patients with a fragility fracture
Vertebral Imaging Recommended
Women >70 years and men ≥80 years
Women aged 65–69 years and men aged 75–79 years if bone mineral density is ≤−1.5
Postmenopausal women and men aged 50–69 years with a low energy fracture, previous height loss ≥4 cm, prospective height loss ≥0.8 cm, or recent/long-term treatment with glucocorticoids

Adapted from the National Osteoporosis Foundation: *Clinician's Guide to Prevention and Treatment of Osteoporosis*. http://nof.org/files/nof/public/content/file/950/upload/523.pdf. Accessed February 19, 2015.

ISCD official positions 2019 Orthopedic uses of DXA

Elective orthopedic and spine surgery patients with the following conditions are at greater risk for impaired bone health and should have DXA testing:

- Diabetes mellitus (long term duration of diabetes (>10yrs) and poor control)
- Inflammatory arthritis
- Exposed to chronic corticosteroids (≥ 5mg/day for three or more months of treatment)
- A low-trauma fracture after 50 years of age
- Chronic kidney disease stage 3, 4 and 5
- Limited mobility
- Smoking

ISCD official positions 2019 Orthopedic uses of DXA

Bone health assessment should be considered in patients prior to elective orthopedic and spine surgery. BMD should be measured in those meeting ISCD or regional indications for DXA testing.

Routine DXA scans should include PA lumbar spine and hip.

Forearm DXA should be considered in patients having upper limb surgery.

When poor bone quality is identified during surgery, bone health assessment including DXA testing is indicated.

Opportunistic CT using HU can be used to estimate the likelihood of osteoporosis to support decisions regarding bone health assessment.

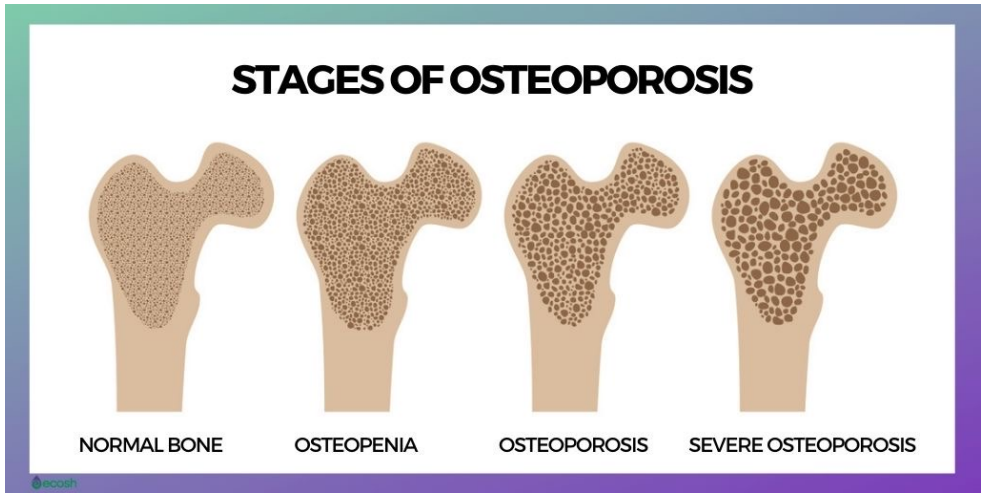
Testing-DEXA

- Measures BMD at the proximal femur and lumbar spine and compares it to the BMD of age-matched reference and young adults
- Report includes the BMD of the intertrochanteric and trochanteric regions, femoral neck, L 1-4, and T and Z scores for each region

Testing: DEXA

- T score compares patient's BMD to that of a young adult population (an average 30-year-old woman)
- Z score compares the patient's BMD to an age, sex, and race matched reference
- Z-score is helpful in diagnosing secondary osteoporosis (Z score <-2.5)
- Z score used premenopausal women and men under age 50 (Z score <-2.0)

Criteria for Osteoporosis[4,14]	
Interpretation	**T-Score***
Normal	–1.0 and higher
Osteopenia	–1.0 to –2.5
Osteoporosis	–2.5 and lower
Severe osteoporosis	–2.5 and lower with one or more fragility fractures
* Reference values vary by geographical location. WHO = World Health Organization.	



FRAX – Fracture Risk Assessment Tool

- Accounts for certain risk factors
  - Previous fracture
  - Smoking
  - Parental hip fracture
  - Steroid use
  - Alcohol use
- Estimate 10-year fracture risk
  - Hip fracture
  - Any Osteoporotic Fracture

http://frax.shef.ac.uk

Testing- FRAX

FRAX® Fracture Risk Assessment Tool

Home | Calculation Tool | Paper Charts | FAQ | References

Calculation Tool

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

Country: US (Caucasian) Name/ID: About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 74 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg) 68
4. Height (cm) 165.1
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/day — No / Yes
12. Femoral neck BMD (g/cm^2) GE-Lunar .775 T-score: -1.9

Clear Calculate

BMI: 24.9
The ten year probability of fracture (%)
with BMD

Major osteoporotic	19
Hip Fracture	4.3

If you have a TBS value, click here: Adjust with TBS

Print tool and information

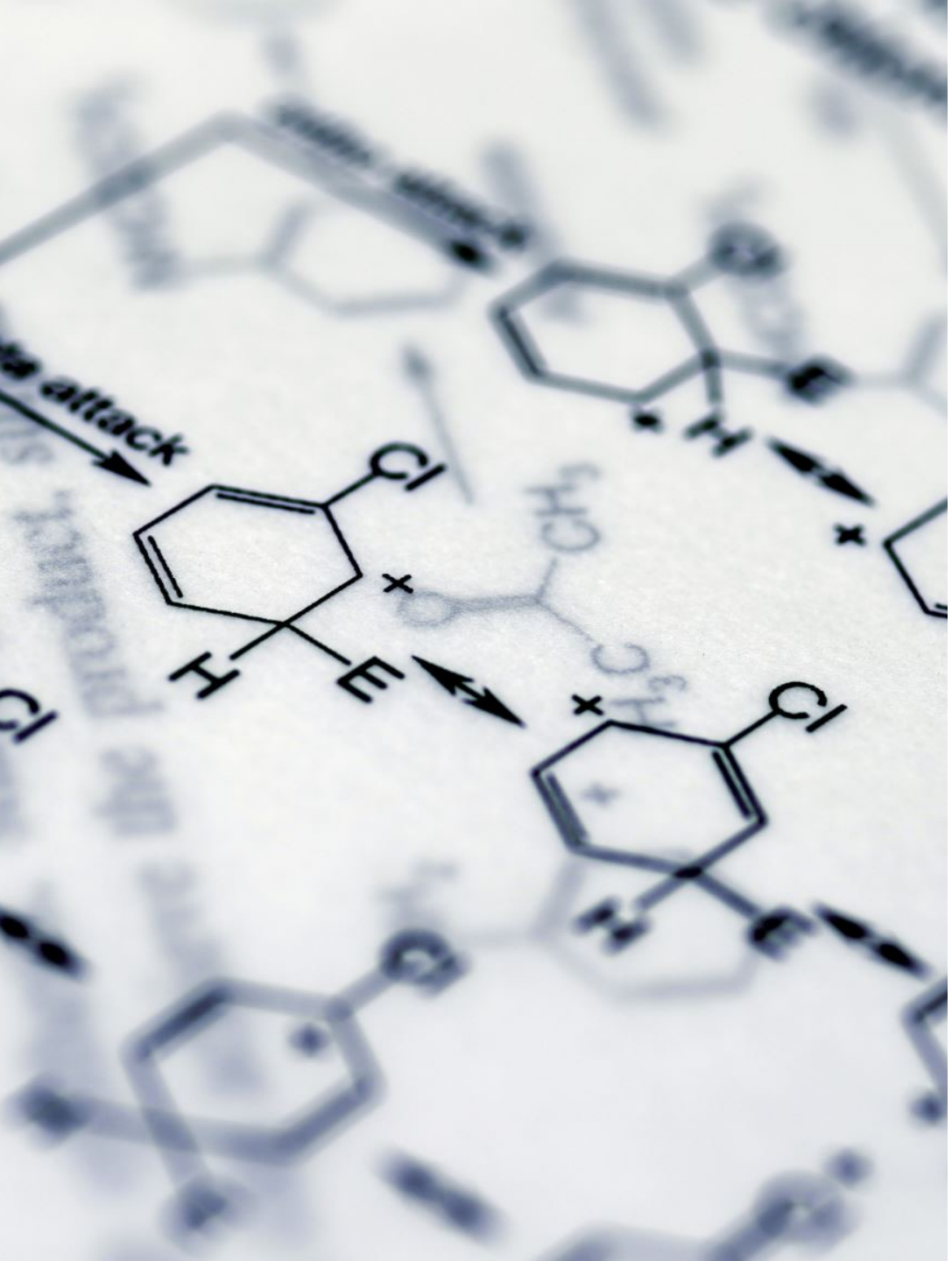
AOA 6 Steps of Success

5 - Pharmacology

- Treatment

Current Recommendations for Treatment

- FRAX score greater than 20% risk for osteoporotic fracture over a 10-year period
- FRAX score greater than 3% hip fracture risk over a 10-year period
- DEXA T score: < - 2.5
- Osteopenic patient with risk factors
- Fragility Fracture



- Pharmacology

  - Treatment
    - Calcitonin
    - Bisphosphonates
    - Rank Ligand Inhibitors
    - PTH Analogs

Calcitonin

- Not first-line therapy (no longer available in Europe, Canada)
- Slows bone breakdown and increases bone density in the spine
  - reduces the risk of vertebral fractures by 30% , not been shown to decrease the risk of non-vertebral fractures
- Most common administration: intranasal
- Side effects: runny nose, headache, back pain and epistaxis, increase risk of cancer
- Short-term use has been demonstrated to significantly reduce osteoporotic bone pain in the acute fracture setting
  - *calcitonin may be a preferred treatment in cases of acute osteoporotic fracture. In such an event, the recommendation is for calcitonin use until the pain has subsided and then to switch over to a more effective long-term drug, such as a bisphosphonate*

Bisphosphonates

- IV or PO Forms
- Decrease osteoclast activity/bone turnover
- GFR>35
- Risks: Avascular Necrosis Jaw, Atypical Femur Fractures

Oral Bisphosphonates

- Alendronate (Fosamax)
  - 70 mg/week (tablet/solution)
- Risedronate (Actonel)
  - 35 mg/week
  - 150 mg/month
- Ibandronate (Boniva)
  - 150 mg/month

Efficacy of PO Bisphosphonates

- Reduces incidence of spine and hip fractures by 50% over 3 years
- Adherence to oral bisphosphonates is low (43-59% at 1 year)

IV Bisphosphonates

- Zoledronic Acid (Reclast)
  - IV infusion over 15-30 minutes
  - Once a year dosing
  - No GI side effects
  - Acute phase reaction can occur with initial infusion
  - Hydration and XS Tylenol prior to treatment
  - 2-3 years then consider drug holiday

Efficacy of Zolendronic Acid

3 years of treatment decreases

- Vertebral fractures by 62–70%
- Hip fractures by 41%
- Non-vertebral fractures by 21–25%

Potential Complications of Bisphosphonates

- Rare complications :
  - Osteonecrosis of the jaw
  - Atypical femur fracture

Figure 2

Osteonecrosis of the Jaw

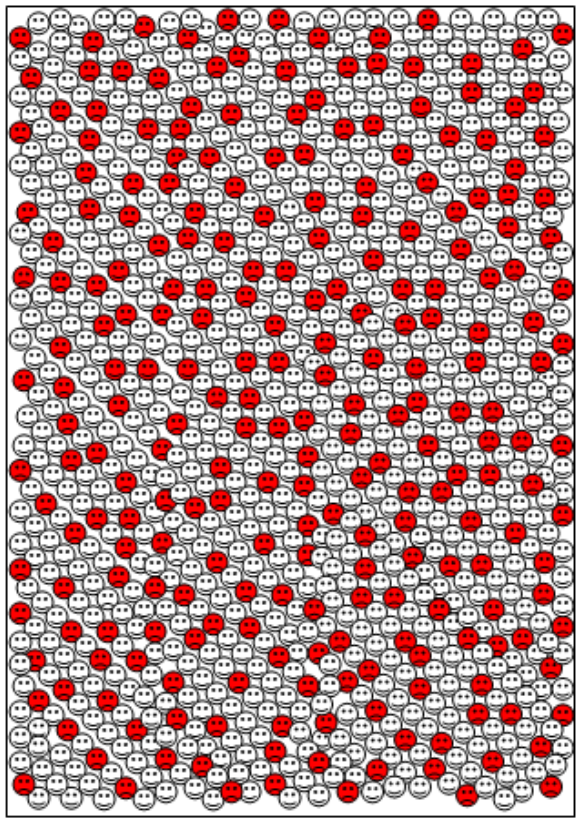
- Incidence is estimated to be only slightly higher than the general population
- > 5 years
- Frequently associated with high-dose IV bisphosphonates for cancer (96% cases)
- ADA reports good oral hygiene, regular dental care is optimal method to decrease risk
- No diagnostic test to determine patients at increased risk

AFF

- Can occur with little or no trauma
- Unilateral or bilateral
- Higher risk: Asian ethnicity, lateral bowing of the femur, autoimmune disease, glucocorticoid use
- Often preceded by pain in the thigh and/or groin area
- Bilateral femoral X-rays should be ordered, followed by an MRI if clinical suspicion is high
- Bisphosphonates should be discontinued
- Risks decline rapidly with discontinuation medication

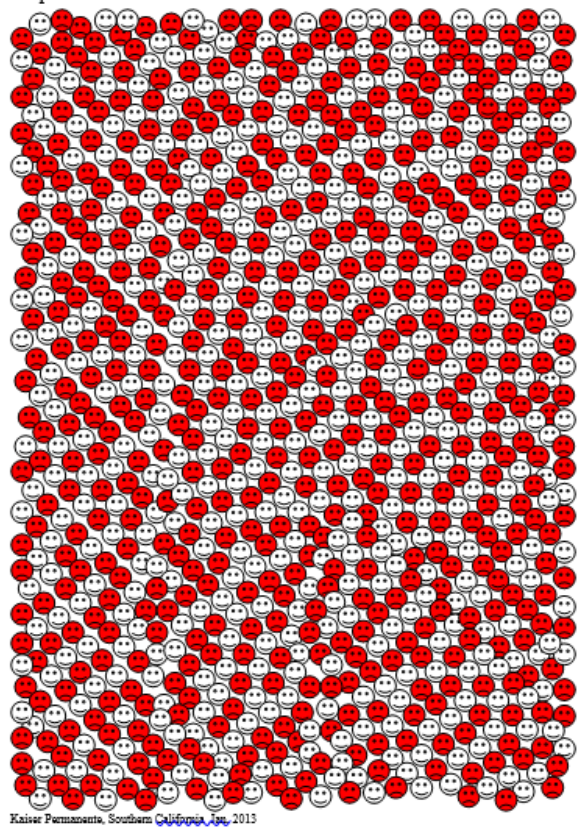
YOUR RISK OF FRACTURE

Out of 1,000 men, 240 will suffer a fracture without treatment for Osteoporosis!



YOUR RISK OF FRACTURE

Out of 1,000 women, 500 will suffer a fracture without treatment for Osteoporosis!

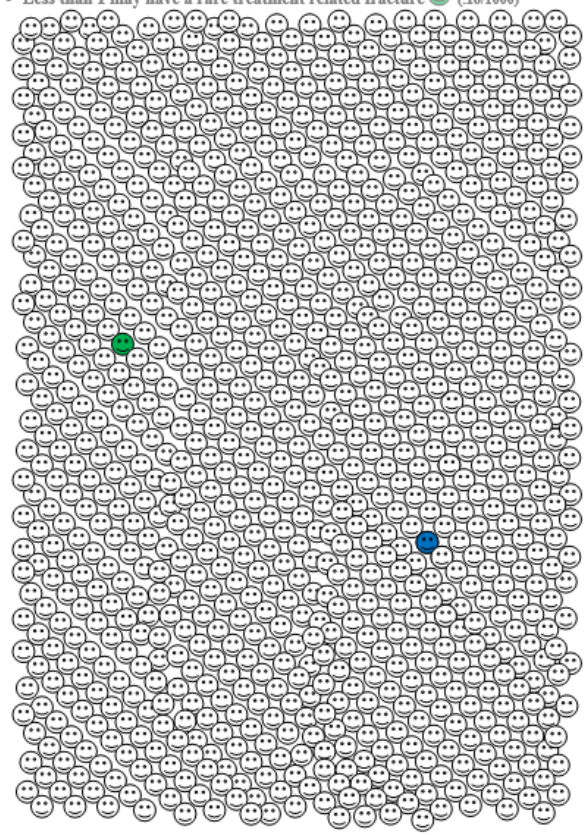


Kaiser Permanente, Southern California, Apr, 2013

THE RISK OF TAKING BONE STRENGTHENING MEDICATION

Out of 1,000 people on Osteoporosis medication for 5 years:

- **Less than 1 may have a jaw problem** (.01/1000)
- **Less than 1 may have a rare treatment related fracture** (.16/1000)



Drug Holiday: Bisphosphonates

- Defined as a temporary suspension of therapy
- Length of drug holiday 1-2 years
- Considered after 3 years on IV therapy or 5 years on PO therapy
- For patients who continue to demonstrate high fracture risk continued treatment with a bisphosphonate or alternate therapy should be considered

Denosumab (Prolia)

- RankL Inhibitor (Inhibits osteoclast formation, decreases bone resorption and increases bone mass)
- 60 mg subcutaneous injection q 6 months
- Not cleared through the kidney, so good for patients with kidney function issues
- Adverse side effects: back pain, extremity pain, hypocalcemia, infection, ONJ, AFF
- Effect lost if not continued at 6 months
- Must transition to another medication if ceasing treatment

Rebound Vertebral Fractures

- Discontinuation of Denosumab is associated with rapid bone loss that may result in multi-level vertebral fractures
- Higher risk in patients with a prior vertebral fracture
- No drug holiday
- Following denosumab with bisphosphonates has been shown to preserve bone mass

Efficacy of Denosumab

Reduces incidence of

- Vertebral fractures by 68% at 1 year
- Hip fractures by 40% and non-vertebral fractures by 20% at 3 years
- Upper limb fractures by 48% at 7 years
  - 43% wrist, 43% forearm, and 58% humerus

Teriparatide (Forteo)

- PTH analog
- Potent osteoanabolic agent
- Induces bone formation
- 20mcg SQ daily
- Pen-30 Day supply
- Side effects: nausea, headache, dizziness, orthostatic hypotension
- Monitor calcium, alk phos, PTH
- 2 years then transition to another medication
- Risks: osteosarcoma, hypercalcemia

Teriparatide (Forteo)

Indications

- Severe glucocorticoid induced osteoporosis
- Presenting T score <-2.5
- Premenopausal women/young men with severe osteoporosis

Osteosarcoma Risk Teriparatide

Treatment restricted to 2 years due to elevated osteosarcoma seen in rodent studies

Increased osteosarcoma was not observed in humans during 15 years of post-marketing studies

Revised label states that use for more than 2 years during a patient's lifetime can be considered if a patient remains at or has returned to having a high risk for fracture

Contraindicated in settings of increased risk for osteosarcoma

Efficacy of Teriparatide

- After an average of 18 months of therapy
  - Reduces risk of vertebral fractures by 65–77%
  - Reduces non-vertebral fractures by 35–53%
- Important to follow treatment with an antiresorptive agent, usually a bisphosphonate or denosumab, to maintain or further increase BMD

When to Start Treatment After a Fragility Fracture?

- PO Bisphosphonates
- IV Bisphosphonates
- Denosumab
- Teriparatide

Orthopedic Osteoporosis Pathway

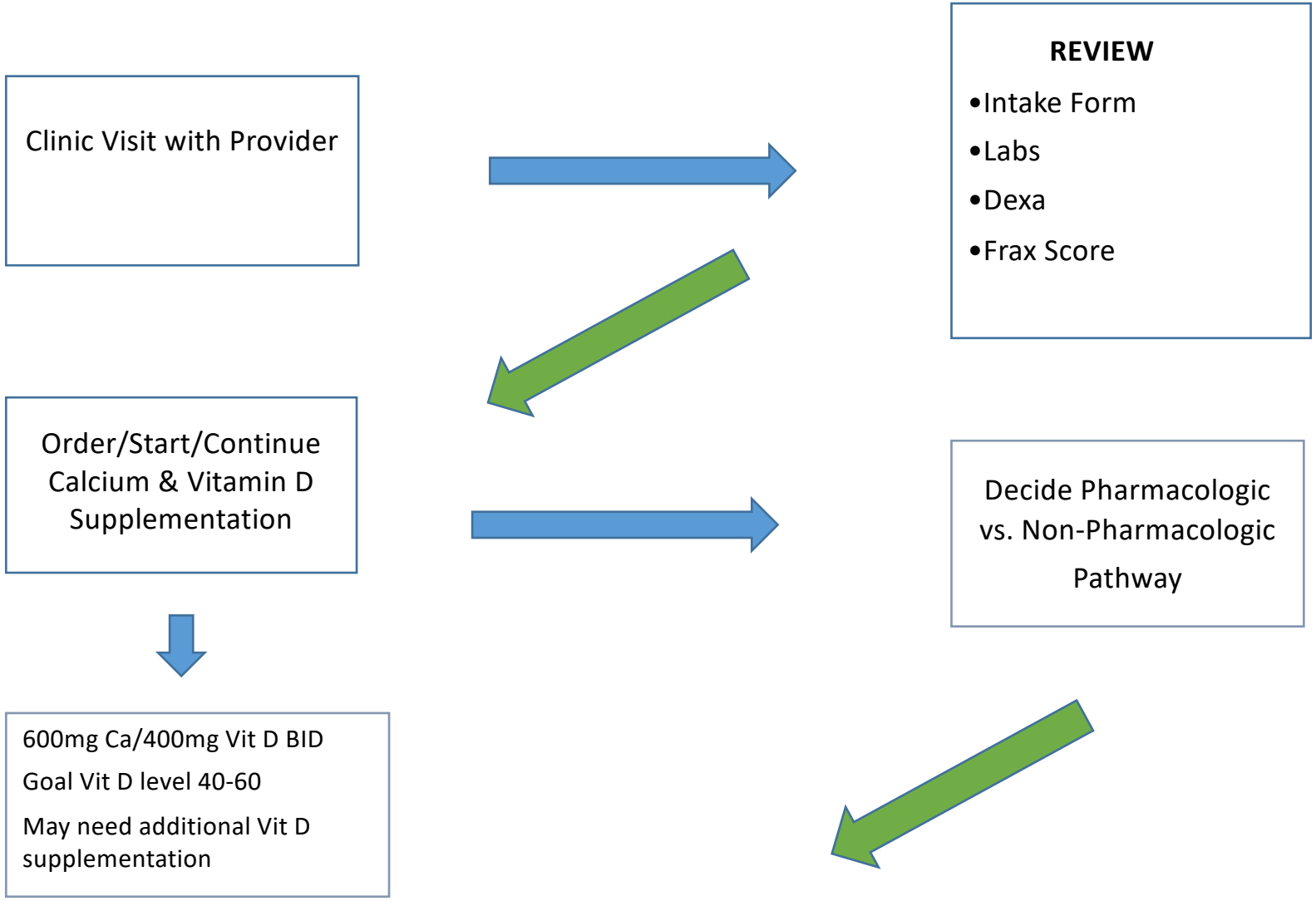
Patient

- Fracture Patient >50
- Pre-Total Joint Replacement
- Spinal Fusion

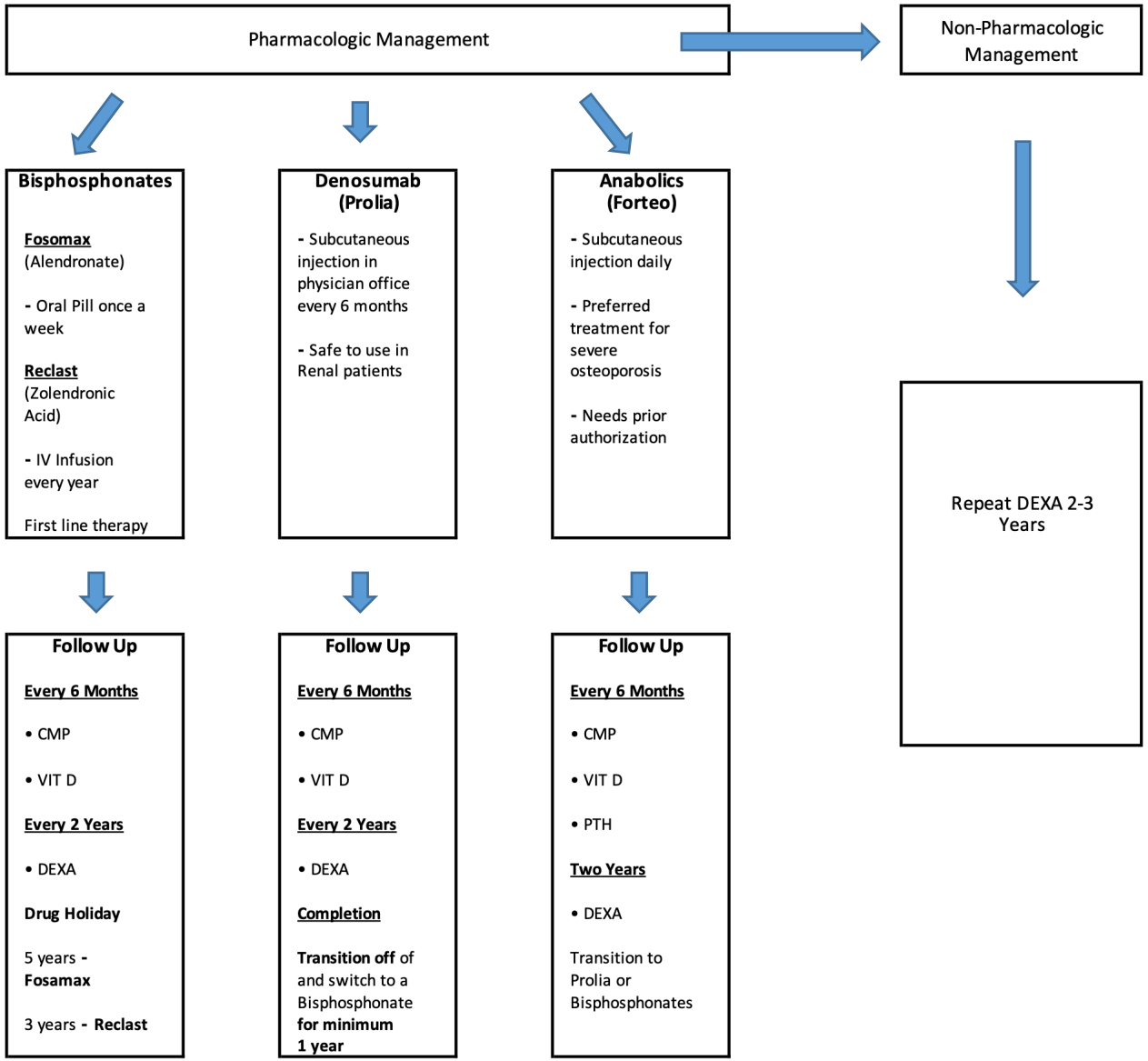
Referral Placed to Orthopaedics

Pre-Office Visit

- Labs
- DEXA Scan
- Intake Form



Pharmacologic vs Non-Pharmacologic Pathway


Pharmacologic Management
Non-Pharmacologic Management
Bisphosphonates
Fosomax (Alendronate)
- Oral Pill once a week
Reclast (Zolendronic Acid)
- IV Infusion every year
First line therapy
Denosumab (Prolia)
- Subcutaneous injection in physician office every 6 months
- Safe to use in Renal patients
Anabolics (Forteo)
- Subcutaneous injection daily
- Preferred treatment for severe osteoporosis
- Needs prior authorization
Repeat DEXA 2-3 Years
Follow Up
Every 6 Months
• CMP
• VIT D
Every 2 Years
• DEXA
Drug Holiday
5 years - Fosamax
3 years - Reclast
Follow Up
Every 6 Months
• CMP
• VIT D
Every 2 Years
• DEXA
Completion
Transition off of and switch to a Bisphosphonate for minimum 1 year
Follow Up
Every 6 Months
• CMP
• VIT D
• PTH
Two Years
• DEXA
Transition to Prolia or Bisphosphonates

AOA 6 Steps of Success

6 - Communication

- Education
  - Patients
  - Surgeons
  - PCPs

Communication

Patient Education

- Risks/Benefits of medication
- Risks of osteoporosis
- Handouts

Orthopedists

- Concerns for upcoming surgical intervention
- Delaying surgery for 3 months after initiating treatment
- Education on risks of osteoporosis on surgical outcomes

PCP's

- Abnormal lab findings
- Help managing secondary conditions (Thyroid, PTH)
- Treatments initiated

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- Calcium Supplementation

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4 - Testing

- Labs
- DEXA
- FRAX

5 - Pharmacology

- Treatment

6 - Communication

- Education

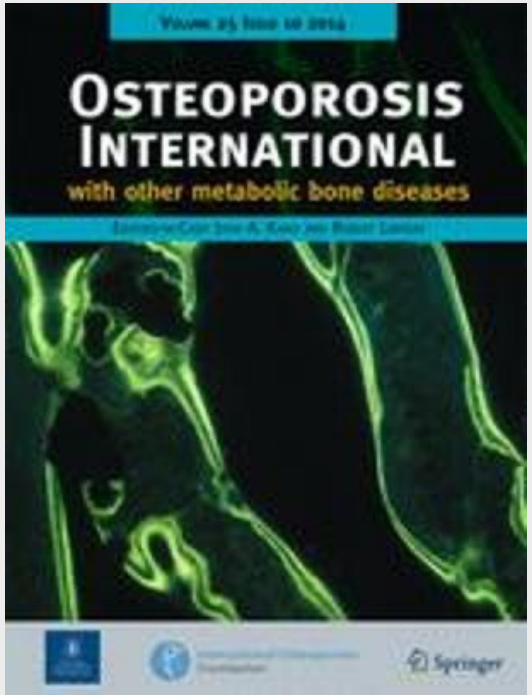
Diagnosis and Treatment of Osteoporosis: What Orthopaedic Surgeons Need to Know
JAAOS October 15, 2019, Vol 27, No 20

- **In summary, orthopaedic surgeons are at the front line of recognizing patients with osteoporosis and those at high risk of osteoporotic fracture.**

This epidemic equates to an osteoporotic fracture every 3 seconds. Orthopaedic surgeons need to not only treat these fractures but also understand the underlying pathogenesis and risk factors to help prevent them. The management of osteoporosis is a critical part of musculoskeletal care. We must be familiar with the tools to assess osteoporosis and the treatments available, including risks and benefits.

Good Overview Article

- Osteoporosis International
- Osteoporos Int. 2022 July 28; 33(10): 2243.
  - Updated from 2014
- Clinician's Guide to Prevention and Treatment of Osteoporosis



Resources

AMERICAN ORTHOPAEDIC ASSOCIATION

Own the Bone®

IOF International Osteoporosis Foundation

BHOF Bone Health & Osteoporosis FOUNDATION™

Healthy Bones, Build Them for Life

Questions?