

Best article I read this year...

A Guide to Improving the Care of Patients With Fragility Fractures

Geriatric Orthopaedic Surgery & Rehabilitation 2011 2: 5

SV Bukata, BF DiGiovanni, SM Friedman, H Hoyen, A Kates, SL Kates, SC Mears, DA Mendelson, FH Serna, Jr., FE Sieber and WK Tyler

I cheated a little

The new version of this guide comes out in June 2015

The Orthopaedic Surgeon Owning the Bone: Osteoporosis 101

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Disclosures

- Speaker's Bureau
 - Eli Lilly
- Consulting
 - Merck, Amgen, Eli Lilly
- Research funding
 - Oppenheimer pilot study fund
 - Lincy fund UCLA

Osteoporosis

- We know we see it every day in our office
 - Total joint patients
 - Fragility fractures
 - Spinal stenosis and back pain patients
 - Older “weekend warriors”

Osteoporosis

- What do I need to know to:
 - Identify
 - Diagnose
 - Get to treatment
- And how can I do it in 90 seconds (the time allotted in the visit...)
- What about all the bad stuff with the treatments?
 - The real facts....

Why should orthopaedic surgeons care?

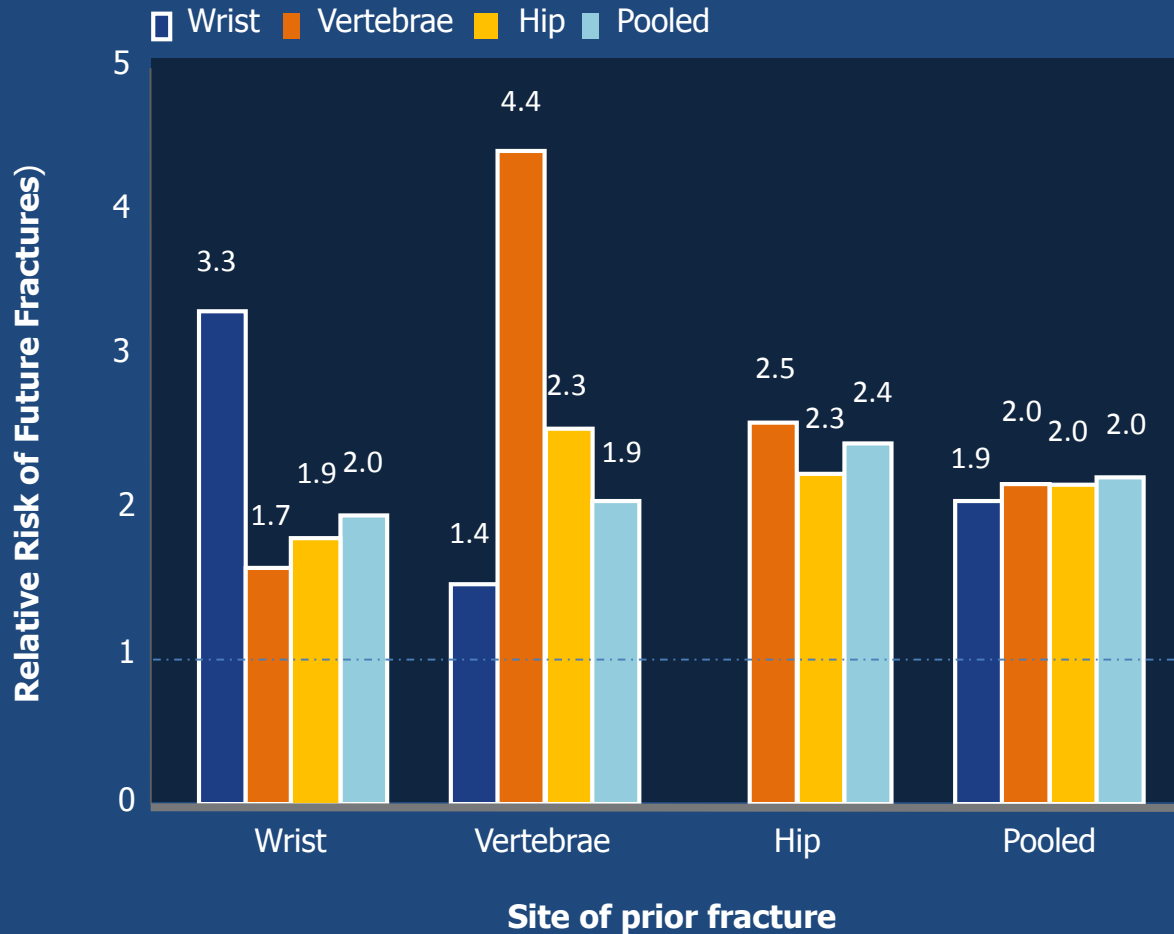
- 50% of fragility fracture patients will have a second fracture
- 50% of hip fracture patients will have had a prior fragility fracture
- 50% of all hip fracture patients come from 16% of the population

We can make a huge difference!!!!

Why should orthopaedic surgeons care?

- Those second fractures can happen quickly
 - 10% within one year
 - 17%-21% within two years
 - 9% hip fractures break other hip within two years

Prior fracture increases risk of future fracture



1. Klotzbuecher CM, et al. J Bone Miner Res. 2000;15(4):721-39.

2. Elliot-Gibson V, et al. Osteoporos Int. 2004;15(10):767-78.

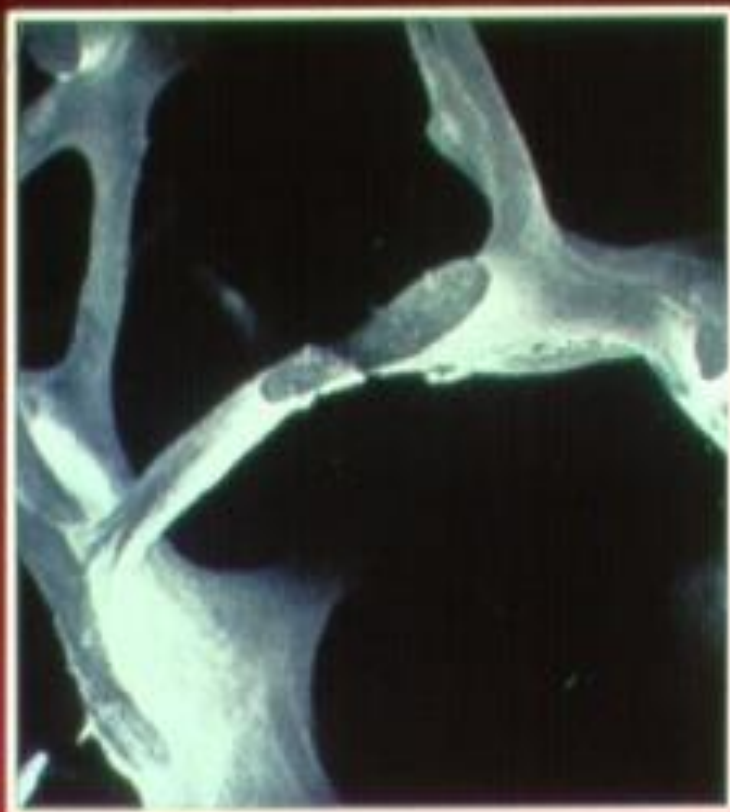
IDENTIFY

Osteoporosis Defined

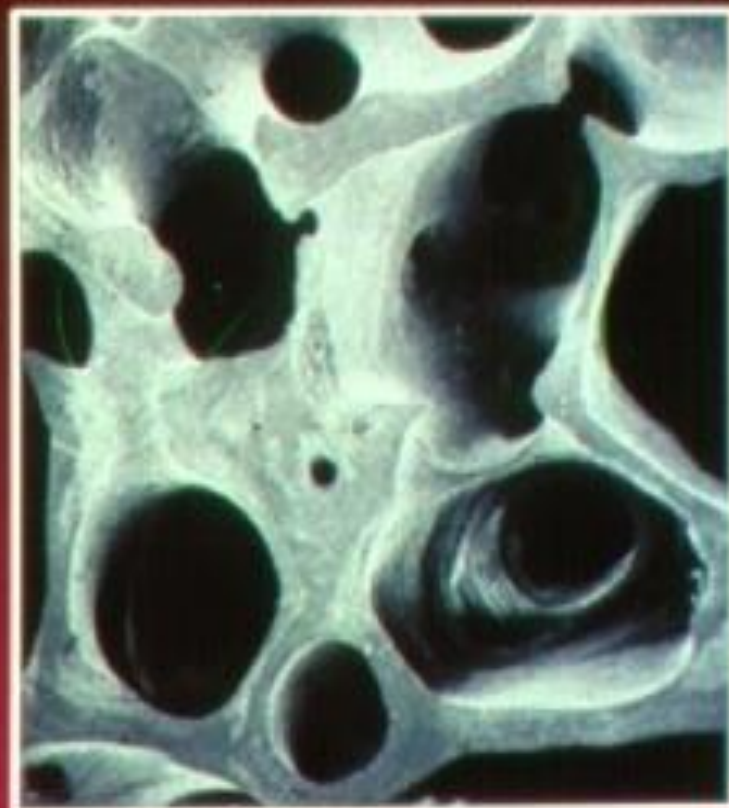
--- a metabolic bone **disease**
characterized by low bone mass and
microarchitectural deterioration of bone
tissue leading to enhanced bone
fragility and a consequent increase in
fracture risk

OSTEOPOROTIC vs NORMAL BONE

Osteoporotic iliac crest



Normal iliac crest



Bone Strength

Bone Mass + Bone Quality = Bone Strength

Bone density

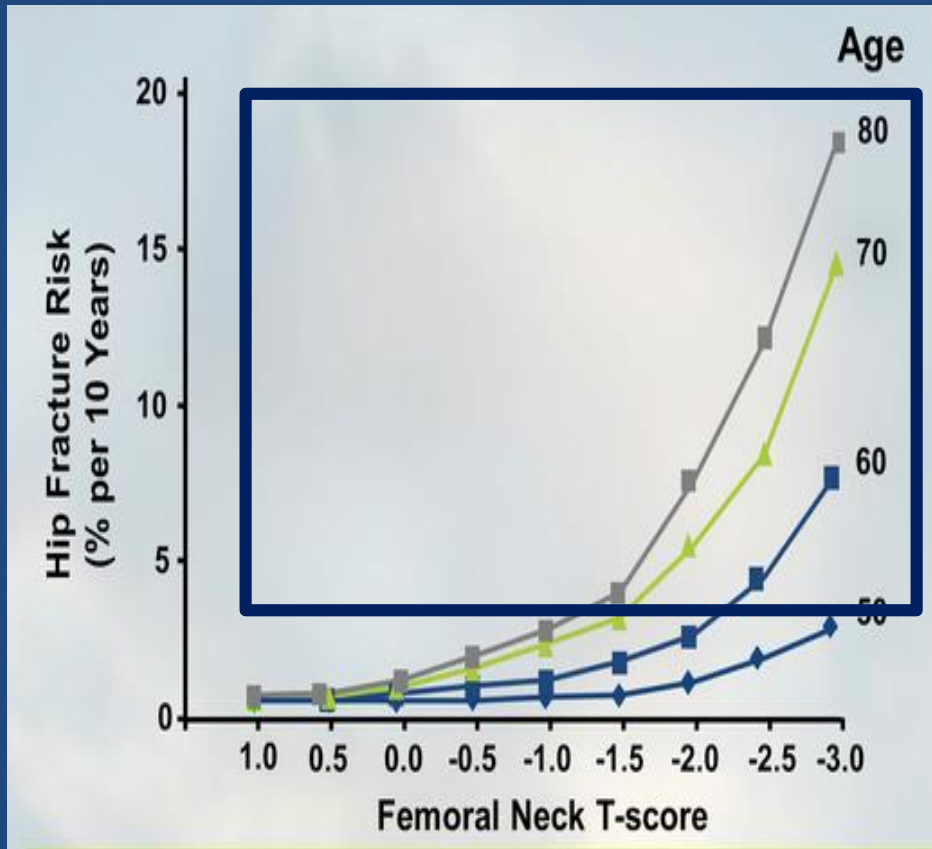
Architecture

Bone turnover

Collagen structure

Collagen crosslinking

10-Year Fracture Risk: Age and BMD



Bone Quality Factors that increase this risk are difficult to measure

DIAGNOSE

Fragility Fracture Defined

- Falls from standing height or less resulting in fracture
 - >95 % of fragility fractures happen from a fall
 - Does not matter how “hard” the surface or how “crazy” the fall
 - It’s about energy transfer and bone strength

We can say “I am here to treat your fracture and get you treatment for your osteoporosis”

New definitions for diagnosis of osteoporosis

- Hip fragility fracture
- Spine fragility fracture
- FRAX score $>20\%$ for major osteoporotic fracture or $>3\%$ for hip fracture
- T score <-2.5 in geriatric patient

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- Hip fragility fracture
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We no longer need DXA and labs to diagnose many of our patients

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 40-90 years) or Date of birth

Age: Date of birth: Y: M: D:

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/cm²)

Select DXA

Clear

Calculate

BMI 20.8

The ten year probability of fracture (%)

without BMD

Major osteoporotic	20
Hip fracture	3.4

Weight Conversion:

pound:

convert

125 pound = 56.7 kg

Height Conversion:

inch:

convert

65 inch = 165.1 cm

TREATMENT

Calcium and Vitamin D

- Alone do not prevent fractures
 - Current calcium recommendations
 - 1200-1500 mg daily Diet + Supplements
 - Most patients need to start on 500-600 mg supplement
- Vitamin D important for many things
 - We generally discharge on 2000 iu daily if calcium levels ok
 - Levels < 20 ng/ml (deficiency)
 - Levels < 32ng/ml (insufficiency)
 - Mineralizations efficiency
 - Neuromuscular control decreased if <45 ng/ml

Vitamin D Supplementation

- Our “rules of thumb” for post fracture patients

25 Vit D level	Treatment with D₂
20-30 ng/ml	50,000 IU once weekly
10-20 ng/ml	50,000 IU twice weekly
<10	50,000 IU three times weekly

Total treatment time of 8 weeks and then recheck levels

Treatment Comes in 2 Sizes

- Antiresorptive agents
(slow down those osteoclasts)
 - Oral bisphosphonates
 - Alendronate, risedronate, ibandronate
 - IV bisphosphonates
 - Pamidronate, zoledronic acid
 - Anti-RANKL agents
 - denosumab
 - Hormonal receptor agents
 - estrogen, raloxifene
 - Cathepsin K inhibitors
 - In clinical trial
- Anabolic agents
(speed up those osteoblasts)
 - Parathyroid hormone derivatives
 - Wnt pathway modulators
 - In clinical trial

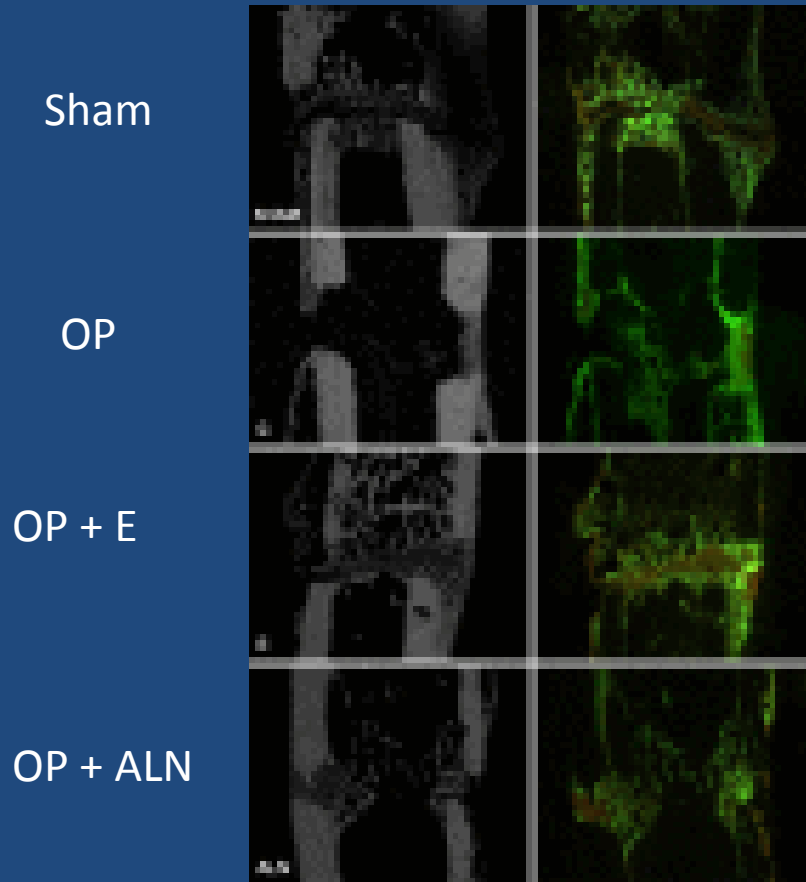
Things that scare us

- Fracture Healing problems
- ONJ
- Atypical femur fracture
- Box warning for Osteosarcoma

Things that scare us

- Fracture Healing problems
 - does not happen with fragility fracture
 - Might be an issue with stress fractures and fusions
- ONJ
- Atypical femur fracture
- Box warning for Osteosarcoma

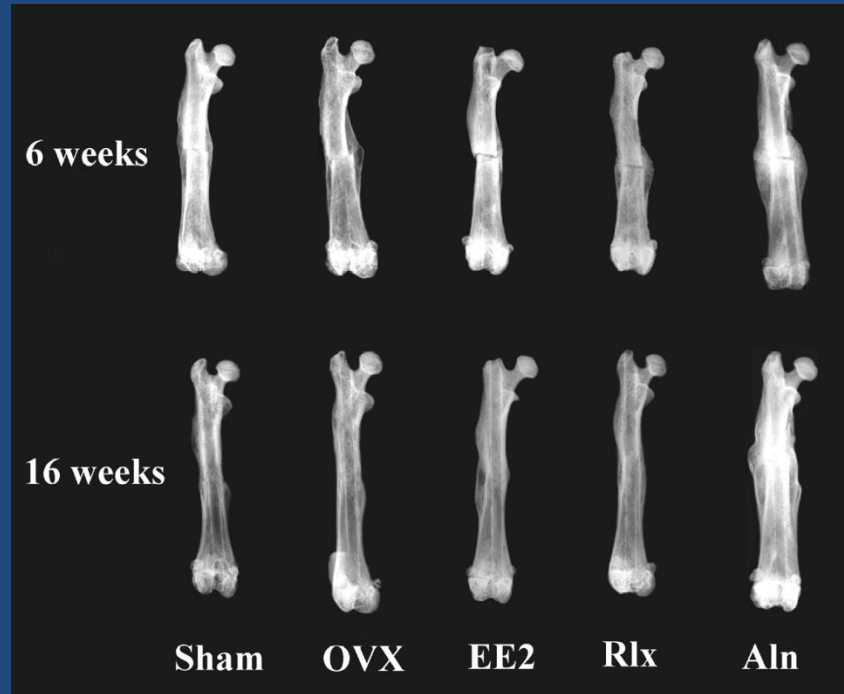
We already know that biology and meds modify healing patterns



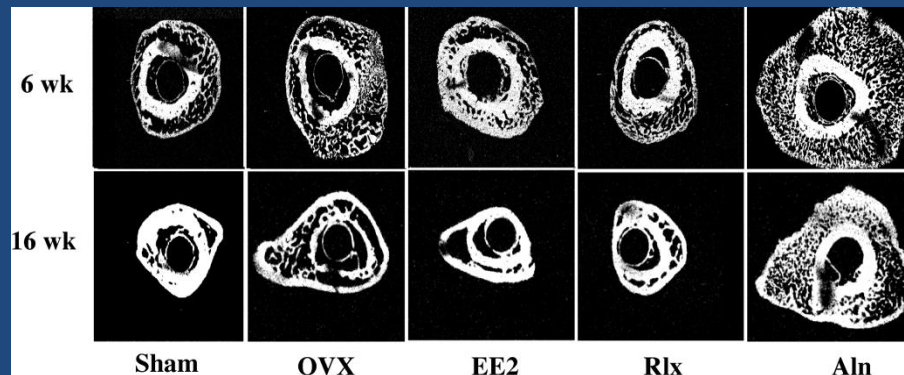
Rat metaphyseal fracture

- OP group
 - Callus enhanced, unstructured, less dense
- OP + Estrogen group
 - Less callus
 - Callus compact and dense
 - Increased trabecular structure
- OP+ Alendronate group
 - Less callus
 - Less organized
 - Fewer trabeculae

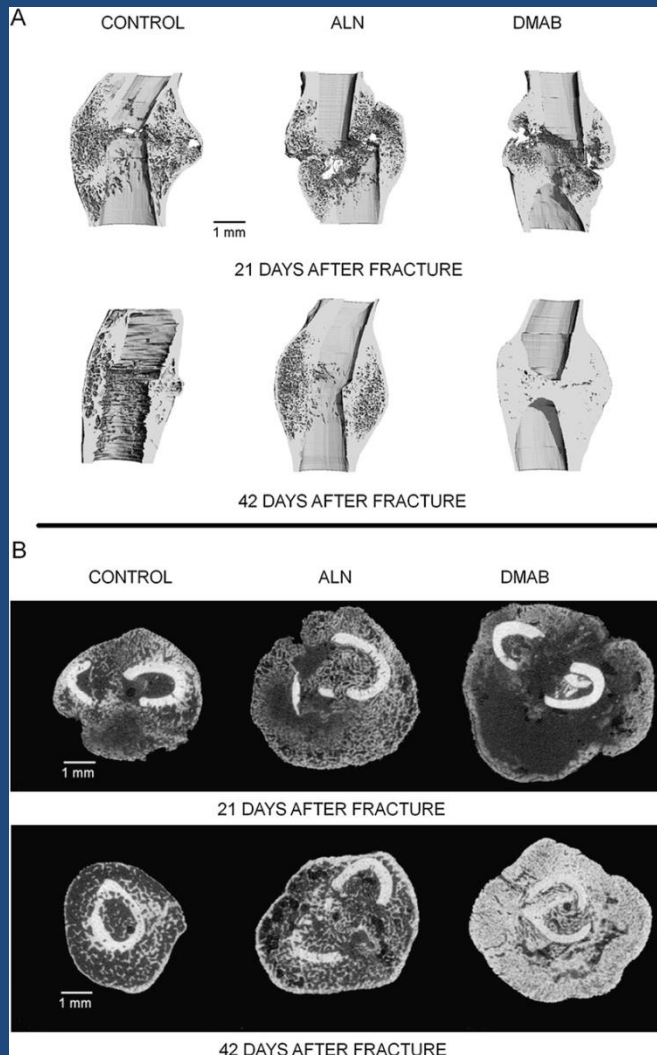
Callus formation comparisons in rat femur fracture model



Cao Y, et al., JBMR 2002
17(12): 2237-2246



Denosumab



- Mouse femur fracture model
 - Increased callus volume
 - Delayed callus remodeling
 - Increased BMD in callus tissue
- Bisphosphonates show only increased BMC in callus
- No compromise in mechanical properties
- No clinical data
 - No problems reported, but nothing reported yet looking at nonunion

Things that scare us

- Fracture Healing problems
- ONJ
 - Extremely rare event mostly seen with cancer patients
- Atypical femur fracture
- Box warning for Osteosarcoma

Osteonecrosis of the Jaw



courtesy of Dr. Sook-Bin Woo from
Oral Medicine at the Brigham and
Women's Hospital in Boston

- Bone exposed
- complicated by infection
- Occurs mainly in patients with cancer after prolonged therapy
- Osteoporosis dose level risk estimated at <1 per 100,000

Things that scare us

- Fracture Healing problems
- ONJ
- **Atypical femur fracture**
 - With prolonged use of bisphosphonate/denosumab
- Box warning for Osteosarcoma

Atypical Fractures



- Unique attributes
 - Tension sided stress fracture
 - Bilateral common (20-30%)
 - Patients have multiple concurrent issues
 - Steroids, H2 blockers, hypothyroid, low Vitamin D, etc
 - More common in Asians
 - Risk of fracture of other femur decreases significantly if stop the bisphosphonate

Evidence?

- Dell, et al
 - 2.6 million people over age 45 (2007-2009)
 - risk 2/100,000 if 2 yrs BP use
 - Risk 78/100,000 if 8 yrs BP use
 - Use of BP saved 700 nonvertebral and 1000 clinical vertebral fractures per 100,000 (total 1700 fractures)
 - If pts had prior fragility fracture those numbers are 1000 and 2300 respectively (total 3300)
 - Dell at ASBMR estimate that 50 “typical” subtrochs prevented for every “atypical” fracture occurred

Things that scare us

- Fracture Healing problems
- ONJ
- Atypical femur fracture
- **Box warning for Osteosarcoma**
 - Not a problem with “our” patients

Box Warning for teriparatide

- FORTEO caused some rats to develop a bone cancer called osteosarcoma

We Can....

- Identify
- Diagnose
- Get to treatment

- do it in 90 seconds

- Understand the real risks/benefits of treatment

Treatment Gap

- A persistent problem
 - 20% treatment at 6 months with wrist fracture
 - 20% treatment after hip fracture in 2002
 - 15% treatment after hip fracture in 2013

HOW CAN WE BE DOING WORSE?