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

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• 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

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
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

Kanis JA Osteoporos Int 2001; 12:989-955
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
New definitions for diagnosis of osteoporosis

- Hip fragility fracture
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We no longer need DXA and labs to diagnose many of our patients.
Please answer the questions below to calculate the ten year probability of fracture with BMD.

Questionnaire:

1. Age (between 40-90 years) or Date of birth
   Age: 57
   Date of birth: Y: M: D:

2. Sex
   Male
   Female

3. Weight (kg)
   56.7

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 per day
    No
    Yes

12. Femoral neck BMD (g/cm²)
    Select DXA:
    

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:
inches: convert
65 inches = 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

<table>
<thead>
<tr>
<th>25 Vit D level</th>
<th>Treatment with D₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30 ng/ml</td>
<td>50,000 IU once weekly</td>
</tr>
<tr>
<td>10-20 ng/ml</td>
<td>50,000 IU twice weekly</td>
</tr>
<tr>
<td>&lt;10</td>
<td>50,000 IU three times weekly</td>
</tr>
</tbody>
</table>

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

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

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