Osteoporosis Update 2007: DXA’s, Diagnosis, and Treatment

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3.1 Million Members

464,715 60 Years Old And Older (14.9%)

63,642 80 Years Old And Older (2%)

56% Of Hip Fractures Occur In Patients Over 80

95% Of Hip Fractures Occur In Patients Over 60

Estimate 1800 to 2000 Hip Fractures A Year (25% Lower Than Expected)

Source: R Dell MD SCPMG 2007
2004 HEDIS Osteoporosis Metric

- Female
- Age > 67
- Measures for an intervention within 6 months of Fx event
- Numerator: DEXA OR Rx for osteoporosis
- Denominator: ICD-9 codes for Fx
- KP SCR #1 in USA
<table>
<thead>
<tr>
<th>AgeClass</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Q1 2007</th>
<th>Total</th>
<th>% Change from 2002 to 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fosamax - NCAL 46 - 49</td>
<td>1359</td>
<td>1740</td>
<td>1772</td>
<td>1780</td>
<td>1507</td>
<td>355</td>
<td>8513</td>
<td>10.9%</td>
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<tr>
<td>Fosamax - NCAL 50 - 59</td>
<td>13369</td>
<td>19098</td>
<td>22632</td>
<td>24209</td>
<td>21273</td>
<td>5070</td>
<td>105651</td>
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<tr>
<td>Fosamax - NCAL 60 - 69</td>
<td>22429</td>
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<td>11251</td>
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<td>46398</td>
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<td>210688</td>
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<td>4150</td>
<td>1177</td>
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<td>38056</td>
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<tr>
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<td>1553</td>
<td>2068</td>
<td>2453</td>
<td>2817</td>
<td>3101</td>
<td>805</td>
<td>12797</td>
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<td>12772</td>
<td>20311</td>
<td>25084</td>
<td>32330</td>
<td>37956</td>
<td>9751</td>
<td>138204</td>
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<tr>
<td>Fosamax - SCAL 60 - 69</td>
<td>21266</td>
<td>33409</td>
<td>39899</td>
<td>52186</td>
<td>65635</td>
<td>17438</td>
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<tr>
<td>Fosamax - SCAL 70 - 79</td>
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<tr>
<td>Fosamax - SCAL 80-89</td>
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<td>19321</td>
<td>22832</td>
<td>30060</td>
<td>38283</td>
<td>10186</td>
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<tr>
<td>Fosamax - SCAL &gt;90</td>
<td>1232</td>
<td>2040</td>
<td>2628</td>
<td>3689</td>
<td>4826</td>
<td>1378</td>
<td>15793</td>
<td>291.7%</td>
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<tr>
<td>Fosamax - SCAL Total</td>
<td>73830</td>
<td>112481</td>
<td>131983</td>
<td>170434</td>
<td>212630</td>
<td>56247</td>
<td>757605</td>
<td>188.0%</td>
</tr>
</tbody>
</table>
CME Kulturkompetenz ist jetzt der Gesetz von Kalifornien
CME Objectives

► Discuss DXA interpretation & Fx risk in various ethnicities
► Discuss appropriate use and interpretation of DXA measurements: BMD, Z score, T score
► Outline standards to compare DXA’s over time
► Use appropriate agents & interventions to treat low BMD
► Identify SCPMG CPG changes
Osteoporosis

• “A systemic skeletal disease characterized by low bone mass and micro architectural deterioration, with a consequent increase in bone fragility with susceptibility to fracture.”*

• Bone density \( \geq 2.5 \) SD below young normal mean†


Normal & Osteoporotic Bone Architecture

Normal Bone

Osteoporotic Bone

Reproduced from *J Bone Miner Res* 1986;1:15-21 with permission of the American Society for Bone and Mineral Research. © 1986 by Massachusetts Medical Society. All rights reserved.
## WHO Classification of BMD (postmenopausal women)

<table>
<thead>
<tr>
<th>Diagnostic criteria*</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>T is above or equal to -1.0</td>
<td>Normal</td>
</tr>
<tr>
<td>T is between -1.0 and -2.5</td>
<td>Osteopenia</td>
</tr>
<tr>
<td>T is -2.5 or lower</td>
<td>Osteoporosis</td>
</tr>
<tr>
<td>T is -2.5 or lower with fragility fracture(s)</td>
<td></td>
</tr>
<tr>
<td>Severe or established osteoporosis</td>
<td></td>
</tr>
</tbody>
</table>
Mechanisms Osteoporotic Fractures

- Age
- Menopause
- Increased bone loss
- Propensity to fall
- High bone turnover
- Microarchitectural changes
- Low peak bone mass

FRACTURES
Model of Bone Remodeling

Haemopoietic precursors → Osteoclast recruitment

Osteoclasts → BP → Osteoblasts
How to Assess Fracture Risk
DXA Machine

www.iscd.org
Spine DXA
Hip DXA
Default: Forearm DXA
Unwrapping DXA Measurements

BMD T Z
Bone Mineral Density; BMD

- A measure with units
- gm/cm² (gm/cm³)
- Statistics are done on gm/cm²
- Comparisons are only done between BMD in gm/cm²: %
DXA Statistics

- Real Z score = SD +/- mean of a group of numbers

- Real T score = the same group compared to a new mean e.g.
  10 +/- SD; 10 transformed to new mean 20, then T will be >> than Z.

- DXA Z score = SD of an age-specific mean BMD

- DXA T score = SD from another mean (young age mean peak BMD)
DXA Z Scores

- SD of mean of age-matched normal controls.
- Z Scores do not change as normal patients age.
- Low Z Scores indicate patient has a statistically Low BMD for age.
- Low Z Score (-2.0); Consider Metabolic W/U*
- If we used Z scores only…
- SCPMG CPG*

\[
\sqrt{\nu(X)} = \sqrt{\sigma^2} = s
\]
DXA T Scores

- SD from mean PEAK BMD (age 20-30)
- Different Reference Ranges have Different Peak BMD’s
- BMD Often Statistically Normal for Age even if Low T Score
- Both low Z & T Scores Describe an Increase in Fracture Risk
- (Un)fortunately T Scores were selected to make clinical decisions for Rx
- Beware T scores from peripheral methodologies

SCPMG CPG’s*
Unser Gouverneur und Regierung haben gesagt.

- So for some cultural competency content:
- We must use only the NHANES reference range.
- This reference range uses a heterogeneous mix of normal women or men.
- The proprietary caucasian & non-caucasian reference ranges do not predict Fx risk as accurately as NHANES (less disease diagnosed by NHANES).
- Proprietary reference ranges:
Normal

Osteopenia

Osteoporosis

Standardized total hip BMD, young white women, mg/cm²
Different reference ranges have higher peak BMD’s, smaller N’s and narrower SD’s (ethnic differences)

Why don’t we just use BMD gm/cm2 ?

There would be a risk / Rx grid similar to our cholesterol Rx grid.

Looking @ T & Z is easier.

NHANES is the best reference range for DXA statistics and Rx’ing.

If I see an outside KP DXA report.........
“Low” BMD & Osteopenia

Young person with low BMD: unlikely
to have microarchitectural
abnormality especially in those who
have not reached peak BMD

A “LOW T SCORE” IN A CHILD,
ADOLESCENT, OR YOUNG ADULT IS
NOT A DISEASE

Older person with low BMD: much
more likely to have
microarchitectural abnormality

Low BMD in younger person has a
much lower Fx risk than in older
person with the same BMD

DXA does not measure
microarchitectural changes; U/S
measurements are a function of
BMD and microarchitectural changes

“OSTEOPENIA = OXYMORONIC”

“Low Bone Mass is kinder”
Mein Kampf: T Speilstand und Osteopenia

- We must stop the incorrect use of T score.
- Misunderstandings about T scores lead to over-treatment.
- BMD would be better to report but unfortunately...
- Osteopenia is a clinically useless word; “Low Bone Mass”
## Fracture Risk in Women with Bone Density of −2.5 SD

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>1-Year Risk (%)</th>
<th>5-Year Risk (%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hip</td>
<td>Any Fx</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>1.2</td>
<td>3</td>
</tr>
<tr>
<td>70</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>80</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

Fx = fracture

Risikofaktoren für einer Bruche

- Ein Fragilität Bruch (ist besser als eine DXA)
- Alter
- DXA
- Steroid
- Rauchen
- Dunn
- Familiengeschichte
DXA: Women & Men 50 < years

- Use Z score
- T score inappropriate to use when peak BMD has not been reached @ all sites
- The younger the patient; the closer T and Z scores are to each other
- Osteopenia is not a useful Dx’tic word
DXA: Children <20

- Only Z scores should be reported
- T scores are irrelevant
- Dx can not be made with DXA alone
- “Low bone density for age “ if <-2.0 Z score
- Spine and Total Body ROI’s preferred
Incidence of Fx: Men & Women

**Fx’s: Women vs Men**

- **Lifetime Risk**: Women 40-50%; Men 15%
- **Distribution of Hip fx**: Women 80%; Men 20%
- **Distribution of Vertebral fx**: Women 50%; Men 50%
Lifetime Fracture Risk for Men

Rochester Epidemiology Study

Estimated lifetime fracture risk at age 50:
- Proximal femur 6.0%
- Clinical vertebral 5.0%
- Distal forearm 2.5%
- Any of the three 13.1%

Osteoporosis Dx in Men

Men age 50-64: T -2.5
  AND other risk factors
Men age >65: T -2.5
Men 20 to 49: no Dx
  based on DXA alone
Fracture risk vs BMD is not the same as women until > 65-70
DXA screening > 70
Who Should Be Screened with DXA

- Women > 65 and older (not on osteoporosis meds)
- Women on HT (WHI)
- Women 50-60 with significant fx risk factors
- Men > 70
- SCPMG CPG pre-2007*
Who Should Not Routinely Get DXA

► Those who you would never treat
► The young prior to achieving peak BMD
► Someone who just had a DXA within 1 year
► Someone already on drug for osteoporosis
Other Reasons for DXA’s

- Low-trauma Fx pt’s
- Hyperparathyroidism
- HEDIS
- If clinical management will change ???
- F/U exams ???
- Bone toxic Rx’s steroids, Arimidex, Lupron
- Unique medical conditions
Repeat DXA Testing

- SAME DXA Machine with same reference
data base
- NHANES reference
- BMD are compared (most accurate method)
- T SCORES CAN NOT BE COMPARED
- Z Scores can be used to compare on different machines (an estimate only)
- Compare/repeat studies are NOT ROUTINE
- 2.8 x CV of the BMD (gm/cm2) is significant; may take > 2 years to see significant differences
- 5 year repeat

SCPMG CPG pre-2007*
“Metabolic Workup” Z <-2.0

- CBC, TSH, LFT’s, sed rate
- Creat
- SPEP
- Ca, Phosphate
- Alk Phos
- 25 hydroxy vitamin D
- Testosterone (men)
- Urine Ca
- Parathyroid Hormone (Not me)
- Bone markers (NOT !)
- Markers for celiac sprue (NOT !)
## T score Treatment Threshold Guidelines: with/without risk factors (women)

<table>
<thead>
<tr>
<th>Organization</th>
<th>T Score Threshold</th>
<th>Treatment Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCPMG</td>
<td>&lt;=-2.0</td>
<td>&lt;=-1.5</td>
</tr>
<tr>
<td>TPMG</td>
<td>&lt;=-2.5</td>
<td></td>
</tr>
<tr>
<td>AACE</td>
<td>&lt;=-2.5</td>
<td>&lt;= -1.5</td>
</tr>
<tr>
<td>ACOG</td>
<td>&lt;=-2.0</td>
<td>&lt;=-1.5</td>
</tr>
<tr>
<td>NOF</td>
<td>&lt;=-2.0</td>
<td>&lt;=-1.5</td>
</tr>
<tr>
<td>NAMS</td>
<td>&lt;=-2.5</td>
<td>&lt;=-2.0 to &lt;=-2.5</td>
</tr>
</tbody>
</table>
Osteoporosis Management

This evidence-based guideline has been developed to assist primary care physicians, specialists, and other healthcare professionals in the primary and secondary prevention of osteoporosis (fragility) fractures in otherwise healthy postmenopausal women and older men.

Preventive Measures

- The following preventive measures are recommended for all postmenopausal women and for men aged 50 and older:
  - Calcium – 1,200 mg/day, including dairy intake
  - Vitamin D – 400-800 IU/day, including diet
  - Exercise – regular weight-bearing and muscle-building exercise
  - Smoking Cessation

Osteoporosis Screening

Bone Mineral Density (BMD) Test

- BMD testing by dual-energy x-ray absorptiometry (DXA) is recommended for screening and selecting patients for treatment.

- The lowest T-score of all measurements at the hip (total hip, femoral neck, trochanter, and intertrochanteric) is recommended to establish a diagnosis of osteoporosis (T-score less than or equal to -2.5) or very low BMD (T-score between -2.5 and -3.0).

- The dual energy x-ray absorptiometry (DXA) is an option for patients in whom hip and spine BMD cannot be measured or interpreted.

The World Health Organization (WHO) has established definitions based on bone mass measurement at any site in white women (see Table 1). According to the International Society for Clinical Densitometry (2004), the WHO definitions can also be applied to men aged 63 and older, and in men aged 50 to 63 years when other risk factors for fracture are identified.

Indications for Screening

Postmenopausal Women

- Age 65 and Older. A BMD test is recommended for postmenopausal women who are not on drug treatment for osteoporosis (this includes women on hormone therapy).

- Under Age 65. A BMD test is recommended for postmenopausal women with a prior fragility fracture,

- Age 70 and Older. A BMD test is recommended for men who are being considered for drug treatment.

- Age 50 to 69. A BMD test is recommended for men with a prior fragility fracture, and on a case-by-case basis when other selected risk factors are present (see Table 2).

BMD Monitoring

- Routine BMD testing to monitor changes in BMD while on treatment is not recommended.

- The recommended re-testing interval for women and men not currently on treatment is 5 years.

Specialist Consultation or Referral

If a secondary cause of osteoporosis is suspected (including a T-score below -2.5), or a fracture occurs during treatment, a phone consultation or referral to Endocrinology or Rheumatology is recommended. A T-score below -2.5 suggests more bone loss than expected for a patient's age.

### Table 1: WHO Definition of Osteoporosis

<table>
<thead>
<tr>
<th>Category</th>
<th>T-score</th>
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</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&gt; -1.0</td>
</tr>
<tr>
<td>Low Bone Mass</td>
<td>-1.0 to -2.5</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>&lt; -2.5</td>
</tr>
</tbody>
</table>

**NOTE**

A T-score is the number of standard deviations below or above the mean BMD for young adult women (age 20).

A Z-score is the number of standard deviations above or below the mean BMD of the same age group.

### Table 2: Risk Factors for Osteoporotic Fracture

- Prior fragility fracture
- Low bone mineral density
- Family history of hip, wrist, or age 60 in a first-degree relative
- Being thin or small-boned (<125 pounds in women)
- Current or past smoking
- Use of corticosteroids and other medications
Highlights Of 2007 SCPMG CPG

- DXA Scans On **ALL** Women Over 65 and Men Over 70!!!

- DXA Scans 50-70 If Any Risk Factors
  - Fragility Fracture
  - Family Hx Fracture
  - Thin or Smoker

- If A Person Has A Fragility Fracture It’s OK To Initiate Treatment Prior To The DXA Scan

- Start Treatment (Fosamax Or Other Meds) For T-Score Of -2.0 Or Less in Women –2.5 in Men

- Start Rx For T-Score Of -1.5 with risk factors

- Don’t Forget Calcium, Vitamin D, Exercise, Stop Smoking, Fall Reduction Classes
Problem Formulation for National KP Osteo CPG’s, 2006

- Risk Factors
- DXA Screening
- Men & Women with high Fx risk
- DXA measurement sites
- Non-pharmacologic recommendations
- Pharmacologic recommendations
- Monitoring therapy
<table>
<thead>
<tr>
<th>Bone Markers: <strong>Neutral</strong></th>
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<tbody>
<tr>
<td><strong>Formation Markers</strong></td>
</tr>
<tr>
<td>Total alk phos</td>
</tr>
<tr>
<td>Bone alk phos</td>
</tr>
<tr>
<td>Osteocalcin</td>
</tr>
<tr>
<td>C terminal propeptide</td>
</tr>
<tr>
<td>Carboxy propeptide/type 1</td>
</tr>
<tr>
<td>collagen</td>
</tr>
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</table>
KP CPG: Risk Factors

- Fragility Fx > 50 y/o
- Corticosteroids > 7.5 mg prednisone >3 months
- Smoking
- Women 15 yrs post menopause or 65 y/o
- Men > 70 y/o
- Family history in 1st degree relative
- Hx of falls in last 12 months
KPCPG: DXA Screening

- PM women >65 y/o not on Rx
- DXA not recommended for PREmenopausal women
- DXA screening for men with risk factors optional
- Recommended DXA retesting interval 5 years
KP CPG: DXA for High Risk

► Do DXA in men and women if RX < 65 y/o
► DXA is optional if Fx and > 65 y/o
► Glucocorticoid Rx <65 y/o: DXA recommended
► Glucocorticoid Rx >65 y/o: DXA optional in women (and no recommendation in men)
KP CPG: DXA Sites

► Any single site is **NOT** recommended
► Recommended ROI: T hip, fem neck, L1-4
► Per **lowest site**: osteoporosis: -2.5; low bone mass -2.0 to -2.5
► Distal 1/3 forearm ROI: default ROI
KP CPG: Non-pharmacologic Recommendations

- PM women and men > 50: weight-bearing and muscle-building exercise
- Smoking cessation
- Home safety-proofing for fall risk
- Hip protectors **NOT** recommended
- Ca 1000 mg/day PREmenopausal women
- Ca 1500 mg/day POSTmenopausal women and **MEN** > 50 y/o
What to Treat Low BMD or Osteoporosis With:

Preferred: (generic 02/08)
- alendronate (F)

Alternatives:
- risedronate (NF)
- raloxifene (F)
- calcitinin (F)
- etidronate (F)
- ibandronate (NF)
- zolendronate (NF)
- PTH (F)
- HT / ET (F)
KP CPG: Pharmacologic Recommendations

- HRT for prophylaxis not recommended
- No Rx for PREmenopausal
- NO Rx recommendation for men
- Prophylactic Rx not recommended if T > -2.5
- Alendronate
- Risedronate
- Raloxifene
- Ibandronate
- Calcitonin
KP CPG: Rx Recommendations

- Alendronate (10 mg/day or 70 mg/week) is recommended as a first-line therapy for Postmenopausal women with a prior fragility fracture. Women aged 65 and older with a T-score at or below -2.5.

- Alendronate is an option for higher risk women: Women over the age of 65 with a T-score between -2.0 and -2.5. Postmenopausal women under the age of 65 with a T-score at or below -2.0. (Evidence-based: A)

- Risedronate (5 mg/day or 35 mg/week) is a recommended alternative to alendronate for postmenopausal women. (Evidence-based: A)
KP CPG: Rx Recommendations

- Raloxifene is an option for postmenopausal women with a T-score at or below –2.5 and low risk for thrombotic complications. (Evidence-based: B).

- Ibandronate is an option for postmenopausal women over the age of 65 with a prior vertebral fracture or a T-score at or below –2.5. (Evidence-based: B)

- Nasal calcitonin is an option for postmenopausal women over the age of 65 with a prior vertebral fracture or T-score at or below –2.5. (Evidence-based: B) Evidence has not demonstrated a statistically significant decrease in the incidence of hip fractures.
KP CPG: Rx Recommendations

- Alendronate (10 mg/day or 70 mg/week) or risedronate (5mg/day or 35 mg/week) are recommended as first-line therapies for men and women taking oral corticosteroid medication (>7.5 mg/day prednisone or equivalent, for >3 months duration).

(Evidence-based: B)
KP CPG: Monitoring Therapy

- Routine DXA re-measurement not recommended (consensus based)
- No recommendation for or against use of bone turnover markers
- No recommendation on duration of Rx
Bisphosphonates: Molecular Structure

When $R_1$ is an OH group, binding to hydroxyapatite is enhanced.

The $R_2$ side chain determines potency.

The P-C-P group is essential for biological activity.

$R_2 = -\text{CH}_3 = \text{etidronate}$
$R_2 = -\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2 = \text{alendronate}$
$R_2 = -\text{CH}_2\text{CH}_2\text{NH}_2 = \text{pamidronate}$
$R_2 = -\text{CH}_2\text{-3-pyridine} = \text{risedronate}$

Alendronate Rx & Lumbar Spine BMD in Menopause

% change from baseline

Years of therapy

*P < 0.001 vs. 2.5 mg alendronate.
†P < 0.01 vs. placebo.
‡‡P < 0.001 vs. placebo.

Effect of Risedronate on BMD in PM Women With Low BMD

*P < 0.05 vs. placebo for all assessments (except femoral neck, 6 months).

Alendronate Rx Women
With Existing Vertebral Fx

Placebo (n = 1005)
Alendronate (n = 1022)

Femoral neck

Total hip

Posterior-anterior spine

% change from baseline

0 6 12 18 24 30 36

0 6 12 18 24 30 36

0 6 12 18 24 30 36

Months

P <0.001 compared with placebo at 36 months.
Fracture Intervention Trial (FIT)

2,027 women with low femoral neck BMD and one or more vertebral fracture

<table>
<thead>
<tr>
<th>Condition</th>
<th>Placebo</th>
<th>Alendronate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinically apparent</td>
<td>5.0</td>
<td>2.3**</td>
</tr>
<tr>
<td>vertebral fractures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip fractures</td>
<td>2.2</td>
<td>1.1*</td>
</tr>
<tr>
<td>Wrist fractures</td>
<td>4.1</td>
<td>2.2*</td>
</tr>
</tbody>
</table>

% reduction 55% 51% 48%

**P<0.001; *P<0.05

Alendronate Rx Fracture Risk in Women With Low BMD w/o Fx

Clinical fractures

Vertebral fractures

% patients with incident fractures at 4 yrs

< -2.5 -2.0 -1.6

Placebo
(n=2218)

Alendronate
(n=2214)

*RR=0.64, 95% CI=0.50-0.82.
†RR=0.50, 95% CI=0.3-0.82.

Effect of Risedronate on Fracture Risk in PMO

Vertebral fractures

  - Placebo: 49% ↓
  - Risedronate 5 mg: 41% ↓
  - *P* < 0.001

  - Placebo: 33% ↓
  - Risedronate 5 mg: 39% ↓
  - *P* = 0.003

Nonvertebral fractures

  - Placebo: 57% ↓
  - Risedronate 5 mg: 55% ↓
  - *P* = 0.02

  - Placebo: 56% ↓
  - Risedronate 5 mg: 54% ↓
  - *P* = 0.063

Effect of Raloxifene on Incident Vertebral Fractures


*RR=0.5, 95% CI=0.3-0.7. †RR=0.7, 95% CI=0.6-0.9.
*RR=0.6, 95% CI=0.4-0.9. ‡RR=0.5, 95% CI=0.4-0.6.

Drugs of Osteoporosis

KP member retail price / year

- Fosamax / alendronate 70 mg/wk $546 (F)
- Fosamax 10 mg/day $546 (F)
- Fosamax 40 mg/wk 10 mg tabs $450 (F)
- Fosamax 40 mg/wk $285 (F) availability
- Fosamax 35 mg/wk $776 (NF)
- Fosamax 70 mg suspension $442 (F)
- Fosamax 35 mg suspension $221 (NF)
- Actonel / risendronate 5 mg/day $872 (NF)
- Actonel 15 mg/wk 5 mg tabs $498 (NF)
- Actonel 35 mg/wk $740 (NF)
- Evista / raloxifene / PTH 60 mg/day $958 (F)
- Didronel / etidronate 400 mg/day x 10 day q 3 mo $1120 (F)
- Calcitonin / Miacalcin Calcimar Fortical 200 U/day $920 (F)
- Forteo 20 mcg/day $6500 (F)
- IV Aredia / pamidronate 30 mg to 90 mg q 3 months $1661 (F)
- HT 0.625mg + 2.5/day $40 (F)
- Boniva / ibandronate 150 mg/mo or 2.5 mg/day $720 (NF)
- IV Zometa / zoledronic acid 5mg/yr $ 2009 (NF)
### Documented Clinical Outcomes 2007

<table>
<thead>
<tr>
<th>Drug</th>
<th>Year</th>
<th>Prevention</th>
<th>Treatment</th>
<th>Vert FX</th>
<th>Non-Vert Fx</th>
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*men
Mean percent change in BMD at the lumbar spine for agents in OMG/ORAG meta-analyses

Hosking, D.J. et al. QJM 2005 98:403-413; doi:10.1093/qjmed/hci070
NOF Osteonecrosis Statement

If a patient receiving bisphosphonates has planned dental surgery that involves the bone, a drug holiday beginning shortly before the procedure and lasting until there is local healing could be considered, although there is as yet no clinical evidence that this will affect the incidence or severity of ONJ.

http://www.nof.org/patientinfo/osteonecrosis.htm 2007
Rationale for Risk Calculator

The graph illustrates the risk of hip fracture per 1000 women per year based on Hip T score and sBMD mg/cm². The risk increases with age and decreases with lower T scores and sBMD values. The graph shows different risk levels for T scores of -2, 0, and +2.
Rationale for Risk Calculator

Vertebral fractures in placebo patients from FIT, %/year

- BMD total hip
- mg/cm²

- Normal
- Osteopenia
- Osteoporosis

Baseline fracture: NO YES

55 years 65 75
The Near Future: WHO “Absolute Fx Risk Calculator”

- Age
- T-score (Neck / Prob. Spine)
- Previous Fragility Fx post 50
- Fam Hx Fx (m & f)
- Smoking
- RA
- Glucocorticoids
- ETOH > 2/day
Verweis

SCPMG CSG’s:
www.kp.org

National Osteoporosis Foundation:
www.nof.org

American Association of Clinical Endocrinologists
www.aace.org

International Society of Clinical Densitometry:
www.iscd.org

American Society of Bone and Mineral Research:
www.asbmr.org
Auf Wiedersehen
Alendronate Added to Ongoing HRT:

Effects on BMD

*P < 0.001 vs. placebo + HRT.