Osteoporosis and fractures
An orthopaedic perspective

Orthopaedic Surgeons Initiative
International Osteoporosis Foundation
International Society for Fracture Repair
The Bone and Joint Decade
Why is the Orthopaedic Surgeons Initiative needed?

• Fragility fractures are a large and growing health issue
  – 1 in 2 women and 1 in 4 men over 50 yrs of age will suffer a fracture in their remaining lifetime

• A prior fracture increases the risk of a new fracture 2- to 5-fold

• Yet few fracture patients receive evaluation and treatment of osteoporosis, the underlying cause of most fragility fractures
  – Calls for action to improve the evaluation and treatment of fracture patients have been published around the World\textsuperscript{1,2}

1. Eastell et al. QJM 2001; 94:575-59
Orthopaedic surgeons have a unique opportunity

- Fragility fracture is often the first indication a patient has osteoporosis
- Orthopaedic surgeons are often the first and may be the only physician seen by fracture patients
- The orthopaedist can serve a pivotal role in optimizing treatment, not only of the fracture, but also of the underlying disease

1. Eastell et al. QJM 2001; 94:575-59
Multinational Survey of Osteoporotic Fracture Management

Survey of 3422 orthopaedic surgeons from 6 countries

- 90% do not routinely measure bone density following the first fracture
- 75% are lacking appropriate knowledge about osteoporosis

Dreinhöfer et al. Osteoporos Int 2005; 16:S44-S54
Goals of the Orthopaedic Surgeons Initiative

• Improve awareness of the scope and magnitude of fragility fractures as a global public health concern

• Improve understanding of osteoporosis and recognition that it is the underlying cause of most fragility fractures

• Motivate orthopaedic surgeons to take an active role in optimizing care of the fragility fracture patient with the ultimate goal of preventing future fractures
Outline

• Fragility fractures and osteoporosis: an expanding epidemic with devastating consequences

• Osteoporosis and fragility fractures: definition and etiology

• Optimal care of fragility fracture patient
Outline

• Fragility fractures and osteoporosis: an expanding epidemic with devastating consequences
Osteoporosis and fragility fractures:

An expanding epidemic
Fragility fractures are common

- 1 in 2 women and 1 in 5 men over age 50 will suffer a fracture in their remaining life time\(^1\)
- 55% of persons over age 50 are at increased risk of fracture due to low bone mass
- At age 50, a woman’s lifetime risk of fracture exceeds combined risk of breast, ovarian & uterine cancer
- At age 50, a man’s lifetime risk of fracture exceeds risk of prostate cancer

Fractures will be more common

- Fracture incidence projected to increase 2- to 4-fold in the next decades due to ageing of the population

- In Europe
  - 12% to 17% of population >65 in 2002
  - 20% to 25% of population >65 in 2025
Number of hip fractures projected to increase 3 to 4-fold worldwide

Projected to reach 3.25 million in Asia by 2050

Total number of hip fractures worldwide projected to increase 3- to 4-fold in next 50 years

1950: 1.66 million
2050: 6.26 million

Estimated number of hip fractures (1000s)

Osteoporotic fractures: Comparison with other diseases

- Osteoporotic fractures:
  - 1500 000 annual incidence all ages
  - 250 000 hip
  - 250 000 forearm
  - 250 000 other sites
  - 750 000 vertebral

- Annual estimate:
  - women 29+: 513 000
  - women 30+: 228 000
  - 1996 new cases, all ages: 184 300

American Heart Association, 1996
American Cancer Society, 1996
Riggs & Melton, Bone, 1995; 17(5 suppl):505S-511S
Osteoporosis and fragility fractures:

Morbidity, mortality and costs
Consequences of hip fracture

One year after hip fracture

- 80% Unable to carry out at least one independent activity of daily living
- 40% Unable to walk independently
- Permanent disability: 30%
- Death within one year: 20%

Patients (%)

Consequences of vertebral fractures

• Acute and chronic pain
  – Narcotic use, decrease mobility

• Loss of height & deformity
  – Reduced pulmonary function
  – Kyphosis, protuberant abdomen

• Diminished quality of life:
  – Loss of self-esteem, distorted body image, sleep disorders, depression, loss of independence

• Increased fracture risk

• Increased mortality
Consequences of distal radius fractures

• The most common fracture in women at middle age
  – Incidence increases just after menopause

• The most common fracture in men below 70 years

• Only 50% report good functional outcome at 6 months

• Up to 30% of individuals suffer long-term complications
Mortality due to hip fracture vs. stroke (deaths per 100,000 in older women)

<table>
<thead>
<tr>
<th></th>
<th>Hip fracture</th>
<th>Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>177</td>
<td>154</td>
</tr>
<tr>
<td>Denmark</td>
<td>154</td>
<td>180</td>
</tr>
<tr>
<td>Germany</td>
<td>131</td>
<td>190</td>
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</tbody>
</table>

Hip fracture data: age 80; Kanis. J Bone Miner Res. 2002; 17:1237
Stroke data: ages 65-74; Sans et al. Eur Heart J 1997; 18:1231
Cumulative survival probability

Center et al. Lancet 1999, 353:878-882
Mortality after major types of osteoporotic fracture in men and women

5-year prospective cohort study

<table>
<thead>
<tr>
<th>Fracture</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal femur</td>
<td>2.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Vertebral</td>
<td>1.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Other major</td>
<td>1.9</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Center et al. Lancet 1999; 353:878-882
**Prior fracture increases the risk of subsequent fracture**

<table>
<thead>
<tr>
<th>Site of prior fracture</th>
<th>Hip</th>
<th>Spine</th>
<th>Forearm</th>
<th>Minor fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>2.3</td>
<td>2.5</td>
<td>1.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Spine</td>
<td>2.3</td>
<td>4.4</td>
<td>1.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Forearm</td>
<td>1.9</td>
<td>1.7</td>
<td>3.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Minor fracture</td>
<td>2.0</td>
<td>1.9</td>
<td>1.8</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*Prior fracture increases the risk of new fracture 2- to 5-fold*

Economic cost of osteoporosis and fragility fractures in Europe

- In Europe the total direct costs of osteoporotic fractures are over €31 billion and are expected to increase to more than €76 billion in 2050\(^1\)
- In France osteoporotic hip fractures are estimated to cost about €1 billion every year\(^2\)
- In Spain the total direct hospital cost of osteoporotic fractures in 1995 was ~ €222 million\(^2\)
- In England & Wales the total direct hospital cost of osteoporotic fractures in 1999 was ~ €847 million\(^2\)

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1. Kanis and Johnell, Osteoporos Int.2005; 16 Suppl 2:S3-7
Economic impact of osteoporosis

Annual economic cost of treating fractures in the USA is similar to that of treating cardiovascular disease and asthma.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevalence (millions)</th>
<th>Annual direct cost including hospitalization (US$ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>4.6</td>
<td>20.3</td>
</tr>
<tr>
<td><strong>Osteoporosis</strong></td>
<td><strong>10</strong></td>
<td><strong>13.8</strong></td>
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<tr>
<td>Asthma</td>
<td>15</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Information supplied by National Heart, Lung & Blood Institute, National Osteoporosis Foundation, American Heart Association
Fragility fractures are common and have severe consequences

Fragility fractures lead to major morbidity, decreased quality of life and increased mortality

- 10-25% excess mortality
- 50% unable to walk independently after hip fracture
- 50% show substantial decline from prior level of function (many lose ability to live independently)
- Increased depression, chronic pain, disability
- Increased risk of subsequent fracture
Outline

• Fragility fractures and osteoporosis: an expanding epidemic with devastating consequences

• Osteoporosis and fragility fractures: definition and etiology
Definition of osteoporosis

“...a systemic skeletal disease characterized by low bone mass and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk.”

World Health Organization (WHO), 1994
Major risk factors for fractures

- Prior fragility fracture
- Increased age
- Low bone mineral density
- Low body weight
- Family history of osteoporotic fracture
- Glucocorticoid use
- Smoking
Osteoporotic fracture incidence

Incidence per 100,000 person-years

Age

Women

Men

Vertebrae

Forearm

Hip
## Remaining lifetime fracture risk (%) in Caucasian population at the age of 50

<table>
<thead>
<tr>
<th>Type of fracture</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forearm</td>
<td>4.6</td>
<td>20.8</td>
</tr>
<tr>
<td>Hip</td>
<td>10.7</td>
<td>22.9</td>
</tr>
<tr>
<td>Spine</td>
<td>8.3</td>
<td>15.1</td>
</tr>
<tr>
<td>Proximal humerus</td>
<td>4.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Other</td>
<td>22.4</td>
<td>46.4</td>
</tr>
</tbody>
</table>
Fracture risk depends on age and BMD

10 year Hip Fracture Probability (%)

Women

Age (years)

Femoral BMD T-score (SD)

Fracture risk depends on age and BMD

10 year Hip Fracture Probability (%)
Assessing bone density

• X-ray observation
  – “Osteopaenic on x-ray” implies significant bone loss already – decreased opacity, thin cortices, wide canals, current fracture, healing fractures
  – A “late finding” in the course of the disease, but may be the “first finding” for a patient
Assessment of bone mineral density by DXA

Current gold standard for diagnosis of osteoporosis

\[ \text{BMD (g/cm}^2\text{)} = \frac{\text{Bone mineral content (g)}}{\text{area (cm}^2\text{)}} \]

Diagnosis based on comparing patient’s BMD to that of young, healthy individuals of same sex
Fracture risk increase per 1 SD decrease in BMD

<table>
<thead>
<tr>
<th>Fracture Site</th>
<th>Forearm</th>
<th>Hip</th>
<th>Vertebral</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal radius BMD</td>
<td>1.7</td>
<td>1.8</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Hip BMD</td>
<td>1.4</td>
<td>2.6</td>
<td>1.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Lumbar spine BMD</td>
<td>1.5</td>
<td>1.6</td>
<td>2.3</td>
<td>1.5</td>
</tr>
</tbody>
</table>

## WHO criteria for diagnosis of osteoporosis

T-score: Difference expressed as standard deviation compared to young (20’s) reference population

<table>
<thead>
<tr>
<th>T-score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>-1.0 and above</td>
</tr>
<tr>
<td>Osteopaenia</td>
<td>-1.0 to -2.5</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>-2.5 and below</td>
</tr>
<tr>
<td>Severe (established) osteoporosis</td>
<td>-2.5 and below, plus one or more osteoporotic fracture(s)</td>
</tr>
</tbody>
</table>

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Osteoporotic fracture and BMD

Fractures per 1,000 person-years

Number of fractures

Fracture rate
Women with fractures

Bone strength is more than BMD


Image courtesy of David Dempster
Determinants of whole bone strength

• Geometry
  – Gross morphology (size & shape)
  – Microarchitecture

• Properties of bone material / bone matrix
  – Mineralization
  – Collagen characteristics
  – Microdamage
Bone remodelling balance influences bone strength

- SIZE & SHAPE
  - macroarchitecture
  - microarchitecture

- MATERIAL
  - tissue composition
  - matrix properties

- BONE REMODELLING
  - formation / resorption

- AGEING, DISEASE and THERAPIES

High Bone Turnover
Resorption > Formation

Decreases Bone Mass
Disrupts Trabecular Architecture
Increases Cortical Porosity
Decreases Cortical Thickness
Alters Bone Matrix Composition

Decreased Bone Strength


L. Mosekilde
Tech and Health Care, 1998
But bone quality is not the only factor…

Neuromuscular function
Environmental risks
Age

Fall incidence

Fall characteristics
Energy absorption
External protection

Bone size (mass)
Bone shape
Architecture
Matrix properties

Fall impact

Bone strength

Fracture risk
Outline

• Fragility fractures and osteoporosis: an expanding epidemic with devastating consequences

• Osteoporosis and fragility fractures: definition and etiology

• Optimal care of fragility fracture patient
  – Critical opportunity for orthopaedists
Millions of fragility fractures a year – with current orthopaedic management, most fractures will heal…

But is that enough?
Alarming facts

• Awareness and knowledge about osteoporosis is low among fracture patients
43 patients with fragility fractures

“Have you ever heard of osteoporosis?”

NO: 20 % YES: 80 %

“Do you think that the fracture you have experienced could be due to fragility of your bones?“

NO: 73 % YES: 27 %

An Osteoporosis Clinical Pathway for the Medical Management of Patients with Low Trauma Fracture

Chevalley et al. Osteoporos Int. 2002; 13:450-455
Alarming facts

• Awareness and knowledge about osteoporosis is low among fracture patients

• Despite availability of therapies proven to reduce fracture risk, even in patients who have already suffered a fracture, diagnosis and treatment of osteoporosis among fragility fracture patients remains low
Treatment of osteoporosis: Are physicians missing an opportunity?

• Among 1162 women with distal radius fracture, at 6 mo
  – 266 (23%) prescribed osteoporosis med
  – 33 (2.8%) had bone density test
  – 20 (1.7%) had bone density + OP therapy
  883 (76%) received neither bone density test nor medical treatment of osteoporosis

• Among 1654 patients (age > 50 yrs) admitted to hospital for a fracture resulting from a fall: ~ 50% hip fracture, at 1 yr
  – 247 (15%) prescribed osteoporosis med
  – Women: 3 times more likely to receive treatment than men (19% vs 5%)

Panneman et al. Osteoporos Int. 2004; 15:120-4
Fracture

More to the story…
Optimal care of the fragility fracture patient

• Diagnosis of “fragility” fracture
  – Identify “fragility” fracture & underlying disease, incorporate into existing workup
  – Influences treatment plan from the onset

• General fracture management
  – Stabilize patient, pain relief, fracture care

• Rehabilitation
  – Minimize dependence, maximize mobility

• Secondary prevention
  – Treat and monitor underlying disease, prevent future fractures
Optimal care of the fragility fracture patient

• Diagnosis of “fragility” fracture
  – Identify “fragility” fracture & underlying disease, incorporate into existing workup
  – *Influences treatment plan from the onset*
Definition of fragility fracture:

Fracture during activity that would not normally injure young healthy bone (i.e., fall from standing height or less)
Fragility fracture?

Accident pattern

Risk assessment

Mechanism of injury:
Low trauma?
Fall from standing height or less?
“Fragility” fracture?

Risk factors for primary and secondary OP
Risk factors for fracture
Risk factors for fall
Major risk factors for fractures

- Prior fragility fracture
- Increased age
- Low bone mineral density
- Low body weight
- Family history of osteoporotic fracture
- Glucocorticoid use
- Smoking
High risk for secondary osteoporosis

- Severe chronic liver or kidney diseases
- Steroid medication (>7.5mg for more than 6 months)
- Malabsorption (eg. Crohn’s disease)
- Rheumatoid arthritis
- Systemic inflammatory disorders
- Hyperthyroidism
- Primary hyperparathyroidism
- Antiepileptic medication
Fragility fracture patient assessment

* In addition to routine pre-op or fracture evaluation

History should include:

- Family history of OP
- Menarche / Menopause
- Nutrition
- Medications
  - (past and present)
- Level of activity
- Fracture history
- Fall history & risk factors for falls
- Smoking, alcohol intake
- Risk factors for secondary OP
- Prior level of function
**Fragility fracture patient assessment**

*In addition to routine pre-op or fracture evaluation*

Physical exam should include:

- Height
- Weight
- Limb exam
  - ROM, strength, deformity, pain, neurovascular status
- Spine exam
  - pain, deformity, mobility
- Functional status
Laboratory tests*

- SR / CRP
- Blood count
- Calcium
- Phosphate
- Alkaline Phosphatase (AP)
- GGT
- Renal function studies
- Basal TSH
- Intact PTH
- Protein-immunoelectrophoresis
- Vit D (25 and 1.25)

**NOTES:**
- * These are in addition to routine pre-op labs such as coagulation studies
- These are screening labs, more may be indicated based on these results
Bone mineral density and spine radiograph for vertebral fracture assessment

- Bone mineral density assessment by DXA
  - Establish severity of osteoporosis
  - Baseline for monitoring treatment efficacy

- Consider spine radiographs (thoracic and lumbar, AP and ML views) for patients with:
  - Back pain
  - Loss of height > 4 cm
  - Progressive kyphosis
Optimal care of the fragility fracture patient

• **Diagnosis of “fragility” fracture**
  – Identify “fragility” fracture & underlying disease, incorporate into existing workup
  – Influences treatment plan from the onset

• **General fracture management**
  – Stabilize patient, pain relief, fracture care
Complexity of elderly patients

• Mean age hip fracture = 80 yrs

• Comorbidities (median ASA 3)
  – Murmurs
  – Renal - dialysis
  – COPD - home O2
  – Diabetes
  – Delirium / dementia
  – Pseudo-obstruction
  – Alcohol abuse

• Impaired metabolic response to injury
  – Hyponatraemia

• Management problems
  – Consent
  – Theatre scheduling
  – Discharge planning

• Polypharmacy
  – Warfarin
  – Plavix
  – Neurotropics
Technical challenges of fracture fixation in osteoporotic bone

- Impaired ability of osteoporotic bone to hold screws or support implants
- Crushing of cancellous bone with subsequent voids after fracture reduction

These factors can lead to a higher risk of failure at the implant-bone interface before healing achieved
Special considerations in fixation of fragility fractures

- **Arthroplasty / Hemiarthroplasty**
  - Also allows early mobilization, may be less painful
- **Implants designed for osteoporotic bone**
  - Fixed angle locking plates
  - Hydroxyapatite-coated screws
- **Use of IM nail instead of onlay devices (plates and screws) for diaphyseal fractures**
- **Void filling with cement or bone graft**
Possible indications for arthroplasty

Hip  Shoulder  Knee  Elbow

Images courtesy of John Keating
**Hip hemiarthroplasty**

Established and widely preferred to ORIF in displaced subcapital fractures

But current controversy

Total arthroplasty use is increasing

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**Shoulder arthroplasty**

- Useful particularly for 3-part and 4-part fractures and fracture dislocations
- Early treatment best
- Good pain relief, but poor movement and function
- Soft tissues influence outcome

Example of fixed angle locking plates

- Screw head threaded – engages with hole in plate
- Single mechanical unit – internal fixator
- No compressive force on periosteum

Female 82 yrs

Plecko and Kraus, Oper Orthop Traumatol.2005; 17:25-50
Fixation augmentation with hydroxyapatite-coated screws

- OsteoTite HA-coated external fixation pin
- HA-coated AO/ASIF lag screw
- HA-coated AO/ASIF cortical bone screw
- HA-coated AO/ASIF cancellous bone screw

HA-coated dynamic hip screw improved outcomes in osteoporotic patients with hip fracture

DHS fixed with standard vs HA-coated AO/ASIF screws in osteoporotic patients with trochanteric fractures

1. HA-coated screws maintained better neck shaft angle at 6 mo
2. Patients with HA-coated device had better Harris hip scores and far less cut out of lag screw

Optimal care of the fragility fracture patient

• Diagnosis of “fragility” fracture
  – Identify “fragility” fracture & underlying disease, incorporate into existing workup
  – Influences treatment plan from the onset

• General fracture management
  – Stabilize patient, pain relief, fracture care

• Rehabilitation
  – Minimize dependence, maximize mobility
Rehabilitation in the fragility fracture patient

Goal is to improve strength, balance, position sense, reactions to:
- Improve level of function / independence
- Decrease risk of falls
- Decrease risk of fractures

Balance (position sense, reaction)
Mechanical vibration plate
Limb and core strength
Mobility in activities of daily living
Safety in gait and transfers
Sensory and visual limitations
Home safety evaluation and adaptation
Rehabilitation of fragility fracture patient

*Fall prevention*

Guideline for the prevention of falls in older persons

Interventions for preventing falls in elderly people (Review)

A multidisciplinary, multifactorial intervention program reduces postoperative falls and injuries after femoral neck fracture
Optimal care of the fragility fracture patient

• Diagnosis of “fragility” fracture
  – Identify “fragility” fracture & underlying disease, incorporate into existing workup
  – Influences treatment plan from the onset

• General fracture management
  – Stabilize patient, pain relief, fracture care

• Rehabilitation
  – Minimize dependence, maximize mobility

• Secondary prevention
  – Treat and monitor underlying disease, prevent future fractures
  – Ideally begins during acute and sub-acute fracture care
Secondary prevention basics

• Further evaluation of underlying disease
  – Bone mineral density
  – Rule out secondary causes of osteoporosis
  – Initiate osteoporosis therapy, as indicated
  – Fall prevention

• Inform patient and primary MD doctor of probable fragility fracture and osteoporosis

• Ensure patient has follow-up care with PT and physician treating osteoporosis (if not orthopaedist)
Interventions to reduce future fracture risk

• Basics
  – Nutrition, exercise, fall prevention strategies
  – Modify risk factors as able (smoking, excess alcohol)
  – Treat co-morbidities (i.e., endocrine disorder?)

• Pharmacological agents
Interventions: General recommendations

• Regular physical activity
  – Maintaining safe ambulatory status, indep ADLs
  – Daily limb and core home exercise routine

• Sufficient intake of calcium and vitamin D
  – daily 1000-1500 mg calcium, 400-800 IU vitamin D
  – by foods or foods and supplements combined

• Adequate nutrition

• Avoid cigarettes, excess alcohol
Pharmacological agents for treatment of osteoporosis

Effective therapies are widely available and can reduce vertebral, hip and other fractures by 30% to 65%,

*even in patients who have already suffered a fracture*
Pharmacological agents shown to reduce fracture risk

Bisphosphonates
• Alendronate (FOSAMAX®)
• Risedronate (ACTONEL®)
• Ibandronate (BONVIVA®)
• Zolendronate (ACLASTA®)

Hormone therapy
• Estrogen / progestin

SERMs
• Raloxifene (EVISTA®)

Stimulators of bone formation
• rh-PTH (FORTEO®)

Mixed mode of action
• Strontium ranelate (PROTELOS®)
<table>
<thead>
<tr>
<th>Drug</th>
<th>Effect on vertebral fracture risk</th>
<th>Effect on non-vertebral fracture risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Osteoporosis</td>
<td>With prior fractures</td>
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<tr>
<td>Alendronate</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Risedronate</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Ibandronate</td>
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<td>+</td>
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<tr>
<td>HRT</td>
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<td>+</td>
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<tr>
<td>Raloxifene</td>
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<tr>
<td>Teriparatide and PTH</td>
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<td>+</td>
</tr>
<tr>
<td>Strontium ranelate</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

NA, No evidence available; +, effective drug; awomen with a prior vertebral fracture

Adapted from Boonen S. et al. 2005; Osteoporos Int; 16:239-54
Orthopaedist’s role in improving fragility fracture care

Opportunity or obligation?

Either way, it is:

• important
• not Difficult
• rewarding
• becoming standard of care
The orthopaedist’s responsibilities in fragility fracture care

- Identify the orthopaedic patient with a possible fragility fracture
- Inform the patient about the need for an osteoporosis evaluation
- Investigate whether osteoporosis is an underlying cause of the fracture
- Ensure that appropriate intervention is initiated
- Educate the patient and the family
- Coordinate care with other treating physicians

Summary and conclusions

• Fractures are common. Fractures will be more common

• Osteoporotic fractures are associated with increased morbidity & mortality

• A fracture is among the strongest risk factors for future fracture. Refracture rate is high

• Majority of patients with fragility fractures are not evaluated or treated for osteoporosis

• Effective treatments are available

• Orthopaedic surgeons are usually the treating physician and can take an active role in optimizing care of the fragility fracture patient
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- International Osteoporosis Foundation
- International Society for Fracture Repair
- The Bone and Joint Decade

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Acknowledgements

In Memoriam

Olof Johnell, MD (1943 - 2006)

Who started this project, and continues to inspire us.

Francis R. Bouxsein (1920 - 2006)

Who died 5 months after suffering a hip fracture, reminding us why we need to improve care of fragility fracture patients.
Online resources

- www.iofbonehealth.org
- www.fractures.com
- www.boneandjointdecade.org
- www.aaos.org/osteoporosis/
- www.niams.nih.gov/bone
- www.nof.org