Burden of Disease

• Most common bone disease
  • 9.9 million Americans +
  • 43.1 million Americans have low bone mineral density (BMD)
• Stealthy onset – a hidden disease
• Very serious outcomes in terms of morbidity and mortality

HEDIS 2016

- **Excludes:**
  - Fractures of the fingers, toes, face, and skull
  - If BMD tested during the preceding 24 months
  - Osteoporosis therapy preceding 12 months
  - Osteoporosis medication preceding 12 months

<table>
<thead>
<tr>
<th>HEDIS 2016: Osteoporosis Therapies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bisphosphonates</strong></td>
</tr>
<tr>
<td>Alendronate</td>
</tr>
<tr>
<td>Alendronate-cholecalciferol</td>
</tr>
<tr>
<td>Ibandronate</td>
</tr>
<tr>
<td>Risedronate</td>
</tr>
<tr>
<td>Zoledronic acid</td>
</tr>
<tr>
<td><strong>Other Agents</strong></td>
</tr>
<tr>
<td>Calcitonin</td>
</tr>
<tr>
<td>Denosumab</td>
</tr>
<tr>
<td>Raloxifene</td>
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<tr>
<td>Teriparatide</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>HMO</th>
<th>PPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>64.4</td>
<td>71.3</td>
</tr>
<tr>
<td>2009</td>
<td>68</td>
<td>72.8</td>
</tr>
<tr>
<td>2012</td>
<td>72.1</td>
<td>75.4</td>
</tr>
<tr>
<td>2016</td>
<td>73.8</td>
<td>79.3</td>
</tr>
</tbody>
</table>

# HEDIS

## Drug Prescribed

<table>
<thead>
<tr>
<th>Year</th>
<th>HMO</th>
<th>PPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>20.4</td>
<td>17.8</td>
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<tr>
<td>2010</td>
<td>20.7</td>
<td>18.5</td>
</tr>
<tr>
<td>2013</td>
<td>29.2</td>
<td>22.4</td>
</tr>
<tr>
<td>2017</td>
<td>46.7</td>
<td>39.1</td>
</tr>
</tbody>
</table>

Diagnosis

• Fragile fracture is one that shouldn’t occur
• If no fragility fracture use BMD score
  • BMD T-score ≤ -2.5 → osteoporosis
  • BMD T-score -2.5 to -1 → osteopenia
• Exclude hyperparathyroidism and osteomalacia

FRAX

• Uses clinical risk factors & femoral neck BMD
• Predicts 10 year risk
  • Lower sensitivity for 50 to 54 years
  • Poor predictor for men
• Postmenopausal women 50 to 64 years
• Readily available online
  https://riskcalculator.fore.org/

Risk Factors

• Stereotypical: 65 y.o. underweight Caucasian woman, who smokes 1 ppd, drinks 3 glasses of white wine a day with a history of falling at home which has lead to her adopting a very sedentary lifestyle.

• Medications: PPI, anticoagulants, barbiturates and chemotherapy

• Hypogonadal states

• Rheumatologic and autoimmune diseases

Risk factors for falls

- History of falling
- Muscle weakness and gate disturbance
- Medications – sedatives, opiates, anti-hypertensives
- Balance impairment – stroke, joint problems
- Visual deficits

Non-Pharmacological Interventions and Universal Recommendations

• 1200 mg calcium/day
• 800 -1000 International units vitamin D/day
• Weight bearing exercise – strongly recommended
• Fall prevention
• Smoking cessation
• Stop or reduce alcohol drinking

Screening

• Complete baseline evaluation and risk assessment before starting a medication
• DXA BMD testing should be done in women 65 years of age
• Yearly height recorded
• Serum 25(OH)D level ~ 30 ng/ml (75 nmol/L)
• Rule out secondary causes

When to treat

Postmenopausal women and men > 50 years old

- Hip or vertebral fracture
- T-score ≤ -2.5 at femoral neck, total hip or lumbar spine
- T-score -2.5 - -1.0 at femoral neck or lumbar spine with a ≥ 3% 10 year probability of hip fracture or a ≥ 20% 10 year probability of a major osteoporotic fracture

ACP & NOF

- Bisphosphonates and denosumab first line to prevent fractures
- Hormone therapy and raloxifene not generally recommended
- Bisphosphonates for 3 to 5 years and reassess
- Severe osteoporosis may start with anabolic therapy

Bisphosphonates

• First line treatment for 3 to 5 years
  • Osteonecrosis of jaw and atypical femur fractures increase after 5 years
• Re-assess after 3 to 5 years
  • BMD
  • Height measurement → vertebral imaging
  • Clinical history
• Risk moderate now then discontinue bisphosphonates
• Risk high then continue bisphosphonates
  • Alternate treatment considered now too

Bisphosphonates

• Bisphosphonates work by binding locally at the bone, where they inhibit osteoclast activity
• Agents of this class have an extended terminal half life
• They have FDA approvals for osteoporosis and prophylaxis
Bisphosphonates

• Use of oral bisphosphonates is contraindicated with GI complications
• Contraindicated in patients who cannot adhere to administration protocol
• Contraindicated with uncorrected hypocalcemia
• Use is contraindicated with a creatinine clearance ≤ 30-35 mL/min
• Ibandronate can be given IM
• Zoledronic acid is given IV

<table>
<thead>
<tr>
<th>Bisphosphonates</th>
<th>Good Rx Fair Price</th>
</tr>
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<tbody>
<tr>
<td>Fosamax (alendronate)</td>
<td>$10</td>
</tr>
<tr>
<td>Boniva (ibandronate)</td>
<td>$37</td>
</tr>
<tr>
<td>Actonel (risedronate)</td>
<td>$64</td>
</tr>
<tr>
<td>Atelvia (risedronate dr)</td>
<td>$74</td>
</tr>
<tr>
<td>Etidronate</td>
<td>$371</td>
</tr>
<tr>
<td>Binosto (aldronate)</td>
<td>$210</td>
</tr>
<tr>
<td>Reclast (zoledronic acid)</td>
<td>$1,082</td>
</tr>
</tbody>
</table>

Goodrx. [https://www.goodrx.com/](https://www.goodrx.com/).
Denosumab (Prolia ®)

- Binds to RANKL, which leads to the inhibition of formation, function and survival of osteoclasts
- Given subcutaneously every 6 months
- Contraindicated in uncorrected hypocalcemia or pregnancy
- Good Rx price $1,180 1 syringe

Human Parathyroid Hormone Analogues

• Parathyroid hormone is the primary regulator of calcium and phosphorus in the bones and kidneys
• Agents in this class have a black box warning for osteosarcoma
• Use is cautioned in individuals with current or recent urolithiasis
<table>
<thead>
<tr>
<th>Parathyroid Hormones</th>
<th>Good Rx Fair Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forteo (teriparatide)</td>
<td>$3,268</td>
</tr>
<tr>
<td>Tymlos (abaloparatide)</td>
<td>$1,829</td>
</tr>
</tbody>
</table>
Raloxifene (Evista®)

- Raloxifene is a selective estrogen receptor modulator that decreases bone reabsorption and increases bone mineral density
- Reduces vertebral fractures
- Use is contraindicated with venous thromboembolism and pregnancy
- Use is cautioned with renal or hepatic impairment
- Not typically a preferred use medication

Calcitonin (Miacalcin®, Fortical®)

- Functions as calcitonin
  - Reduces osteoclast activity in bone
- Calcitonin reduces vertebral fracture risk
- May increase risk of malignancy
- Not frequently used
- Not FDA approved for osteoporosis

Conclusions

• Osteoporosis is under diagnosed and under treated
• Many medications exist with no clear “best” drug
• Predicting treatment need is imperfect
• Everyone at risk should be urged to understand and adopt non pharmacological approaches
• More research needed
  • Head to head
  • Longer than 5 years


