Osteoporosis

Disclaimer

See also:

- Inflammatory Arthritis
- Rheumatoid Arthritis

Contents

Disclaimer ................................................................................................................................. 1
Red Flags............................................................................................................................ 2
Background – About Osteoporosis ..................................................................................... 2
Assessment .......................................................................................................................... 2
Management ......................................................................................................................... 7
Referral ................................................................................................................................. 11
Information ......................................................................................................................... 12
For health professionals...................................................................................................... 12
For patients.......................................................................................................................... 12
References ............................................................................................................................ 12
Disclaimer ............................................................................................................................. 13
Red Flags

- Glucocorticoid use > 3 months
- Androgen deprivation therapy
- Aromatase inhibitor therapy

Background – About Osteoporosis

- Osteoporosis is a progressive disease characterised by increased bone fragility and increased fracture risk.
- It is asymptomatic until a fracture occurs.
- Bone mineral density (BMD) is correlated with bone strength.
- Each standard deviation decline in BMD doubles fracture risk.
- Consider the major consequences after an osteoporotic fracture. After a hip fracture:
  - there is a 25% death rate at 1 year.
  - 20% of those admitted from their own home are discharged to institutional care.
  - 2.5 times increased risk of future fractures can occur.
  - 40% will require assistance walking.

- Osteoporosis is common but underdiagnosed. In Australia 66% of Australians aged > 50 years have osteoporosis, osteopenia or poor bone health.
- Half of all women will have an osteoporotic fracture in their lifetime.
- 30% of fractures occur in men, who have a higher mortality than women, and are more likely to have a cause e.g., excessive alcohol, corticosteroids, smoking, hypogonadism.

Assessment

1. Identify patients:
   - who may have osteoporosis.

Patients who may have osteoporosis

Indications a patient may have osteoporosis:

- Minimal trauma (fragility) fractures
- Vertebral fracture on plain X-ray
- Glucocorticoid use > 7.5 mg per day for > 3 months
- Early menopause or oophorectomy
- Prolonged periods of amenorrhea:
  - in elite athletes
  - associated with eating disorders
- Male hypogonadism or androgen deprivation therapy for prostate cancer
• Medical illnesses e.g., hyperthyroidism, hyperparathyroidism, coeliac disease, Cushing disease
• Positive family history of osteoporosis or minimal trauma (fragility) fracture

➢ with any known **minimal trauma (fragility) fractures**. Take a history of all fractures including mechanism and site.

**Minimal trauma (fragility) fractures**
• Fractures resulting from trauma that would not normally cause a fracture in a healthy adult e.g., a fall from standing height or less.
• Osteoporotic minimal trauma fractures occur most commonly in the wrist, hip, and spine.
• Spinal fragility fractures require a loss of vertebral height of $\geq 20\%$ in thoracic or lumbar spine. Identification requires plain X-rays of spine.

➢ with undetected vertebral fractures by screening in both males and females. Check and record the patient’s height. If a height loss, particularly $> 2.5$ cm, suspect **minimal trauma (fragility) fractures** of the vertebrae and arrange a spine X-ray.

2. Identify patients at risk:

➢ Assess for **major risk factors**.

**Major risk factors**
• Aged $> 70$ years
• Aged $> 60$ years in men and $50$ years in women, with any of the following:
  o Prior fracture
  o Parental history of hip fracture
  o Low BMI
  o Smoking
  o High alcohol intake
  o Recurrent falls
  o Diet lacking in calcium and/or vitamin D

• **Medical conditions**

**Medical conditions**
 o Endocrine (hypogonadism, Cushings, hyperthyroidism, hyperparathyroidism)
 o Amenorrhoea $> 6$ months in women aged $< 40$ years, **not** associated with hormonal therapy/contraception. Consider:
   ▪ exercise induced amenorrhoea in athletes.
   ▪ dietary related amenorrhoea in patients with anorexia or malnutrition.

 o Chronic inflammatory disease
 o Malabsorption syndromes
 o Transplant recipients
 o Chronic liver, kidney disease, COPD
 o Multiple myeloma
 o Monoclonal gammopathy of uncertain significance
 o Vitamin D deficiency
 o Pernicious anaemia
• **Medications**

  o Glucocorticoids > 7.5 mg per day for more than 3 months
  o Anticonvulsants
  o Chemotherapy drugs
  o Depo-medroxyprogesterone (although it is associated with a reduction in bone density, this effect normally reverses a year after stopping the drug. In younger women, without other major risk factors for osteoporosis, monitoring of bone density is not recommended)
  o Suppressive doses of thyroxine
  o Selective serotonin reuptake inhibitors (SSRIs), lithium
  o Methotrexate
  o Aromatase inhibitors e.g., letrozole
  o Anti-androgen therapy

  ➢ Consider **DXA scanning**:
  • Arrange a Medicare rebatable DXA for eligible patients.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Criteria for bone density using dual energy X-ray absorptiometry (DXA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12306</td>
<td>Bone densitometry for:</td>
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<tr>
<td></td>
<td>• confirmation of a presumptive diagnosis of low bone mineral density made on the basis of one or more fractures occurring after minimal trauma, or</td>
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<tr>
<td></td>
<td>• monitoring of low bone mineral density proven by bone densitometry at least 12 months previously.</td>
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<tr>
<td>12312</td>
<td>Bone densitometry, with one or more of the following:</td>
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<td></td>
<td>• Prolonged glucocorticoid therapy</td>
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<tr>
<td></td>
<td>• Any condition associated with excess glucocorticoid secretion</td>
</tr>
<tr>
<td></td>
<td>• Male hypogonadism</td>
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<td></td>
<td>• Female hypogonadism lasting more than 6 months before the age of 45 years</td>
</tr>
<tr>
<td>12315</td>
<td>Bone densitometry, with one or more of the following conditions:</td>
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<tr>
<td></td>
<td>• Primary hyperparathyroidism</td>
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<td></td>
<td>• Chronic liver disease</td>
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<td></td>
<td>• Chronic renal disease</td>
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<td></td>
<td>• Any proven malabsorptive disorder</td>
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<td></td>
<td>• Rheumatoid arthritis</td>
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<tr>
<td></td>
<td>• Any conditions associated with thyroxine excess</td>
</tr>
<tr>
<td>12320</td>
<td>Bone densitometry if:</td>
</tr>
<tr>
<td></td>
<td>• the patient is aged ≥ 70 years, and</td>
</tr>
</tbody>
</table>
Either:
- the patient has not previously had bone densitometry, or
- the T-score for the patient’s bone mineral density is $\geq -1.5$.

12321
1 service only in a 12 month period

Bone densitometry following significant change in therapy for:
- established low bone mineral density, or
- confirming a presumptive diagnosis of low bone mineral density made on the basis of one or more fractures occurring after minimal trauma.

12322
1 service only in a 24 month period

Bone densitometry if:
- the patient is aged $\geq 70$ years, and
- the T-score for the patient’s bone mineral density is $< -1.5$ but $> -2.5$.

➢ Consider a private DXA for other at-risk patients.

Other at-risk patients

Patients with one or more risk factors that are not recognised as PBS-eligible for scanning:
- Smoking
- Heavy alcohol use
- Non-steroid medications
- Low body weight
- Immobility
- Vitamin D insufficiency

➢ Interpret the DXA results.

Interpreting DXA results

DXA is the preferred method of measuring bone mineral density (BMD).

Results are reported as:
- T-score – the number of standard deviations from bone density in healthy young adults – predicts fracture risk
- Z-score – number of standard deviations from an age- and sex-matched control group

- If Z-score $< -2$, suspect underlying causes of low BMD.
- WHO criteria:

<table>
<thead>
<tr>
<th>Result</th>
<th>T-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>$&gt; -1$</td>
</tr>
<tr>
<td>Osteopaenia or low bone mass</td>
<td>$-1$ to $-2.5$</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>$&lt; -2.5$</td>
</tr>
</tbody>
</table>

Limitations:
o DXA scan is not a perfect test, as there may be false positive and false negative results.

o The majority of minimal trauma (fragility) fractures occur in individuals with a bone mineral density in the osteopaenic range. These patients have established osteoporosis regardless of T-score.

o Degenerative spinal disease may falsely elevate spine BMD.

- See also Osteoporosis Australia:
  o Bone Density Testing in General Practice
  o Osteoporosis Risk Assessment, Diagnosis and Management

➢ Consider when to repeat DXA:
  - Repeat DXA when bone mineral density (BMD) is likely to approach T = −2.5.
  - Average decline in T-score is 0.1 per year.
  - Rescan on the same machine to reduce measurement errors.

➢ Use a fracture risk calculator e.g., FRAX Fracture Risk Assessment Tool or the Garvin Fracture Risk Calculator for patients with osteopaenia and no fragility fractures to assess fracture risk.

Fracture risk calculator
  - FRAX is locally recommended.
  - Estimates the 10-year probability of a major osteoporotic fracture and hip fracture.
  - Only useful in untreated patients.
  - Incorporates a number of important risk factors for fracture, but does not include the severity of these.
  - FRAX will underestimate the risk in certain circumstances e.g., patients receiving high-dose steroids for a prolonged period, those at risk of falls, a previous history of falls, and patients with a number of previous fractures. Use clinical judgement in these situations.

3. Make a diagnosis of osteoporosis if:
  - There is a documented history of minimal trauma (fragility) fractures, or
  - T-score is below −2.5.

4. Consider secondary causes of osteoporosis, especially if bone mineral density (BMD) for age is low (i.e., Z < −2).

Secondary causes
  - Malabsorption e.g., coeliac disease
  - Inflammatory arthritis e.g., rheumatoid arthritis
  - Amenorrhoea > 6 months, aged < 40 years
  - Eating disorders
  - Male hypogonadism
  - Chronic liver disease
  - Chronic renal disease
  - Hyperthyroidism
  - Hypercalcaemia
  - Medications e.g., steroids, anticonvulsants, prolonged Depo Provera, prolonged proton-pump inhibitors (PPIs).
• Cushing syndrome
• Metabolic bone disease other than osteoporosis (e.g., Paget’s disease, fibrous dysplasia, osteogenesis imperfecta, osteomalacia) – may be suggested by radiological or clinical findings.

5. Investigate diagnosed osteoporosis:

**Baseline investigations**
- Blood tests are often normal but may help identify secondary causes.
- Check Vitamin D, calcium, phosphate, albumin, alkaline phosphatase (ALP), electrolytes, creatinine. FBE, ESR, or CRP.

➢ Extra **blood tests** as appropriate to exclude **secondary causes**

**Blood tests**
- Parathyroid hormone (PTH)
- Testosterone and SHBG (in males)
- LH, FSH
- Coeliac antibodies
- Thyroid Function Tests (TFT)
- Serum protein electrophoresis (SPE)
- Fasting urine calcium-to-creatinine ratio

6. While **osteonecrosis of the jaw (ONJ)** is rare, recommend a **routine dental assessment** before bisphosphonate therapy commences.

**Osteonecrosis of the jaw (ONJ)**
Whereas dental procedures can be performed on patients who are already taking anti-resorptives, it is best that patients undertake major dental works like extractions and implants before commencing this drug class.

Note that patients at a higher risk of osteonecrosis of the jaw are those using bisphosphonates for treating malignancies. See the **Antiresorptive Agents and Dentistry** pathway for further information.

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**Management**

1. **Arrange urgent or routine endocrinology referral** if unsure of diagnosis, or if the patient:
   - has osteoporosis and is aged < 50 years for women, or aged < 60 years for men.
   - is intolerant to treatment.
   - has contraindications to treatment.
   - is unresponsive to treatment.
   - has osteoporosis associated with chronic kidney disease or post-transplant.
   - may require second line therapy with teriparatide.
   - has **secondary causes**
   - has fragility fractures with bone densitometry of T ≥ –1.5.

2. **Refer for urgent or routine endocrinology referral or urgent or routine rheumatology referral** for osteoporosis associated with:
   - inflammatory disorders.
3. Provide advice for primary prevention and treatment:

➢ Ensure adequate calcium intake.
➢ Prescribe vitamin D – aim for > 50 nmol/L in low risk populations and > 75 nmol/L in high risk populations.
  • Note that supplementing vitamin D above normal recommended intake may not benefit well people in the community.
  • If elderly and institutionalised, supplement vitamin D to normal levels (30% reduction in fractures) and supplement calcium.

➢ Maintaining a healthy weight

➢ Exercise

Exercise
• Specific exercise may be useful for patients with osteoporosis. See National Osteoporosis Foundation – Osteoporosis Exercise for Strong Bones.
• Consider referral to physiotherapist, exercise physiologist, or lifestyle programs for preventive exercises and activity.
• Consider a Chronic Disease Care Plan and referral under EPC guidelines.

➢ Smoking cessation

➢ Alcohol consumption

Alcohol consumption
There is conflicting evidence about this. However, > 3 standard drinks per day is considered detrimental to bone health.

➢ Consider falls prevention strategies.

Falls prevention strategies
• Avoid sedatives and medications associated with postural hypotension
• Environmental modification to remove tripping hazards
• Improve lighting
• Use of gait aids
• Correction of refractive errors
• Treatment of cataract
• Consider more detailed falls risk assessment

4. Commence pharmacological therapy for patients with:

Pharmacological therapy
Bisphosphonates:
• Oral, weekly: alendronate, risedronate
• IV, yearly: zoledronic acid
• Side-effects: gastrointestinal upset (common), osteonecrosis of jaw (0.01 to 0.001%), atypical fractures (78 in 100,000 patient years)
• Provide instructions on how to take oral bisphosphonates.
**Oral bisphosphonates**
- To reduce oral bisphosphate side-effects:
  - Take first thing in the morning with a glass of water on an empty stomach.
  - Remain upright for 30 minutes after taking tablet, and before taking other medications.
- Consider giving information sheet.
  - Contraindications: eGFR < 35 mL/min
  - Zoledronic acid requires normal renal function and vitamin D

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**Monoclonal antibodies:**
- Subcutaneous injection, 6 monthly: denosumab
- Side-effects: osteonecrosis of jaw and atypical fractures (rare)
- Safe in renal impairment

**Selective oestrogenic receptor modulator:**
- Oral, daily: raloxifene
- Increases venous thromboembolism risk
- Second-line agent
- Poor non-vertebral fracture reduction

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**Menopause hormone therapy** – should not be prescribed if its only function is the management of osteoporosis.

**Synthetic parathyroid hormone:**
- Specialist only use: teriparatide
- For further fractures despite antiresorptive therapy
  - a proven hip or vertebral fragility fracture, regardless of the bone mineral density.
  - any other minimal trauma (fragility) fracture with a bone mineral density T ≤ –1.5.
  - women and men aged > 70 years with a bone mineral density T ≤ –2.5.
  - glucocorticoid therapy for > 3 months with a bone mineral density T ≤ –1.5.

5. Manage **osteopenia or low bone mass**.

**Osteopenia or low bone mass**
- The decision to offer non-PBS funded treatment in osteopaenia is based on an individual’s fracture risk.
- Discuss starting pharmacotherapy if FRAX-calculated risk is:
  - > 3% for a major fracture.
  - > 20% for other fractures.
- Below this threshold, non-pharmacological only therapy is advised.
- Advise patient of the expected **private cost** of the proposed treatment.

**Private cost**
- Oral bisphosphonates as of 2020 cost – $10 to $15 per month
- Zolendronic acid – $280 yearly infusion
• *Denosumab – $290 6-monthly injection*

- Repeat DXA at an interval of 2 to 10 years; 1 full standard deviation of bone mineral density is lost every 10 years.
- Repeat fracture risk calculation as clinically indicated or every 5 years.

6. Assess treatment effectiveness. Consider repeating DXA 2 to 3 years after commencing or changing treatment to identify those with progressive bone loss despite treatment. For these patients consider:

- if teriparatide may be appropriate. If teriparatide indicated refer for urgent or routine endocrinology referral, as it must be initiated by a specialist.

**Teriparatide**

- Teriparatide is a synthetic form of parathyroid hormone that increases bone mineral density by activating osteoblasts to stimulate new bone formation.
- Available on the PBS for established osteoporosis when the patient is treated by a specialist and has a very high risk of fracture:
  - BMD T-score of ≤ -3, and
  - patient has had ≥ 2 minimal trauma fractures, and
  - at least one fracture occurred 12 months after commencement of antiresorptive therapy.
- Approved for up to 2 years of treatment but only PBS funded for up to 18 months.

- referring for urgent or routine endocrinology referral if:
  - unresponsive to treatment.
  - persistent severe osteoporosis despite treatment.
  - further minimal trauma (fragility) fractures despite treatment.

7. Assess adherence and tolerance. Many patients stop oral bisphosphonates due to side-effects, reiterate advice about how to take correctly.

8. Reassess treatment length after 5 to 10 years of therapy:

**Treatment length**

- *Ideally, this should be with a repeat DXA scan on the original machine.*
- *If T-score at the femoral neck remains < −2.5 or if new vertebral fractures or the patient is a high risk of further fractures, continue treatment.*
- *Some patients may be eligible for new treatments e.g., teriparatide.*
- *If patient has not had new fractures for 2 years and bone density has improved, consider a drug holiday for 2 to 3 years, although there is debate about this.*
- *Be aware there is a lack of consensus and evidence on the long-term treatment of osteoporosis.*

- After 5 to 10 years treatment with oral bisphosphonates.
- After 3 to 6 years treatment with zoledronic acid.
1. Consider urgent or routine endocrinology referral for advice on, or review, of management plan in patients after 5 years of treatment.

9. Ensure patients are aware of the complications of bisphosphonate or denosumab:
   - Be aware of atypical fractures on bisphosphonate or denosumab. Encourage immediate reporting of prodromal thigh pain. Organise urgent femur X-ray for prodromal thigh pain.
   - Advise patients to inform their dentist that they are being treated for osteoporosis if major dental work is recommended.

10. If patient has experienced ONJ or atypical femoral fracture refer for urgent or routine rheumatology referral or urgent or routine endocrinology referral.

11. Consider referring all patients who are initiating aromatase inhibitors or androgen deprivation therapy for urgent or routine endocrinology referral for advice regarding treatment or prevention of osteoporosis.

12. If referring for urgent or routine rheumatology referral or urgent or routine endocrinology referral, ensure that there are recent (in last 3 months) baseline blood test results available.

### Referral

- **Arrange urgent or routine endocrinology referral if unsure of diagnosis, or if the patient:**
  - has osteoporosis and is aged < 50 years for women or aged < 60 years for men.
  - is intolerant to treatment.
  - has contraindications to treatment.
  - is unresponsive to treatment.
  - has osteoporosis associated with chronic kidney disease or post-transplant.
  - at high risk of fracture and second line therapy with Teriparadate is indicated.
  - has further minimal trauma (fragility) fractures despite treatment.
  - has secondary causes.
  - has fragility fractures with bone densitometry of $T \geq -1.5$.
  - needs advice on, or review of management plan in patients after 5 years of treatment.

- **Refer for urgent or routine endocrinology referral or urgent or routine rheumatology referral for osteoporosis associated with:**
  - inflammatory disorders.
  - treatment with glucocorticoid medicines.
  - ONJ or atypical femoral fracture.

- **Consider referring all patients who are initiating aromatase inhibitors or androgen deprivation therapy for urgent or routine endocrinology referral for advice regarding treatment or prevention of osteoporosis.

- Refer for a routine dental assessment before bisphosphonate therapy commences.
• Consider referral to physiotherapist, exercise physiologist, or lifestyle programs for preventive exercises and activity.

### Information

#### For health professionals

**Further information**

- Osteoporosis Australia – [For Healthcare Professionals](#)
- RACGP – [Osteoporosis Risk Assessment, Diagnosis, and Management](#)
- University of Sheffield – [FRAX Fracture Risk Assessment Tool](#)

#### For patients

- Better Health Channel – [Osteoporosis](#)
- International Osteoporosis Foundation [includes 1 minute Osteoporosis Risk Test](#)
- Osteoporosis Australia

### References


**Select bibliography**

• Sanders KM, Stuart AL, Williamson EJ, Simpson JA, Kotowicz MA, Young D, et al. Annual high-dose oral vitamin D and falls and fractures in older women: a randomized controlled trial. JAMA : the journal of the American Medical Association. 2010 May;303(18):1815-1822.

• The Royal Australian College of General Practitioners (RACGP). RACGP Musculoskeletal Health. Australia: The Royal Australian College of General Practitioners (RACGP); [date unknown].

Disclaimer

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