

# What you need to know about Osteoporosis

Medical guide



osteoporosis australia

## **Introduction**

Health professionals play a central role in identifying people at high risk of osteoporosis and osteoporotic fractures.

Many patients may already be suffering from the 'silent disease' without knowing, as osteoporosis can progress without any signs or symptoms. In Australia, there is a real opportunity to improve the investigation of patients and combat the progression of the disease. Recognising risk factors and discussing bone health with patients is vital.

An estimated 1.2 million Australians have osteoporosis and another 6.3 million are affected by osteopenia (low bone density), a potential precursor to osteoporosis.<sup>1</sup>

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## Bone loss and fragility

Two types of tissue form bones – cancellous (or trabecular) bone and cortical bone. Trabecular bone, which forms an interconnecting latticework, is more metabolically active and turns over at a rate of approximately 25% per year.<sup>2</sup> Less active and denser cortical bone surrounds the trabecular bone, forming the bone's outer surface. The proportion of trabecular to cortical bone differs depending on the site. For example, spinal vertebrae are largely trabecular while the femur is predominately cortical.

It is estimated that the entire skeleton replaces itself over a period of 10 years. The destruction of old bone and its replacement is largely regulated by the activity of osteoblasts (cells that lay down new bone matrix) and osteoclasts (cells that resorb bone). Strong contributors to the activity of these cells are the hormones testosterone and oestrogen, which have osteogenic qualities, and parathyroid hormone, which is osteolytic. Stresses and strains placed on the bone also have an osteogenic effect, hence the importance of exercise in building and maintaining bone strength and quality. Bone quality is dependent on both its bone mineral density (BMD) and its structural properties, such as architecture and geometry. As such, small bones are not necessarily poor quality and large bones are not invariably strong.

The bones are the major storage organ for calcium. 99% of the body's calcium is stored in the bones as calcium hydroxyapatite. The bones are responsible for the homeostasis of calcium and release it into the bloodstream as required. The presence of vitamin D has a significant role in the mineralisation of the bone.

The relationship between osteoblasts and osteoclasts plays a role in determining the speed of bone turnover and whether there is a net loss or increase in bone volume.

Menopause, with its associated decline in oestrogen production, results in an increase in bone turnover. This is exhibited by an accelerated bone loss, averaging 2% per year.<sup>3</sup> Both cortical thinning and the thinning and breakage of the latticework forming the trabecular bone can occur.

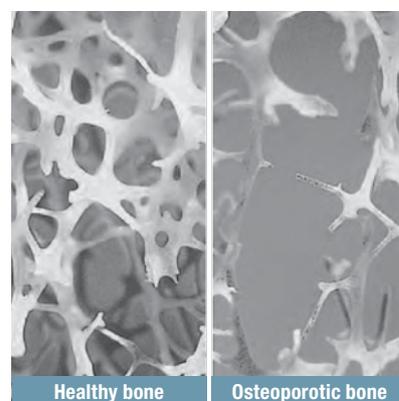
Accelerated bone loss is greatest in the first three to six years after menopause and then gradually resumes the rate of premenopausal bone loss. After the age of 70, bone loss begins to accelerate again, reaching 1-2% per year in women older than 80 years.<sup>4</sup>

A 10% loss in bone mass in the vertebrae can double the risk of vertebral fractures and a 10% loss of bone mass in the hip can result in a 2.5 times greater risk of hip fracture.<sup>5</sup>

Men experience only a gradual decline in testosterone, so that the structural integrity of trabecular bone is maintained for longer. In addition, men have a greater bone volume with a faster cortical bone deposition than women, hence are able to better offset any inner bone loss. However, by the age

of 70 years, sufficient bone has usually been resorbed to warrant investigation, particularly where other osteoporotic risk factors are present.

Apart from hormone levels there are a range of other factors that have an impact on bone health, including genetics, diet (particularly calcium intake), vitamin D levels, exercise and certain diseases and medicines. When less than optimal, these factors may compromise bone strength and increase the risk of fracture.



Healthy bone vs osteoporotic bone.

## Fracture incidence

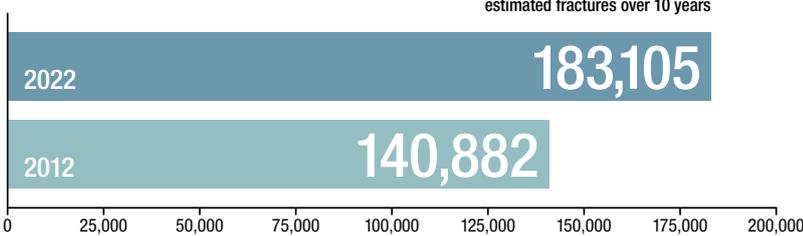
Osteoporosis remains largely undiagnosed and untreated. Only around 20% of people with osteoporotic fractures who come to medical attention are treated to prevent further bone loss and fractures.<sup>6,7</sup> The healthcare system works to repair the fracture but does not investigate the underlying cause.

Any bone can be affected by osteoporosis. The most common fracture sites are the spine, hip and wrist. Other sites affected include the humerus, ribs, forearm and pelvis. Minimal trauma fractures (also known as fragility fractures) are defined as fractures resulting from trauma equal to (or less than) a fall from standing height.

### Osteoporotic fractures in Australia

In 2012, 140,822 fractures occurred in Australia as a result of osteoporosis and osteopenia. By 2022, it is expected that there will be a 30% increase in the annual number of fractures, if action is not taken now to improve diagnosis and management of osteoporosis. The total costs of poor bone health and associated fractures is estimated to reach \$33.6 billion over the 10 years from 2013-2022. Hospital costs currently account for 73% of direct fracture costs.<sup>8</sup>

#### Osteoporotic fractures



Source: Osteoporosis costing all Australians. A new burden of disease analysis – 2012 to 2022. Osteoporosis Australia.

## The fracture cascade

It has been well documented that following a low trauma fracture at any site, there is a 2-4 fold increase in the risk of a subsequent fracture.<sup>9,10</sup> Patients with a history of prior fracture at any site should be evaluated for osteoporosis and fracture risk.<sup>5</sup>

Subsequent fracture is a particular problem for the 50-75% of vertebral fractures that do not come to medical attention. For example, women who sustain a vertebral fracture are 4 times more likely to sustain another vertebral fracture. Vertebral fractures may be asymptomatic, or signs and symptoms such as back pain, height loss or kyphosis can be misinterpreted and not properly investigated.

Undiagnosed and untreated fractures increase the chance of more severe fractures, resulting in pain, disability and even premature mortality.<sup>10,11</sup>

Osteoporosis care of fracture patients has been characterised as a *Bermuda Triangle*, comprised of orthopaedic surgeons, primary care physicians and osteoporosis experts, into which the fracture patient disappears.<sup>12</sup> Everyone assumes that someone else is managing the patient's fractures when in reality, often no one does.

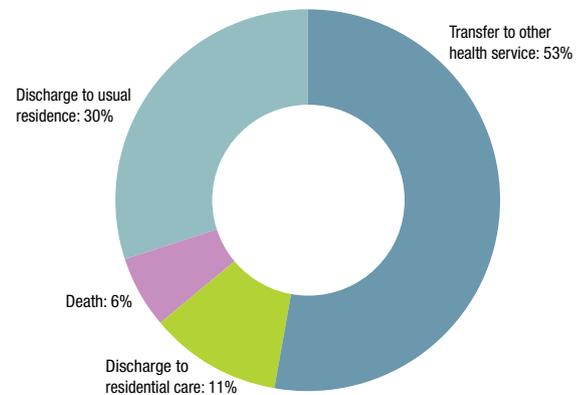
Only 20% of people who come to medical attention with osteoporotic fractures are treated to prevent further bone loss and fractures.<sup>6,7</sup> Minimal trauma fractures are a clear signal that a patient's bone health should be investigated.

### Hip fractures

Most hip fractures occur following a fall and 90% occur in people over 50.<sup>9</sup>

Half of all patients who have had a hip fracture will be unable to regain their previous independence and will require some form of additional walking aid or assistance with mobility.<sup>13</sup>

#### Results after a hip fracture



Source: AIHW National Hospital Morbidity Database.\*\*



## Risk factors for osteoporosis and fractures

- Genetics\*
  - Family history of osteoporosis and minimal trauma fractures.
- Calcium and vitamin D status\*\*
  - Inadequate calcium intake.
  - Low/deficient vitamin D levels.
- Fracture history and age\*
  - Previous spinal or minimal trauma fracture.
  - Increasing age (over 70).
- Body weight.
  - Low body weight\*.
  - Obesity (new research suggests impact on bone).
- Height loss\*
  - Height loss (3cm or more).
  - Kyphosis.
- Negative lifestyle factors:\*\*
  - Lack of physical activity.
  - Excessive alcohol.
  - Smoking.
- Recurrent falls\*.

- Medical conditions (secondary osteoporosis)\*
  - Inflammatory arthritis.
  - Malabsorption (eg: coeliac disease).
  - Premature menopause in women.
  - Hypogonadism in men.
  - Hyperparathyroidism/Hyperthyroidism or thyroxine excess.
  - Chronic kidney or liver disease.
  - Multiple myeloma/monoclonal gammopathy.
  - Organ or bone marrow transplant.
  - Inflammatory bowel disease.
  - HIV and its treatment.
  - Type 1 and type 2 diabetes mellitus.
- Medicines\*
  - Glucocorticoids (longer than 3 months).
  - Aromatase inhibitors.
  - Gonadotropin-releasing agonists (commonly used to treat prostate and breast cancer).
  - Antiepileptic drugs.
  - Antidepressants (SSRI's).

## Assessment of patient bone health

- Review personal fracture history and any family fracture history.
 

**Note:** Minimal trauma fractures should be investigated.
- Assess calcium intake and vitamin D status.
- Review conditions or medications that can impact bone health (see risk factors).
- Check menstrual history in women, testosterone history in men.
- Determine smoking, alcohol and exercise status.
- Measure height and ask about back pain (any height loss 3 cm or more should be investigated).

\*Patients over 50 with these risk factors should be investigated with a bone mineral density scan (DXA).

\*\*These factors may contribute to a patient's overall risk of osteoporosis and fracture.

## Diagnosis of osteoporosis

The diagnosis of osteoporosis is based on the measurement of bone mineral density (BMD). A presumptive clinical diagnosis can also be made following a minimal trauma fracture in middle aged or elderly patients. Checking BMD in patients over 50 with risk factors is recommended. BMD is measured in  $\text{g}/\text{cm}^2$  and the results expressed as T-Score [the number of standard deviations (SD) above or below the young normal mean] and Z-Score [the number of standard deviations (SD) above or below age matched controls].

### Bone densitometry

Dual-energy X-ray Absorptiometry (DXA) to measure bone density of the hip and spine are the standard tests for diagnosing osteoporosis and monitoring response to treatment. The hip (femoral neck or total proximal femur sites) and lumbar spine (usually L1-L4 or L2-L4) are used unless there are abnormalities in these regions which may affect bone density. Proximal femur BMD appears to be the best overall predictor of fracture risk, particularly as it is less affected by osteoarthritis. Osteoarthritic changes may elevate spine BMD.

**Note:** The various DXA machine brands will report different absolute units ( $\text{g}/\text{cm}^2$ ) for BMD, and the results are not directly comparable. However, the widespread use of standardised reference ranges largely overcomes this problem.

The results of a BMD scan can show bone density in the range of normal, osteopenia or osteoporosis.

Suspected osteoporotic fracture in the spine should be confirmed by plain radiograph. Peripheral DXA and spinal quantitative computed tomography are sometimes used as alternatives for osteoporosis diagnosis but have not been evaluated for guiding therapeutic interventions.

**Note:** Quantitative ultrasound of the heel (often available in pharmacy) is not recommended as an appropriate standard test for BMD.

### Investigate patients

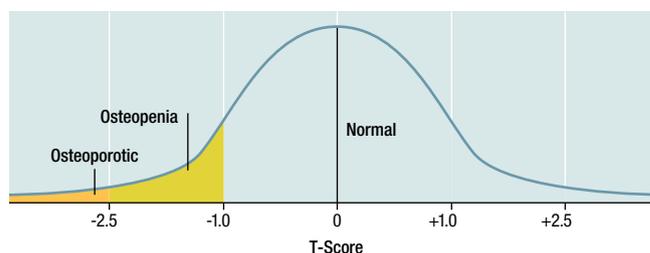
Any patient over 50 with risk factors for osteoporosis warrants investigation with a DXA scan.

Medicare rebates are available for BMD testing in high risk categories, including all patients over 70 and for monitoring treatment and low bone density. A rebate is also available to confirm low bone density in a patient with presumed osteoporosis presenting with one (or more) minimal trauma fractures.

**Note:** A BMD in the osteopenic range does not invalidate a clinical diagnosis of osteoporosis when a minimal trauma fracture has occurred.

### Other forms of testing

- Plain x-rays should be ordered if height loss (3 cm or more) or kyphosis is documented, to confirm the presence of spinal fractures.
- Blood tests may be indicated to exclude other causes of bone mineral loss such as primary hyperparathyroidism, malabsorption, thyroid disease or vitamin D deficiency.
- Bone markers are biochemical markers of bone turnover which can be measured in serum and urine. They are not routinely indicated for osteoporosis assessment.



## Bone density levels\* (WHO definitions)

**Normal:** BMD is less than 1.0 SD below the young adult mean (T-Score greater than -1.0)

**Osteopenia (low bone mass):** BMD is between -1.0 and -2.5 SD below the young adult mean (T-Score -1.0 to -2.4).

**Osteoporosis:** BMD is -2.5 SD or more below the young adult mean (T-Score equal to or less than -2.5).

**Severe (established) osteoporosis:** BMD is -2.5 SD or more below young adult mean and one (or more) osteoporotic fractures have occurred.

\*Based on DXA measurement at hip or spine.  
NOTE: For every one standard deviation (SD) decrease below peak BMD (= reduction in T-Score by 1.0), the fracture risk approximately doubles.

## Management of bone health and treatment of osteoporosis

Calcium, vitamin D and exercise all play an important role in optimising bone mass and preserving bone density in healthy adults as well as slowing bone loss in patients diagnosed with osteopenia and osteoporosis.

### Calcium

More than half of Australian adults do not get their recommended intake of calcium. Daily calcium recommendations are 1,000 mg per day for adults, increasing to 1,300 mg per day for women over 50 and men over 70 years. It is recommended that these levels are achieved through diet. Since calcium content in food varies, this requires regular intake of calcium rich food. For people with inadequate dietary calcium intake, calcium supplements of 500-600 mg per day are recommended and are equally effective.

**Refer to the Calcium fact sheet provided with this booklet or on the Osteoporosis Australia website [www.osteoporosis.org.au](http://www.osteoporosis.org.au) for background information and recommendations.**

### Vitamin D

Low vitamin D levels and vitamin D deficiency are common in Australia, but this can be easily rectified.

Adequate vitamin D levels should be at least 50 nmol/L at the end of winter. Levels should be 10-20 nmol/L higher during summer to allow for seasonal decrease in the winter months.

The main source of vitamin D is from sunlight through the action of UVB light on skin. Optimal exposure times will vary based on season, skin type (people with dark skin require more exposure than fair skinned people) and location (lower latitudes require longer exposure times).

For people who consistently do not achieve the recommended levels of sun exposure or have risk factors for vitamin D deficiency, testing is recommended. Supplementation is advised for people with mild, moderate or severe deficiency.

**Refer to the Vitamin D fact sheet provided with this booklet or on the Osteoporosis Australia website [www.osteoporosis.org.au](http://www.osteoporosis.org.au) for background information and recommendations.**

### Exercise

Exercise has a range of benefits for bone health, including increased bone density, improved co-ordination, balance and strength (to help prevent falls) and assisting rehabilitation after a fracture.

For healthy adults, a combination of weight bearing and progressive resistance training is recommended to improve or maintain bone density, muscle mass, strength and functional capacity (balance and gait). For older adults and people with osteopenia or osteoporosis, exercise should be multi-modal and supervised and include weight bearing activities, progressive resistance training and high challenge balance activities each week. The aim of exercise is to slow (or reverse) bone loss, maintain bone strength, increase muscle mass, strength and function and to improve gait and mobility to help prevent falls.

**Refer to the Exercise fact sheet provided with this booklet or on the Osteoporosis Australia website [www.osteoporosis.org.au](http://www.osteoporosis.org.au) for background information and recommendations.**





## Medicines

Osteoporosis is an under-treated disease in Australia. Even when fractures occur, the underlying cause of the fracture is not always investigated. Patients with risk factors for osteoporosis or minimal trauma fractures must be investigated.

In patients at high fracture risk, especially those who have already had fractures, specific anti-osteoporosis therapy is required. These treatments have been shown to be effective (approximately halving subsequent fracture risk) and are well tolerated.

In Australia, there are treatments covered by the PBS for men and women after fragility fracture, as well as for men and women at high risk but without prior fracture, on the basis of age and BMD T-Score.

The major components of anti-resorptive therapy are the bisphosphonates. These are available in multiple formulations; oral weekly (alendronate and risedronate), oral monthly (risedronate) and intravenous annual (zoledronic acid).

Another anti-resorptive is the human monoclonal antibody denosumab, which inhibits RANK Ligand (RANKL). This is given as a subcutaneous injection every 6 months.

Each of these agents has been shown to reduce the risk of vertebral fractures, hip fractures and other non-spine, non-hip fractures.

Hormone Replacement Therapy (HRT) relieves menopausal symptoms. By restoring oestrogen levels, HRT has also been shown to slow the rate of bone loss and reduce the risk of fracture. HRT may be prescribed for younger women (below the age of 60) when specific anti-osteoporosis medications are not suitable, or when menopausal symptoms require treatment.

Selective Oestrogen Receptor Modulators (SERMS) interact with oestrogen receptors, but in a different way to oestrogen, resulting in mixed agonist and antagonist effects in different body tissues. Taken as a daily tablet.

The second-line treatment strontium ranelate has a dual action, increasing bone formation markers and decreasing bone

resorption markers. Strontium ranelate is subject to a Black Box warning. It should only be used when other medications are unsuitable and must not be used in patients with ischaemic heart disease, vascular disease or embolism. Refer to the current Product Information for more details.

For patients who have experienced at least one symptomatic new fracture after 12 months continuous therapy with an anti-resorptive agent, teriparatide is available. Teriparatide (recombinant human parathyroid hormone) activates osteoblasts and stimulates the formation of new bone. It is a self-administered subcutaneous daily injection and can be prescribed for a maximum period of 18 months.

**Refer to the Medicines fact sheet provided with this booklet or on the Osteoporosis Australia website [www.osteoporosis.org.au](http://www.osteoporosis.org.au) for background information and recommendations.**

## Re-fracture prevention

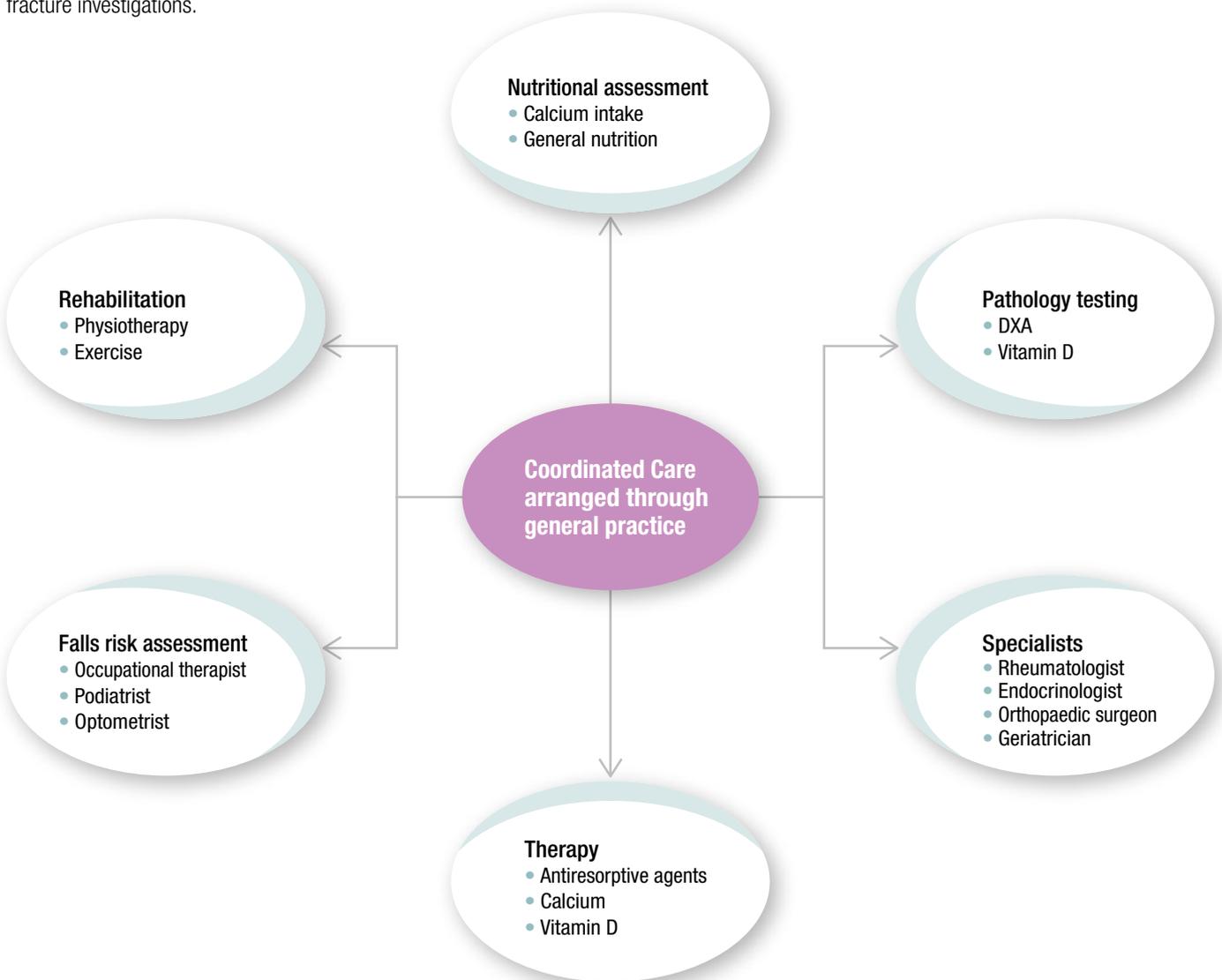
Patient care following a fracture involves a team of healthcare professionals to manage the fracture, including paramedics, hospital emergency, orthopaedic surgeons, nurses, physiotherapists for rehabilitation, occupational therapists (falls prevention and home audits), dieticians and GP for pain management, monitoring and post fracture investigations.

It is vitally important that patients over 50 who sustain a minimal trauma fracture (hip and non hip) are investigated to prevent re-fracture. It is the role of all healthcare professionals to inform the patient and their colleagues that the minimal trauma fracture requires investigation.

## Patient care in general practice post fracture

For general practitioners, patient investigation following minimal trauma fracture is recommended.

A range of approaches and health professional services may be required to prevent further fractures, reduce risk of falls and manage patient bone health.



## Patient care post hip fracture

### Analgesia

Analgesia is important for the management of hip fracture. Pain control in the early stages of care can promote comfort and patient confidence. If pain is poorly controlled, early mobilisation can be delayed, leading to the usual complications of prolonged bed rest and increased risks of post-operative delirium.

### Wound care and pressure sores

Wound management and pressure sore prevention is important for fracture patients. Early mobilisation is also important for lowering risk of clinical thrombosis.

### Nutrition

This is an inter-disciplinary concern. Poor nutrition prior to fracture can contribute to the risk of fracture. Recovery is aided by good nutrition; adequate intake of protein and energy is of particular importance.

## Rehabilitation

Rehabilitation is important following the repair of all types of fractures. The rehabilitation approach will depend on the type of fracture and the patient's age. It is designed to get patients back to their previous level of functioning, or above the level of frailty (or problems with mobility) that led to the fall and fracture. Rehabilitation can take place in hospital, outpatient clinic, rehabilitation centre, private practice, community centre, fitness facility, or at home.

Rehabilitation can involve:

- Prescribed exercise (for example: muscle strengthening exercises, weight bearing exercises, walking, transfer and balance training for improving fitness, posture and mobility, hydrotherapy).
- Walking aids.
- Pain relief (for example; medication, massage, physiotherapy, TENS(Transcutaneous Electrical Nerve Stimulation), hydrotherapy, ultrasound, heat and cold packs, acupuncture and relaxation techniques).



## Falls prevention

33% of people over 65 experience a fall each year.<sup>14</sup> Falls are the leading cause of injury-related hospitalisation in people over 65, accounting for 17% of emergency admissions<sup>15</sup> and 4% of all hospital admissions in this age group.<sup>16</sup>

In older people, nearly half of falls occur in the home and immediate home surroundings.<sup>17 18</sup> The remaining falls occur in public places or in other people's homes. Falls can result in minor injuries including abrasions, bruises and sprains, or cause serious injury and fractures. Falls are responsible for 90% of hip fractures.<sup>19</sup> It is estimated that up to 6% of falls result in a fracture.<sup>17</sup>

## Falls risk screening tools

### Screening patients

A simple screen: ask older patients about their history of falls in the past 12 months and assess balance and mobility. People with a history of falls (one or more) in the last year and who perform badly on a simple test of gait or balance should be assessed further.

**Note:** the following tools are for patients in a community setting. There are different screening and assessment tools for other settings (eg: Hospital sub-acute, Hospital acute, residential aged care facilities).

### Falls risk screening tool

Setting	Assessment tool
Community	The Timed Up and Go Test (TUGT) measures the time taken to rise from a chair, walk three meters (with usual assistive device), turn, return to the chair and sit down. A time of 12 seconds or more indicates increased risk of falls. <sup>20</sup>

### Assessment tools

Assessment tools provide detailed information about the underlying issues contributing to overall falls risk and should be linked to tailored interventions.

Assessing falls risk usually involves either:

- a** Multifactorial assessment tools (that cover a wide range of falls risk factors) or;
- b** Individual functional mobility assessments, focused on postural stability (eg: vision, strength, coordination, balance, gait).

#### a Multifactorial fall risk assessment tools

Setting	Assessment tool
Community	QuickScreen <sup>®</sup> is a risk assessment tool designed specifically for general practice and assesses previous falls, medication usage, vision, peripheral sensation, lower limb strength, balance and co-ordination. <sup>21</sup>

#### b Individual functional mobility assessments

Risk factor	Assessment tool
Balance and gait	Tinetti performance-oriented mobility assessment tool <sup>22</sup>
Cognitive impairment	Mini mental state examination <sup>23</sup>
Incontinence	Urinary and fecal assessment
Feet and footwear	Foot pain, safe-shoe checklist
Syncope/dizziness	Tilt-table test <sup>24</sup>
Medications	Medication review
Vision	Snellen eye chart
Environment	Westmead home safety assessment <sup>25</sup>

## Interventions

In order to prevent falls it is important to address risk factors for falling.

There are a range of interventions that are useful in combating falls. For example, exercise has been shown to be a successful falls prevention strategy in the community<sup>26</sup> and is also effective as part of multifactorial interventions in residential aged care facilities.<sup>27</sup>

### Preventing falls. Successful single intervention in the community<sup>26</sup>

Risk factor	Intervention
Muscle weakness, gait and balance	<p>A combination of resistance training and balance exercises reduces falls and risk factors for frailty including sarcopenia, poor balance, gait instability, depression, fear of falling and cognitive impairment. Exercises should include balance training at moderate to high intensity and be ongoing.<sup>28</sup></p> <p>People aged between 60-80:</p> <ul style="list-style-type: none"> <li>• Low falls risk – Tai Chi group sessions and functional balance exercises.</li> <li>• Moderate falls risk – targeted group- based exercises classes.</li> </ul> <p>People older than 80:</p> <ul style="list-style-type: none"> <li>• High risk of falls – individually tailored exercise program in the home (eg: Otago Exercise Program).</li> </ul>
Feet and footwear	Podiatry intervention – foot orthoses, advice on footwear, home-based foot and ankle exercises, routine podiatry care.
Syncope/dizziness	Cardiac pacing in people with carotid sinus hypersensitivity and a history of syncope-related falls.
Medications	<p>Gradual supervised withdrawal of psychoactive medications.</p> <p>Collaborative review and modification of medicine by GP and pharmacists.</p> <p>Vitamin D and calcium supplementation.</p>
Vision	<p>Older people with impaired vision from cataracts should undergo surgery.</p> <p>People with severe visual impairment should receive a home safety assessment and modification program designed to prevent falls.</p> <p>Provision of single lens glasses should be considered for older people wearing multifocal glasses who take part in regular outside activities.</p>
Environment	Occupational therapy interventions – education and home hazard modification in high-risk people (home hazard changes can include: installing hand rails on stairs and in the home, non-slip strips on stairs, slip resistant mats in bathroom, removing electric cords and mats that can cause tripping, improved lighting, ensuring that regularly used items in kitchen are within easy reach, maintain paths).

## Tables and graphs

\* Risk Factors based on: The Royal Australian College of General Practitioners (2010) Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older men, viewed 28th April 2014, [www.racgp.org.au/guidelines/musculoskeletalconditions/osteoporosis](http://www.racgp.org.au/guidelines/musculoskeletalconditions/osteoporosis), and Osteoporosis Australia. Is your patient (man or woman) over 50? Think osteoporosis. 1st Ed,4/2013, viewed 28th April 2014, [www.osteoporosis.org.au/health-professionals/general-practitioners](http://www.osteoporosis.org.au/health-professionals/general-practitioners).

\*\* Hip Fracture Graph – Outcomes of hospitalisation for osteoporotic hip fracture, 2006-07 AIHW (Source: AIHW National Hospital Morbidity Database) The Problem of Osteoporotic Hip Fracture in Australia, AIHW, Bulletin 76, March 2010.

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## Osteoporosis Australia

Osteoporosis Australia is a national, not-for-profit organisation committed to improving awareness and understanding of osteoporosis. Our goal is to reduce the incidence of osteoporosis and osteoporotic fractures in the Australian community.

Our services include:

- Educational materials for consumers and health professionals.
- 'Osteoblast' magazine for consumers and medical professionals.
- Osteoporosis Prevention and Self-management Program for consumers.
- Community education seminars.

**Our activities include:**

- World Osteoporosis Day (October 20).
- Support for medical research.
- Advocacy to improve patient care.

## Contact us

### Osteoporosis Australia

For more information call our national toll-free number: **1800 242 141**

Visit our website: **[www.osteoporosis.org.au](http://www.osteoporosis.org.au)**

### Affiliated state organisations

#### Osteoporosis

##### New South Wales

p: (02) 9857 3300

#### Osteoporosis Australian

##### Capital Territory

p: (02) 6288 4244

#### Osteoporosis Victoria

p: (03) 8531 8000

#### Osteoporosis Tasmania

p: (03) 6228 4824

#### Osteoporosis

##### South Australia

p: (08) 8379 5711

#### Arthritis & Osteoporosis

##### Western Australian

p: (08) 9388 2199

#### Osteoporosis

##### Northern Territory

p: (08) 8948 5232

#### Osteoporosis

##### Queensland

p: (07) 3857 4200

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