

Checking for osteoporosis

Osteoporosis should be sought actively in men and women with certain medical conditions and others with established risk factors for fracture. The predictive value of bone mineral density measurements in fracture is superior to that of LDL cholesterol in myocardial infarction, making the case for case finding at least as strong as that for hypertension.

PAT J. PHILLIPS

MB BS, MA(Oxon), FRACP,
MRACMA

GEORGE PHILLIPOV

MSc, PhD

Dr Phillips is Senior Director, Endocrinology, North West Adelaide Health Service, The Queen Elizabeth Hospital Campus, Adelaide, SA; Dr Phillipov is Manager, Endocrinology Laboratory and Osteoporosis Centre, North West Adelaide Health Service, The Queen Elizabeth Hospital Campus, Adelaide, SA.

Osteoporotic fractures impose a major burden on patients, contributing to invalidity, loss of independence, pain, disability and death. They are also a major burden on the Australian community. In 1995, the direct costs alone were \$600 million,¹ and costs are projected to increase as our population ages.

The average general practitioner in Australia with 1000 patients will have:

- approximately 40 patients who have osteoporosis²
- 60 patients (40 women and 20 men) who will suffer an osteoporotic fracture at some stage during their lifetime¹
- 80 patients with low bone mass and

increased risk of osteoporosis and fracture.²

Measurement of bone mineral density (BMD) enables an accurate diagnosis of osteoporosis and prediction of an individual's risk of fracture. Medications that have been shown to increase BMD and to decrease the risk of fracture are recommended by the RACGP,³ and are subsidised by the PBS.

In addition, there are other strategies that can greatly reduce the risk of falls and associated fractures, and that can also improve patient comfort and functional capacity.

There is thus a strong case for including case finding for osteoporosis in routine Australian general practice.

IN SUMMARY

- Osteoporosis should be sought actively in men and women with certain medical conditions and other groups with established risk factors for fracture.
- The predictive value of BMD in terms of fracture is superior to that of LDL cholesterol in terms of myocardial infarction.
- Bone mass declines by approximately 15% in the first five years after the menopause. The decline follows the '5-4-3-2-1 rule': that is, losses of 5% occur in the first year, 4% in the second, 3% in the third, 2% in the fourth and 1% in the fifth.
- Bone quality and the risk of fracture can be assessed by the transmission of electromagnetic radiation or ultrasound. Dual energy x-ray absorptiometry is currently the accepted method of assessment.
- HRT is effective treatment for the ill effects associated with hypogonadism (including osteoporosis) for hypogonadal postmenopausal women and hypogonadal men.
- Alendronate (Fosamax), etidronate (Didrocal) and raloxifene (Evista) are available for women; etidronate is available for men. Calcitriol (Rocaltrol, Sitriol) and bisphosphonates are available for both men and women with osteoporosis and fracture with minimal trauma.

Osteoporosis: silent and lethal

Loss of bone mineral and bone strength and a predisposition to fracture are part of the lifecycle of bone. Bone mass peaks in the mid-twenties, remains stable until approximately 50 years of age, then rapidly declines. After the menopause, the rate of decline is approximately 15% in the first five years and 0.5 to 1% per year thereafter. The overall rate of decline is slower in men (approximately 0.5 to 1% per year), and the gender difference in bone loss explains the delayed rise in fracture rate in men, which parallels the rise in women but occurs 10 to 15 years later (Figure 1).

When the lifecycle of bone is considered, it is no surprise that osteoporosis and osteoporotic fracture are common in both genders.⁴ However, most people at risk of osteoporosis do not perceive that risk, perhaps believing that a healthy diet and exercise will protect them. Medical risk factors for osteoporosis are listed in Table 1.

Only a small proportion of people with osteoporosis are aware of it. One study of a population treated for fractured hip found that the subjects had few proactive measures to maintain bone mass and prevent falls and future fracture, although risk factors and indicators for pre-existing osteoporosis were apparent.⁵

Most perimenopausal and postmenopausal women in Australia have not discussed osteoporosis with their GP, which is a similar situation to that in the USA.⁶ The issue and risk of osteoporosis are especially underestimated by men because osteoporosis is usually seen to be a women's health issue, despite one-third of hip fractures in Australians who are 65 years or older occurring in men.

Although osteoporosis may not be recognised, it can impose a major burden through fracture (Figure 2), deformity, disability and pain (Figure 3). The outcomes of a fracture can be catastrophic for an individual, and may include:²

- death within 12 months (24% of patients who suffer a hip fracture)
- lifelong residency in a nursing home (20 to 26% of survivors)
- lesser mobility than before fracture (50% of survivors).

Outcomes of fracture are also costly for the community, which subsidises or pays for acute, rehabilitative and nursing home care. The total

Osteoporosis

This image is unavailable to copyright restrictions

The loss of bone mineral and strength that occurs from the age of 50 years is part of the natural bone cycle. Osteoporosis is common, predisposing both men and women to an increased risk of osteoporotic fracture and to reduced mobility and independence. However, only a small number of people with osteoporosis are aware of the problem.

ILLUSTRATION © BONNIE HOFKIN

Table 1. Medical risk factors for osteoporosis

- Prolonged glucocorticoid therapy (e.g. oral or aerosol corticosteroids)
- Conditions associated with excess glucocorticoid secretion
- Hypogonadism (in men)
- Amenorrhoea lasting more than six months before the age of 45 years
- Primary hyperparathyroidism
- Chronic liver or renal disease
- Proven malabsorption disorders
- Rheumatoid arthritis
- Conditions associated with thyroxine excess (e.g. Graves' disease, toxic multinodular goitre, excess thyroxine replacement)

continued

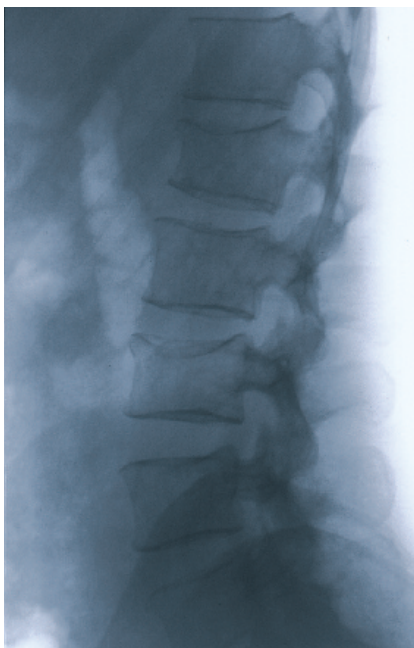
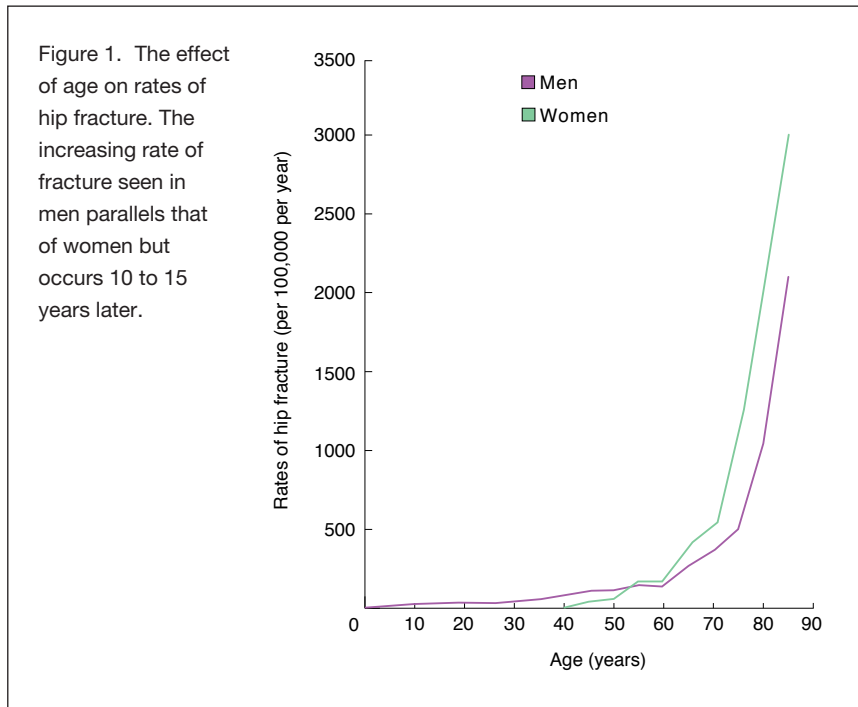


Figure 2. Osteoporotic fracture. Note the exaggerated biconcave shape of the vertebral bodies and the increased density of bone at the end plates. The intervertebral disc spaces have expanded as the vertebrae have collapsed.

cost for 2000 is estimated to be \$1070 million (based on the actual cost in 1992 inflated at 4% per year).²

Osteoporosis: measurable and treatable

Bone quality and the risk of fracture can be assessed by the transmission of electromagnetic radiation (single photon; dual energy x-ray absorptiometry [DXA]; CT or conventional radiography); or by changes in the transmission of ultrasound. At present, DXA is the accepted method of assessment.⁷ A guide to interpreting BMD reports is given in the box on page 19.

Hormone replacement therapy (HRT) has long been recognised as effective treatment for the ill effects associated with hypogonadism (including osteoporosis) for hypogonadal postmenopausal women and hypogonadal men. Subsidised HRT is available to hypogonadal women and men.

In the last 10 years, other medications have been added to the armamentarium. Bisphosphonates and calcitriol

(Rocaltrol, Sitriol) are available for both men and women. Alendronate (Fosamax), etidronate (Didrocal) and raloxifene (Evista) are available for women; etidronate is available for men with osteoporosis and fracture with minimal trauma. Moreover, it has been recognised that the following generalised public health measures should be adopted for all older people:

- ensuring a calcium intake of 1000 to 1500 mg per day
- providing vitamin D supplements for those confined indoors
- encouraging weightbearing activity that helps to maintain bone mass and reduce falls
- actively discouraging smoking and strongly supporting quitting.

Benefits of case finding

The National Osteoporosis Foundation in the USA has outlined the cost effectiveness of case finding in otherwise healthy women defined in terms of two sets of risk factors for osteoporosis:

- a first fracture after the age 40, and
- at least one of the following – a family history of osteoporotic fracture at the wrist, hip or vertebrae; thinness (weight less than 58 kg); or a smoking habit.

The Foundation's approach, which assumes that women are not taking HRT but would take HRT or alendronate if their BMD values were low, is outlined in the flowchart on page 20. It also takes the public health approach, based on the expected costs of investment and treatment being at least returned by savings in future costs by preventing bone loss and associated problems through the use of medication (HRT or alendronate). A similar case for the cost effectiveness of case finding in similar but older groups of men may be developed, given the similar decrease in BMD and increase in fracture that occurs in men 10 to 15 years later than their female counterparts.

BMD reports: a quick guide⁷

Osteoporotic bones do not cause symptoms before a fracture occurs. The only quantifiable way of diagnosing osteoporosis in the absence of a fracture is by measuring bone mineral density (BMD), which reflects a characteristic of bone strength.

BMD is reported in T scores and Z scores.

- *The T score.* The T score describes BMD in terms of standard deviation units from the mean of a gender-matched, young normal population. Osteoporosis is defined as a T score of at least 2.5 standard deviation units below the young normal mean (that is, a T score below -2.5); osteopenia is indicated by a T score between -1 and -2.5. The risk of fracture increases by a factor of approximately 2.5 for each fall of 1 unit in the T score.⁸
- *The Z score.* The Z score describes BMD in terms of standard deviation units from the mean of an age- and gender-matched population. The Z score indicates whether any BMD decrease indicated by the T score is compatible with age-related changes or if other pathology may be involved. A Z score within 2 standard deviation units of the mean suggests that a decrease in BMD is not sinister.

Case discussion

A 69-year-old woman was referred for BMD measurements. She was 158 cm tall and weighed 52 kg.

- *Lumbar spine.* The most important data to assess in a spinal BMD report concern the L2 to L4 vertebrae (Table A). This patient's T score (-1.2) is greater than -2.5, indicating that she does not have osteoporosis in this region, but is less than -1 and therefore indicates osteopenia. Her Z score (1.1) lies within 2 standard deviation units of the mean, and therefore does not suggest sinister pathology.
- *Femoral neck.* The most important site to assess in a BMD report for the femur is the femoral neck (Table B). Her T score (-1.0) is greater than -2.5, indicating that she does not have osteoporosis in this region. Her Z score (0.9) is within 2 standard deviation units of the mean and therefore does not suggest other pathology.

Remember

- The most important information to assess in the BMD report concerns the L2 to L4 vertebrae and the femoral neck.
- The T score reflects the severity of BMD loss. The Z score reflects the likelihood of a pathological cause for reduced BMD.
- Consideration of BMD measurements taken over time will enable the risk of fracture to be assessed and the effectiveness of interventions to be monitored.
- Other risk factors for fracture that should be considered include advancing age, stability and environment.

Table A. BMD report: spine

Region	BMD (g/cm ²)	T score	Z score
L1	0.925	-1.7	0.6
L2	1.103	-0.8	1.5
L3	1.120	-0.7	1.7
L4	0.954	-2.0	0.3
L2 to L4	1.055	-1.2	1.1

Table B. BMD report: femur

Region	BMD (g/cm ²)	T score	Z score
Neck	0.865	-1.0	0.9
Ward's area	0.776	-1.0	1.4
Trochanter	0.727	-0.6	0.7

Given the additional value of targeting public health measures to those who are at most risk of osteoporosis, the Foundation's approach underestimates the total benefits of case finding. Case finding also has the value of providing accurate information to people concerned about their future health and of

having a BMD baseline for future comparison, should the clinical scenario change. Osteoporosis case finding may therefore be justified in women (and men) other than those with specific medical conditions or the osteoporosis risk factors defined by the National Osteoporosis Foundation.

Final comments

In Australia, the cost effectiveness of case finding and treating people with specific medical conditions is recognised by the Health Insurance Commission. It provides Medicare subsidies for BMD measurements in certain medical conditions (Table 1)⁹, and medications for men

continued

Figure 3. Osteoporosis leads to reduced mobility and independence of older people. Prior to the onset of osteoporosis at age 50 years (left), posture is upright, but by the age of 75 years (right), vertebral fracture has caused the vertebral bodies to flatten and wedge, leading to a reduction in height and kyphosis of the thoracic spine.



with osteoporosis and women with osteoporosis or fracture.¹⁰

Case finding in osteoporosis is established and accepted in defined medical conditions for both men and women. It is established (but not yet accepted) for subgroups of otherwise healthy women, and it is not yet decided (but awaiting further evidence) for equivalent but older subgroups of otherwise healthy men. **MT**

References

1. Australian National Consensus Conference 1996. The prevention and management of osteoporosis. Consensus Statement. *Med J Aust* 1997; 167 (suppl): S1-15.
2. National Osteoporosis Foundation. 1996 and 2015 Osteoporosis prevalence figures: state-by-state report. Washington DC: The Foundation, 1997.
3. RACGP and Osteoporosis Australia. Osteoporosis: guidelines for general practitioners. *Australian Family Physician* 1997; 26: 1181-1196.
4. Phillipov G, Phillips PJ, Leach G, Taylor AW. Public perceptions and self-reported prevalence of osteoporosis in South Australia. *Osteoporos Int* 1998; 8: 552-556.
5. Nguyen N, Van V, Phillips P, Phillipov G. Osteoporosis risk factors and hip fracture. *Proceedings of the Australian and New Zealand Bone and Mineral Society*, September 1995; Canberra.
6. National Osteoporosis Foundation. Osteoporosis: review of the evidence for prevention, diagnosis and treatment and cost-effectiveness analysis. *Osteoporos Int* 1998; 8 (suppl 4): S7-S80.
7. Phillips PJ, Phillipov G. Bone mineral density – what do the numbers mean? *Current Therapeutics* 1999; 40(2): 49-53.
8. Marshall D, Johnell O, Wedel H. Meta-analysis of how well measures of bone mineral density predict occurrence of osteoporotic fractures. *BMJ* 1996; 312: 1254-1259.
9. Commonwealth Dept of Health and Family Services. Medicare Benefits Schedule Book. Canberra: Dept of Health, Nov 1999.
10. Commonwealth Dept of Health and Aged Care. Schedule of Pharmaceutical Benefits for Approved Pharmacists and Medical Practitioners. Canberra: AGPS, Nov 1999.

Case finding for osteoporosis*

A healthy postmenopausal woman who is not taking HRT

Assess the patient for two sets of risk factors:

- a first fracture after the age of 40
- a family history of osteoporotic fracture (wrist, hip or vertebra), thinness (weight less than 58 kg) or smoking habit

At least one risk factor is present from each set

Risk factors from one set only are present

No risk factors are present

BMD testing is indicated if the patient is over 50 years of age

BMD testing is indicated if the patient is over 60 years of age

* Based on reference 6