

Osteoporosis

Prevention and detection in general practice



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Background

Osteoporosis causes a large and growing health burden in Australia. Effective treatments are available, but these are inconsistently implemented. There is some inconsistency in expert advice on who should be recommended to have bone densitometry.

Objective

This review draws on the available high level evidence for what works in prevention and discusses the rationale for using absolute risk estimations for decision making.

Discussion

Effective interventions for the prevention and early intervention of osteoporosis have not been delivered as widely as they should be. Efforts should be focused on offering treatment to those groups with the highest risk of fracture, particularly those that have had a fragility fracture. There is synergy in the lifestyle recommendations for bone health with other aspects of health, so these should be addressed as thoroughly as possible.

Keywords

osteoporosis, prevention and control; general practice; risk factors



Osteoporosis (OP) is an important primary care health problem. It is common, causes significant suffering for many and contributes to an earlier death for some.¹ With the ageing population and rising prevalence of conditions predisposing to OP, it is a growth area keenly in the sights of the pharmaceutical industries. Accordingly, primary care clinicians need to be able to distinguish facts from hype.²

Key to this is to distinguish evidence about bone density (a risk factor) from evidence about fracture (a health outcome) prevention. Osteoporosis only causes symptoms or impact on the patient when there is a fracture, so fracture outcome data takes precedence over bone density data in guiding clinical practice. Low bone density is one of the main risk factors for fracture, but not the only one.¹

Prevention

There are a number of established risk factors for OP (*Table 1*). Age, family history of OP, female gender, age at menopause and prior fragility fracture are all potent risk factors for future fragility fracture, but these factors can't be changed. Smoking, high alcohol intake, low calcium diet, low body weight, recurrent falls, sedentary lifestyle, low sex hormone levels and malabsorption are likely to be amenable to intervention. *Table 2* summarises possible modifiable factors.

There is disappointingly weak evidence of impact on fracture outcomes from lifestyle interventions, although there is evidence of improved bone density for some.¹ They are still strongly recommended because of other health benefits.

The focus of fracture prevention changes with the setting, age group and patient preferences. In residential aged care facilities (RACFs) vitamin D supplementation should be considered for its impact on bone density and its impact on falls.³ Additional risk factors for patients in RACFs include cognitive impairment, bowel or bladder incontinence, use of anxiolytics, low serum vitamin D and high serum phosphate. Given that most residents in RACFs have OP and 40% of all hip fractures occur in this population, active identification of those warranting and accepting of treatment is encouraged.³ Significant reductions in fracture risk were seen in less than 2 years in therapy trials.^{4,5}

Prevention with lifestyle changes

Unfortunately, there are no studies reporting fracture or bone density outcomes for interventions for smoking, low body weight, high alcohol



intake and sedentary lifestyle, although these factors are associated with higher fracture risk.

A Cochrane review (updated 2011) of randomised controlled trials of exercise based interventions for fracture or bone density outcomes found no evidence of impact on fractures but ‘a relatively small statistically significant, but possibly important, effect of exercise on bone density compared with control groups. Exercise has the potential to be a safe and effective way to avert bone loss in postmenopausal women’⁶

Exercise is generally a good thing, although it is possible that exercise programs could increase injuries, including fractures, if not cautiously planned and implemented in a frail population. Physiotherapy or exercise physiology advice can be helpful.¹

There is growing interest in efforts to increase peak bone mass in adolescents and young adults through high impact exercise (eg. jumping) because of theoretical modelling that suggests higher peak bone mass would delay onset of OP.⁷ Exercise interventions in young people show modest changes in bone mineral density (BMD),⁸ but it has not been tracked through the decades to show lower fragility fracture rates.

Prevention with dietary supplements

Calcium

Calcium supplementation alone has a small positive effect on bone density. The data show a not statistically significant trend toward reduction in vertebral fractures, but the trend is unclear for calcium reducing the incidence of nonvertebral fractures.⁹ This is reflected in the weak rating given to this intervention in Australian guidelines.¹ More calcium is not always better, as there is concern that excessive calcium supplementation may increase myocardial infarction.^{10,11} Unfortunately, these studies don’t define a safe dose from a cardiovascular disease point of view. This risk trade-off needs to be watched as more evidence becomes available. The increased cardiovascular disease risk has not been seen with dietary calcium, only with supplements. Currently the recommended daily intake is 1000–1300 mg/day.¹²

Fluoride

A Cochrane review of the impact of fluoride concludes that fluoride can increase BMD at the lumbar spine, it does not reduce vertebral fractures. The evidence showed an increase risk of gastrointestinal side effects and nonvertebral fractures when used for OP in adults.¹³

Vitamin D

Vitamin D is necessary for building bone. Older people (especially those in RACFs) often have low vitamin D levels through lack of exposure to sunlight and low dietary intake. A review of 45 trials with 84 585 patients (updated in 2008) found that taking vitamin D alone is unlikely to prevent fracture. Vitamin D taken with additional calcium supplements does appear to reduce risk of hip fractures in people living in institutional care. Although the risk of harmful effects from vitamin D and calcium is small, some people, particularly those with kidney

Table 1. Risk factors for recommending bone densitometry¹

Consider bone densitometry if the following risk factors are present:

- Age >70 years
- Age >60 years for men and >50 years for women plus any of:
 - family history of minimal trauma fractures
 - smoking
 - high alcohol intake (>2–4 standard drinks per day for men, less for women)
 - diet lacking in calcium
 - low body weight
 - recurrent falls
 - sedentary lifestyle over many years

Medical conditions and medications – any adult with the following chronic conditions or medications:

- Endocrine (eg. hypogonadism, Cushing syndrome, hyperparathyroidism, hyperthyroidism)
- Inflammatory conditions (eg. rheumatoid arthritis)
- Malabsorption
- Organ or bone marrow transplant
- Chronic kidney disease, chronic liver disease
- Drugs (eg. anti-epileptic, anti-oestrogen, anti-androgen, corticosteroids, excessive thyroxin, selective serotonin reuptake inhibitors [SSRIs])
- Multiple myeloma

stones, kidney disease or high blood calcium, are at increased risk of harmful effects.¹⁴

Vitamin D supplementation does not improve bone density in healthy children but may have a modest role in those with low vitamin D levels.¹⁵ A tip to remember is that most of our vitamin D is made in our skin, rather than diet, and glass filters the ultraviolet spectrum that causes vitamin D synthesis in the skin. This can be important for patients in RACFs.

Preventing falls

There is good evidence for the effectiveness of various interventions to reduce falls (eg. exercise, balance training, hazard reduction, medication reviews). These have not however, been able to demonstrate reduced fracture rates, presumably due to the size of study needed. In RACFs, where the frail population is at very high absolute risk of fracture, hip protectors should be considered.

Taking vitamin D supplements probably does not reduce falls in the community setting except in people who have a low level of vitamin D,¹⁶ but it does reduce the rate of falls for those in RACFs.¹⁷

Primary prevention with medications

Risedronate and etidronate

Cochrane reviews of primary prevention with risedronate⁵ and etidronate¹⁸ showed no statistically significant effect on fractures.



Alendronate

A Cochrane review for primary prevention with alendronate found statistically significant results for primary prevention of vertebral fractures, for which the reduction was clinically important with high quality evidence, but no significant impact on nonvertebral fractures.⁴ Although the relative risk reduction in vertebral fracture was 44%, the absolute risk reduction was only 2%.⁴

Hormone therapy

There is excellent evidence for hormone therapy (HT) (oestrogen only or combined) improving BMD and reducing risk of fracture (30–40% relative risk reduction after 5.7 years) in postmenopausal women when given at or near menopause.¹⁹ This has to be carefully balanced against risks, especially for long term use, and is generally not recommended as first line treatment just for fracture prevention.¹ In

women, the Cochrane review shows the cardiovascular disease harms from HT are apparent in 1–3 years, while the fracture benefits are apparent after a longer time.¹⁹ The minimum effective oestrogen dose for fracture prevention is not known.¹

For men, HT probably helps prevent bone loss in hypogonadal men, however, fracture prevention data is lacking and the risk of side effects may outweigh the benefits.¹

Selective oestrogen receptor modulators

Only raloxefine is approved for treatment of OP in Australia and requires a previous fragility fracture for Pharmaceutical Benefits Scheme authority. Consequently it plays a small role in primary fracture prevention in Australia, and has been shown to reduce vertebral but not nonvertebral fractures when used for secondary prevention. It may worsen menopause symptoms and, like HT, can

Table 2. Preventing osteoporosis – summary of modifiable factors

| Activity | Rationale/practice tips |
|---|--|
| Smoking cessation | Associated with higher rates of fragility fracture but interventions not shown to reduce fractures. Highly recommended for other health reasons |
| Avoid underweight | Probably works through lower muscle mass leading to lower bone mass. Exercise and diet are also likely to be important |
| Hypogonadism | Should be managed in its own right; generally not treated pharmacologically just for fracture prevention |
| Minimise steroid use | >3 months on oral steroids is associated with increased fracture risk. High dose inhaled steroids can impact on bone mass of children |
| Detect and manage malabsorption and chronic inflammatory conditions | Particularly vitamin D and calcium. Consider inflammatory bowel disease, coeliac disease, surgical short gut, chronic arthritis |
| Recurrent falls | Good evidence for multimodal falls prevention interventions; this may reduce fractures |
| Adequate exercise | Prolonged sedentary periods should be considered a risk factor separate to active exercise. High impact (eg. skipping, jumping) has greater impact on BMD than walking, swimming or riding Exercise is recommended for many health reasons, however what is adequate for cardiovascular protection (walking, riding) may not stimulate bone formation. There is a lack of consensus on details in this area |
| Adequate vitamin D | Lack of consensus on what level is required, current expert opinion suggests minimum 50 nmol/L. Expect lower levels at the end of winter. Measurement only recommended for high risk groups. Use safe sun exposure and supplements where this is not feasible or adequate |
| Adequate calcium | Aim for a minimum of 1000 mg/day by diet to maintain bone density. There is controversy over the increased CVD risk from calcium supplementation |
| High alcohol intake | Like smoking, high alcohol intake is associated with higher fracture rates and has many health reasons to support its reduction |
| Pharmacotherapy for those at high risk | Suggest the use of a risk estimate calculator, discuss absolute risk and consider alendronate or other if there are specific indications |
| Case finding | |
| Ensure every person with a fragility fracture is offered OP management | Currently poorly done in both hospital and primary care settings |
| Loss in height >3 cm may indicate vertebral fractures in older people (eg. at health assessments) | Vertebral fractures confer similar increase risk of further fractures as any other fragility fracture |



increase venous thrombosis, however, it can significantly reduce breast cancer risk.¹

Screening and absolute risk tools

Under-recognised and undertreated

At an individual level, the greatest likelihood of delivering health gain is with those people at highest risk of fragility fractures. A 30% relative risk reduction, which could be achieved through use of pharmacotherapy, has a lot more meaning in a person with an absolute risk for fracture of 30% in 5 years, than in an individual with 5% absolute risk in 5 years. For the former, the gain would be a 10% absolute risk reduction (number needed to treat for 5 years to prevent one or more fractures = 10). In the latter scenario, the absolute risk reduction would be 30% of 5% = 1.5% absolute risk reduction (giving a number needed to treat of around 67).

An estimate of an individual's absolute risk can be made using paper based nomograms or web based risk calculators (see *Resources*). Although the impact of using absolute risk tools has not been measured, I have found this to be a valuable aid for decision making for both the clinician and the patient and can be part of routine aged health assessments.

Those at highest risk (and with the most to gain from treatment) are those with previous fragility fractures. Unfortunately, most people being treated for fragility fractures in hospital don't receive any OP care and only some of them are later treated for OP in general practice.^{20,21}

Patterns of bone densitometry use suggest OP is relatively undermanaged in rural populations and in men.^{22,23}

Exactly who should be recommended to have bone densitometry performed remains controversial, with inconsistent recommendations across various authoritative reviews and guidelines. There are no randomised controlled trials of screening for OP using current treatments, so the actual balance of risks and benefits is unproven. However, the combination of a common and important condition with a preclinical phase, an acceptable test and acceptable treatment of known efficacy makes a case for the wide use of bone densitometry in those where it is likely to change management. A rational compromise is to consider bone densitometry in women over 50 years of age or in men over 60 years of age with one or more other risk factors.

Dual energy X-ray absorption – who and how often?

Although other methods of assessing bone density (ultrasound) can predict fracture risk, dual energy X-ray absorption (DXA) is preferred as the evidence base for interventions have used DXA based bone density as the basis for patient selection in the trials.

In the absence of a specific bone losing medical condition or medication, normal age related bone loss will not progress sufficiently in less than 2 years to show a significant change in BMD.²⁴ The time to retest a patient's bone density is when they may be approaching a BMD level that would change management. In the absence of a fragility fracture, this is likely to be when they would be approaching a T-score of

–2.5. As a fairly rough guide, normal decline in T-score is around 10 years per unit.²⁵ Once on treatment, changes in BMD generally do not predict change in fracture risk.¹

Conclusion

Osteoporosis is common and important in terms of impact. Effective interventions have not been delivered as widely as they should be. Efforts should be focused on offering treatment to those groups with the highest risk of fracture, particularly those that have had a fragility fracture.

Although bisphosphonates and hormone replacement can be used for primary prevention, the number needed to treat will be high compared to the use for secondary (postfracture) prevention. There is synergy in the lifestyle recommendations for bone health with other aspects of health, so these should be addressed as thoroughly as possible.

Key points

- With patients, talk about the absolute risk of fracture using all risk factors, not just BMD.
- Management of OP has the most to offer those with highest risk of fracture, those with a previous fragility fracture in particular.
- A large part of the group with most to gain from treatment is being missed.
- Men and those from rural settings are particularly likely to be missing out on evidence based therapy.

Resources

- Clinical guideline for prevention and treatment of osteoporosis in postmenopausal women and older men: www.racgp.org.au/guidelines/musculoskeletaldiseases/osteoporosis
- Risk calculators:
 - www.shef.ac.uk/FRAX/tool.jsp
 - <http://garvan.org.au/promotions/bone-fracture-risk/calculator>.

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