

Calcium salts and osteoporosis

Key messages

- Preventing osteoporotic fractures requires:
 - adequate calcium intake
 - modification of risk factors
 - treatment with specific anti-osteoporotic therapy (if indicated).
- Calcium supplements are recommended for people:
 - with an inadequate dietary intake
 - on specific anti-osteoporotic therapy.
- Calcium supplements increase bone density in some bones by about 1–2%. However there is no evidence that calcium supplements alone significantly reduce fracture rates.
- Consider the elemental calcium content of each calcium product.
- Consider vitamin D supplements in those at risk of vitamin D deficiency.

Preventing and managing osteoporosis

The aim of managing osteoporosis is to prevent both vertebral and non-vertebral fractures. This can be done by preventing bone loss and falls, and treating existing osteoporosis.

Community pharmacists and pharmacy assistants play an important role in promoting risk factor modification, identifying people at risk of osteoporotic fractures and referring them for further assessment and investigation.

This *Pharmacy Letter* focuses on using calcium to prevent and treat osteoporosis.

For further information on risk factors, drug therapy, special groups and phytoestrogens, see *NPS News 26* (available from www.nps.org.au).

Lifestyle contributes to bone health, from childhood to adulthood

Adequate calcium intake essential

Three to four serves of calcium rich foods a day should provide the recommended daily intake of 1000 mg calcium in premenopausal women, postmenopausal women on hormone replacement therapy and men.

Postmenopausal women who are not on hormone replacement therapy should aim for four to five serves of calcium per day (about 1500 mg calcium) as calcium absorption efficiency falls both with age and loss of oestrogen at menopause.¹

Milk, cheese, yoghurt, fish eaten with bones (e.g. canned salmon and sardines) and calcium-fortified foods are the most concentrated sources of dietary calcium (approximately 300 mg per serving).

Do calcium supplements prevent postmenopausal osteoporosis?

Calcium supplements increase bone density in the lumbar spine, femoral neck and forearm by about 1–2%, according to a recent meta-analysis² of controlled trials. Calcium supplements alone, however, have not been shown to significantly reduce vertebral or non-vertebral fracture rates.

Regular exercise has benefits

Resistance and weight-bearing activities contribute to the development of high peak bone mass and may reduce the incidence of falls in older persons.³ Meta-analysis of randomised controlled trials showed that aerobics, weight-bearing and resistance exercises are all effective in increasing the bone density of the spine in postmenopausal women. Walking increased bone density at both the spine and the hip.⁴

Smoking cessation may slow or partially reverse bone loss⁵

Accelerated bone loss and less efficient calcium absorption may contribute to the lower bone mass generally observed in smokers.⁶

Moderating alcohol consumption can reduce fracture risk

Excessive alcohol consumption may decrease bone formation leading to a low bone mass.⁶ Intoxication increases the risk of falls. Both factors combined increase the risk of fracture.



When to refer

Recognise and reduce fracture risk

Osteoporosis is unrecognised in many people. It is important to recognise risks (e.g. family history and loss of height) and to refer people for further assessment and possible definitive treatment with specific anti-osteoporotic therapy. See *NPS News 26* for further information.

Refer the following groups of people to their general practitioner if they have not already discussed preventing and treating osteoporosis:

- **People with suspected or known low-impact fracture**, for example loss of height (indicating possible vertebral fracture) or fracture as a result of a fall from standing. Assessment and investigation with a view to starting specific anti-osteoporotic therapy are required.
- **Perimenopausal women and women with an early menopause**. Hormone replacement therapy has been associated with cardiovascular disease and breast cancer. However women at high risk of osteoporosis may benefit.
- **People taking medication associated with osteoporosis**, for example corticosteroids, anticonvulsants or thyroxine. Other risk factors should be assessed and minimised where possible.
- **People with chronic conditions associated with osteoporosis**, for example parathyroid, thyroid, renal, liver, chronic cardiorespiratory diseases or malabsorption disorders. Assessment and investigation are required.

Minimise potential adverse effects of treatment

Refer the following people to their general practitioner before a calcium supplement is initiated:

- **People with a history of kidney stones** should have a 24-hour urine calcium measurement before starting calcium supplements to avoid hypercalciuria. There may be an advantage in using calcium citrate.⁷
- **People with renal impairment** should have plasma calcium concentrations monitored. The calcium dose may need to be altered or the calcium salt changed.

The role of calcium in treating established osteoporosis

People taking specific anti-osteoporotic therapies should receive calcium supplements

People taking specific anti-osteoporotic therapies (except calcitriol) should receive calcium supplements in addition to their other medications. Calcium supplements were given to both control and treatment groups in most of the clinical trials of anti-osteoporotic therapy.^{3,8} The dose of elemental calcium ranged between 500 mg and 1000 mg.

Calcium supplements play only a minor role in preventing postmenopausal bone loss; their effects on bone loss are weaker than those reported for oestrogen, bisphosphonates, calcitonin⁹ or selective oestrogen receptor modulators (SERMS).⁸

When selecting a calcium supplement

Compare the elemental calcium content

When comparing calcium products consider the elemental calcium content. Calcium carbonate, calcium citrate, calcium lactate and calcium gluconate vary in content of elemental calcium per gram of the salt. Most calcium supplements have the elemental calcium content specified on the label.

Consider patient preference

There is no clear preference for one calcium salt over another. Although many short-term studies compare different formulations for solubility, absorption and effects on bone markers, no long-term studies compare effects on bone mineral density or fracture risk.

Selection of a calcium salt may be influenced by patient preference, for example number of tablets per day, chewable or effervescent tablets.¹⁰ Considering these patient preferences may increase patient compliance.

Tips for increasing compliance with osteoporosis treatment¹¹

- Educate the patient about osteoporosis and its consequences.
- Encourage the patient to assume responsibility for bone health by
 - ensuring adequate calcium and vitamin D intake
 - stopping smoking
 - moderating alcohol intake
 - doing weight-bearing exercise.
- Create a dosing schedule that the patient can link with their lifestyle.
- Minimise costs.

Additional ingredients in calcium products

Vitamin D increases intestinal calcium absorption. Most Australians receive adequate vitamin D through sun-mediated skin synthesis and food sources, for example cod-liver oil, fatty fish, eggs, butter and margarine.

High risk groups that may require vitamin D supplements include the elderly, people in institutional care, women who wear shrouds and those with darkly pigmented skin.

Randomised controlled trials involving elderly people show a positive benefit of vitamin D supplementation (with calcium) in reducing fracture risk.^{12,13} The effective dose of vitamin D is uncertain, but is thought to be 400 to 1000 IU/day.³ Multivitamin tablets usually contain 400 IU of vitamin D, and some calcium supplements contain between 50 and 200 IU.

Boron, magnesium, zinc, copper and manganese may be added to calcium supplements with the purpose of increasing efficacy of the calcium supplement. These elements are involved in the synthesis of bone matrix and may be beneficial only if dietary intake is inadequate.¹⁴

Most benefit is likely to be gained in elderly populations because of decreased ability to absorb these elements from dietary sources. However there are no published human clinical trial data to validate the efficacy of these minerals with regard to bone mineral density or fracture risk.

References

1. Heaney RP, Recker RR, Stegman MR, et al. Calcium absorption in women: relationships to calcium intake, estrogen status, and age. *J Bone Miner Res* 1989;4:469–75.
2. Shea B, Wells G, Cranney A, et al. Meta-analyses of therapies for postmenopausal osteoporosis. VII. Meta-analysis of calcium supplementation for the prevention of postmenopausal osteoporosis. *Endocr Rev* 2002;23:552–9.
3. NIH Consensus Development Panel on Osteoporosis. Osteoporosis prevention, diagnosis, and therapy. *JAMA* 2001;285:785–95.
4. Bonaiuti D, Shea B, Iovine R, et al. Exercise for preventing and treating osteoporosis in postmenopausal women (Cochrane Review). In: *The Cochrane Library*, Issue 4, 2002. Oxford: Update Software.
5. Ward KD, Klesges RC. A meta-analysis of the effects of cigarette smoking on bone mineral density. *Calcif Tissue Int* 2001;68:259–70.
6. Turner RT. Skeletal response to alcohol. *Alcohol Clin Exp Res* 2000;24:1693–701.
7. Wade JP. Rheumatology: 15. Osteoporosis. *CMAJ* 2001;165:45–50.
8. Sambrook PN, Seeman E, Phillips SR, et al. Preventing osteoporosis: outcomes of the Australian Fracture Prevention Summit. *Med J Aust* 2002;176:S1–16.
9. Riggs BL, O'Fallon WM, Muhs J, et al. Long-term effects of calcium supplementation on serum parathyroid hormone level, bone turnover, and bone loss in elderly women. *J Bone Miner Res* 1998;13:168–74.
10. Rossi S, ed. *Australian Medicines Handbook 2003*. Adelaide: Australian Medicines Handbook Pty Ltd, 2003.
11. Silverman S, Schein JR. Physician–patient decision making in osteoporosis management. *Journal of Musculoskeletal Medicine* 2001;March:124–30.
12. Chapuy MC, Arlot ME, Duboeuf F, et al. Vitamin D3 and calcium to prevent hip fractures in elderly women. *N Engl J Med* 1992;327:1637–42.
13. Dawson-Hughes B, Harris SS, Krall EA, et al. Effect of calcium and vitamin D supplementation on bone density in men and women 65 years of age or older. *N Engl J Med* 1997;337:670–6.
14. Lowe NM, Fraser WD, Jackson MJ. Is there a potential therapeutic value of copper and zinc for osteoporosis? *Proc Nutr Soc* 2002;61:181–5.

Self-audit: a quality improvement activity

Designed for community pharmacists, NPS self-audits:

- provide you with evidence-based information about product selection
- provide you with a process to reinforce standards of practice for over-the-counter (OTC) medications
- are eligible for continuing pharmacy education (CPE) points, or quality care pharmacy program continuous quality improvement (QCPP/CQI) points.

Easy to conduct

Participants are asked to complete a structured self-audit form as soon as possible after serving a customer. This helps the pharmacist to review interactions between themselves, their customers and their staff. 'Should the customer have been referred to the pharmacist?' 'Is there a functioning screening and referral system operating in your pharmacy?'

Individual results

Personalised feedback is provided to all participants, and includes individualised results, the group's aggregate results and an expert commentary.

Individualised results show you exactly what is happening in your pharmacy; for example,

'**8** of your customers required the attention of the pharmacist. Your results show that **4** of these customers were actually seen by the pharmacist or pre-registration pharmacist.'

Pharmacist and pharmacy staff enjoy self-audit

Feedback from participants in self-audits is consistently good.

Pharmacists say self-audits are a useful training tool for both themselves and their staff.

Pharmacy assistants enjoy the process of self-audit and are keen to participate.

Self-audits 2003

- Osteoporosis and calcium supplements: Commences April 2003.

To participate, please complete and return the enclosed order form.

A sample of the self-audit form is available from the NPS web site (www.nps.org.au).

- Dyspepsia: Commences August 2003.

An invitation to participate will be mailed directly to you in August 2003.

Previous self-audits available for use

- Non-steroidal anti-inflammatory drugs (NSAIDs)
- Allergic rhinitis
- Common cold
- Smoking cessation

View these at our website www.nps.org.au.

You may still complete these self-audits for training purposes, even though they are officially closed. Instead of receiving individualised results, a set of generic results will be forwarded to you and you can calculate your own results.

Please note, however, closed self-audits do not attract CPE or QCPP/CQI points.

If you would like to complete one of these self-audits, please contact us on:

Phone: (02) 9699 4499

Fax: (02) 9699 5155

Email: info@nps.org.au

The information contained in this material is derived from a critical analysis of a wide range of authoritative evidence. Any treatment decisions based on this information should be made in the context of the individual clinical circumstances of each patient.



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