A multimodal intervention to improve fragility fracture management in patients presenting to emergency departments

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ABSTRACT

Objective: To implement and evaluate a multimodal intervention to improve osteoporosis treatment in patients with a fragility fracture.

Design, setting and participants: Strategies to improve the management of patients discharged from an emergency department after presentation with fragility fracture were implemented prospectively in a large tertiary public hospital. Patients were surveyed by post to assess their awareness of osteoporosis and of the need for treatment. General practitioners and hospital clinicians completed an online questionnaire about their attitudes to osteoporosis and its management. A simplified consensus guideline was developed for local use. Our study was conducted between 1 October 2007 and 31 October 2008.

Main outcome measures: Rates of referral of patients for osteoporosis review; rates of investigation and treatment.

Results: Although most GPs (259/306 [85%]) accepted that it was their responsibility to assess and treat their patients and inform them of their osteoporosis risk, only 35/87 patients (40%) indicated awareness of their risk. After implementation of our project, the rate of bone mineral densitometry investigations improved from 6/200 (3%) to 39/87 (45%) ($P < 0.05$). The number of patients receiving calcium and vitamin D supplementation increased from 24/200 (12%) (for both supplements) to 29/87 (33%) and 32/87 (37%), respectively ($P < 0.05$). Initiation of specific treatments increased from 12/200 (6%) to 26/87 (30%) ($P < 0.05$). Referral of eligible patients to the Fragile Bone Clinic for osteoporosis review improved from 20/500 (4%) to 51/194 (26%). After being contacted by a fracture liaison nurse, 84% of these patients presented for osteoporosis review in the clinic.

Conclusions: A major key to improving osteoporosis management is to actively identify all patients at risk and proactively engage and encourage them to seek assessment and management. A multimodal strategy involving a dedicated fracture liaison nurse may offer the greatest potential for improving education and patient follow-up and treatment.

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The prevalence of osteoporosis in Australia is rapidly increasing because of increased life expectancy and an ageing population. Osteoporosis affects 1 in 2 women and 1 in 3 men aged over 60 years.[1-3] About 50% of fragility fractures have osteoporosis confirmed on bone densitometry criteria. The most common sites of fragility fractures are the hip, wrist and spine.[1,2]

Fragility fractures are associated with significant disability, increased mortality and significant cost to the health care system.[4,5] Hip fracture is considered the most significant and serious type of fragility fracture. About 25% of people suffering hip fractures die within 12 months of the event, 15%–25% require long-term care and 50% require help with activities of daily living.[5-8] Furthermore, people who sustain a first hip or other fragility fracture are at increased risk of subsequent fracture at all sites.[4,5,9]

Effective evidence-based treatments are available for patients with osteoporosis.[10-12] In addition, there are Australian evidence-based guidelines on management of patients with osteoporosis with and without a fracture history.[3] Furthermore, there is evidence to support targeting high-risk groups, especially people with a previous fragility fracture and older patients, as they have the greatest potential to benefit individually and are the most cost-effective groups to treat.[11-13]

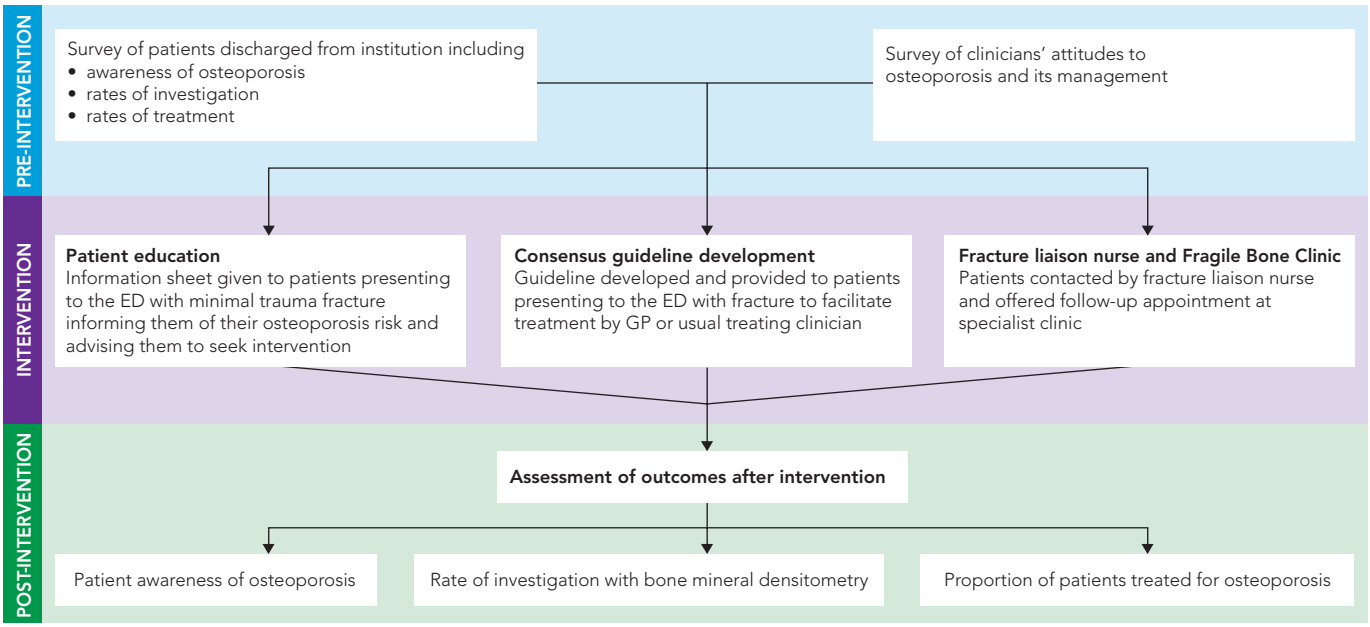
Despite these recommendations and guidelines and the availability of appropriate treatment subsidised by the Pharmaceutical Benefits Scheme, many Australian patients with previous fragility fractures remain untreated.[11,12] A large Australian study conducted in a primary care setting[4] showed that less than 20% of postmenopausal women with a fracture reported receiving any specific treatment for osteoporosis, and only 8% had been investigated for osteoporosis. Western Australian data on high-risk older patients presenting to a tertiary hospital with minimal trauma fractures have shown similar low rates of treatment (< 20%) with specific antiosteoporotic therapies.[14,15] Such hospital patients are considered to represent the highest readily identifiable at-risk group. An intervention level of less than 20% highlights an important lost opportunity for better population health outcomes and reduced health care costs. As reported by Zochling et al,[16] patients not treated at the time of their fracture are likely to remain untreated after discharge.

One important barrier to intervention identified in two Australian studies[4,14] was poor levels of awareness (50%–60%) among patients of their elevated injury risk, including those with previous fractures. Moreover, only a minority of hospital patients seemed to appreciate that osteoporosis was the underlying cause of their fragility fracture and that the osteoporosis was treatable.[14]

The main objective of our project was to implement and evaluate a multimodal intervention to improve osteoporosis treatment in patients with a fragility fracture. Specifically, we aimed to:

- improve awareness of the risks of osteoporosis in patients with fragility fracture presenting to an emergency department (ED) or admitted to hospital;
- empower patients to seek help to reduce their risk of further osteoporotic fractures;
- improve awareness among hospital clinicians and general practitioners of the risks of osteoporosis in patients presenting with fragility fractures;
- develop and implement a simple, user-friendly osteoporosis guideline, based on published Australian guidelines and adapted for local use, to improve the investigation and management of osteoporosis; and

1 Stages of the intervention



ED = emergency department. GP = general practitioner. ◆

• encourage referral of fracture patients to a geriatrician-led, fracture liaison nurse-supported Fragile Bone Clinic for appropriate management.

METHODS

Setting

The setting was a large, tertiary public hospital with a busy ED. The hospital draws from a catchment population of about 600 000 and has 56 000 admissions per year, with about 2220 presentations for fracture each year in people aged 65 years and over. Our study was conducted between 1 October 2007 and 31 October 2008.

Target groups

The primary target group consisted of patients presenting to the ED with fragility fractures. Secondary target groups were clinicians caring for patients within the hospital setting after fragility fracture and GPs providing care to patients after their discharge from hospital. The stages of intervention are summarised in Box 1.

Pre-assessment of the target groups

Two hundred sequential patients who had experienced a fracture were surveyed to assess their awareness of osteoporosis and of the need to treat their underlying condition. This pre-assessment was conducted as part of a Bone Protection Project reported previously,[14,15] which included patients discharged from the ED as well as those admitted to hospital (the present target group). The Bone Protection Project was part of a national survey that included the 200 patients discharged from the tertiary institution surveyed.

We also used a simple online questionnaire to survey GPs and hospital clinicians who were likely to be reviewing patients after a fragility fracture to assess their attitudes to osteoporosis and its management.

Consensus guideline development

Our brief was to develop and implement a simplified and locally acceptable single-page clinical guideline to improve the management of older patients with osteoporotic fracture risk after presentation to hospital with a fracture. An extensive literature review of the evidence base for osteoporosis risk management and current guidelines was completed. A "Draft guideline for the management of osteoporosis following a minimal trauma fracture in older people" was adapted from the best available Australian guidelines.[3] We invited a group of local clinicians with expertise in managing osteoporosis and representatives of the target group of GPs to review and provide feedback on the first draft guideline for local use. After amendments to the first draft, the group convened a workshop to agree on the final wording and form of the guideline. This led to a final consensus guideline that was completed and emailed to all clinicians involved in the review to ensure unanimous support. The final *Consensus guideline* (Box 2) was endorsed by the hospital medical executive for implementation in the clinical service.

Information sheet for patients

An information sheet was combined with the *Consensus guideline* to explain to patients their risk of recurrent fractures and recommend that they have their osteoporosis risk reviewed by their medical practitioner or the Fragile Bone Clinic at the same tertiary hospital.

Poster reminders

We developed and strategically positioned a poster alerting clinicians to review or refer patients presenting with a fracture for osteoporosis risk assessment and management.

Intervention

Patients with fragility fractures who were discharged from the ED were reviewed by a member of the Care Coordination Team. Patients were given the patient information sheet and a copy of the *Consensus guideline*. They were offered the options of review by their GP or at the Fragile Bone Clinic.

Information on all patients who agreed to be reviewed at the Fragile Bone Clinic was provided to a fracture liaison nurse attached to the clinic for the purpose of this intervention. The nurse contacted referred patients by telephone within 2 weeks of referral, offering further information on osteoporosis and encouraging patients to attend the Fragile Bone Clinic or their GP for a review of their osteoporosis risk.

Two sample cohorts of patients discharged from the ED were surveyed by post. The initial survey was of 200 patients presenting to the ED between 6 and 9 months after project implementation. The response rate was 45/200 (23%). The second survey was of 200 patients seen in the ED between 10 and 13 months after further review and reinforcement of the project. The response rate to the second survey was 42/200 (21%).

Statistical analysis

Data were analysed using SPSS software, version 17.0 (SPSS Inc, Chicago, Ill, USA). The main statistical analyses were descriptive statistics and frequencies. A *P* value of < 0.05 was considered significant for between-group comparisons.

Ethics approval

Our project was approved by the Human Research Ethics Committee of Sir Charles Gairdner Hospital, Perth.

RESULTS

The results of the pre-intervention survey of clinicians are presented in Box 3. Most GPs indicated that they reviewed their patients after fracture presentation to the ED (239/306 [78%]), informed them about their risk of osteoporosis (257/306 [84%]), and considered it their responsibility to investigate and manage this risk with the patient (259/306 [85%]). Most clinicians indicated that they would use simple guidelines if available.

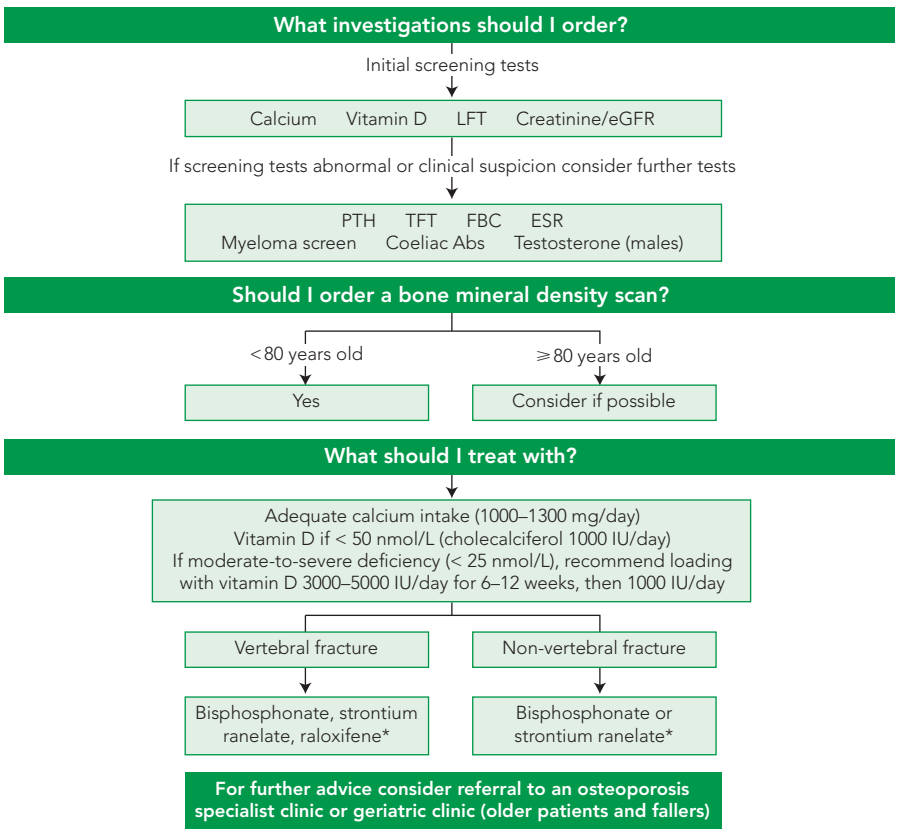
The results of the patient surveys and audits of clinical management before and after the multimodal intervention are summarised in Box 4. Despite clinicians' pre-intervention intentions to manage osteoporosis risk proactively, the baseline results in Box 4 show a low level of patient awareness, a low rate of investigation by bone mineral densitometry and other relevant investigations, and a lower than expected uptake of treatment. After the intervention, all of these outcome measures improved. Investigations with bone mineral densitometry increased from 6/200 (3%) to 39/87 (45%). The number of patients receiving calcium and vitamin D supplementation increased from 24/200 (12%) (for both supplements) to 29/87 (33%) and 32/87 (37%), respectively. Initiation of specific treatments increased from 12/200 (6%) to 26/87 (30%), and 35/87 patients (40%) indicated awareness of their risk. Patients identified the main prescribers of their osteoporosis treatments as GPs (52%), geriatricians (30%) and ED doctors (13%).

We also reviewed the rate of referral of all eligible patients to the Fragile Bone Clinic over the period 1 January to 30 September 2008 as an outcome (Box 5). Of the 569 patients aged 65 years or over presenting to the ED with fragility fractures, 194/569 (34%) were discharged directly from the ED and deemed eligible for referral to the Fragile Bone Clinic. Of the patients eligible for referral to the clinic, 51/194 (26%) were referred. This compared favourably with the low referral rate of 20/500 (4%) in the two calendar years before the project was implemented. When patients were contacted by the fracture liaison nurse and offered review at the clinic, 84% accepted an appointment.

DISCUSSION

Our pre-intervention survey findings were at odds with the expressed intentions of

2 Final *Consensus guideline*



Ab = antibody. eGFR = estimated glomerular filtration rate. ESR = erythrocyte sedimentation rate. FBC = full blood count. LFT = liver function tests. NICS DVA = National Institute of Clinical Studies Department of Veterans' Affairs. PBS = Pharmaceutical Benefits Scheme. PTH = parathyroid hormone. TFT = thyroid function tests. ◆

3 Results of clinician survey before the intervention

Number (%) of practitioners who always or mostly:	Surgeons (*n* = 43)	Physicians (*n* = 103)	GPs (*n* = 306)
Review patients on discharge from hospital	na	na	239 (78%)
Inform patients they have osteoporosis	22 (50%)	93 (90%)	257 (84%)
Request bone mineral densitometry to assess patient's osteoporosis	9 (20%)	45 (44%)	129 (42%)
Feel a responsibility to investigate patients for osteoporosis	3 (7%)	89 (86%)	259 (85%)
Commence calcium supplements	9 (20%)	93 (90%)	254 (83%)
Commence vitamin D supplements	6 (15%)	90 (87%)	205 (67%)
Commence specific osteoporosis treatment	4 (8%)	83 (81%)	223 (73%)
Consider "other doctor" responsible for osteoporosis	37 (86%)	14 (14%)	67 (22%)
Refer patient to "other doctor or clinic"	35 (81%)	24 (23%)	21 (7%)
Would use simple guidelines if available	28 (64%)	99 (96%)	291 (95%)

GP = general practitioner. na = not applicable. ◆

medical practitioners with regard to their own pre-intervention practices. While most GPs and physicians responding to the survey accepted that it was their responsibility to assess, inform and manage their patients for osteoporosis, the patient surveys suggested that only a minority of patients were aware of osteoporosis, were investigated or were offered treatment for osteoporosis. The limitation may be that a biased sample of medical practitioners with an interest in osteoporosis responded to the survey or, alternatively, that some practitioners do not appreciate the significance of the direct link between fracture and a need for osteoporosis assessment and treatment to prevent further fractures. A further limitation of our study was the low survey response rates (21%–25%), which may affect the external validity of the data. However, similar levels of response have been reported in numerous studies, including our pre-intervention surveys. Methods other than postal surveys may need to be considered to improve response rates.

Furthermore, busy doctors in the ED, orthopaedic ward and general practice may feel it is not their role, or not within their field of expertise, to manage this risk. In the ED and hospital setting, the focus is predominantly on acute, reactive care, rather than proactive care that aims to prevent disease onset and minimise complications. Most ED and orthopaedic clinicians in our institution claimed that time and resources were the main barriers to improving the quality of osteoporosis care in their settings. To this list of barriers we would add hospital "culture" and normative clinical behaviour. Nevertheless, most clinicians supported the need to improve care and welcomed collaboration with clinical colleagues capable of providing this care.

Previous studies have confirmed that single strategies, including providing information to patients and implementing guidelines alone, are ineffective in improving treatment.[17-19] Our project used a multimodal and multidisciplinary approach to improving awareness and management of osteoporosis risk. The focus was on empowering patients by providing easy-to-understand information and assisting clinicians by providing simple, easy-to-follow guidelines. To overcome the issue of time constraints on medical practitioners directly involved in patient care, allied health staff and other medical practitioners, including geriatricians with an explicit mandate to manage osteoporosis risk, cooperated to facilitate patient identification and management.

Our project provided the opportunity for patients in the target group to be referred directly to a service for further assessment and management or to be managed by the treating clinician or GP. The latter model was shown to be of limited success in our setting. While overall rates of assessment, management and referral to the Fragile Bone Clinic improved substantially, a substantial proportion of patients were not optimally managed or referred for follow-up assessment and care at all. The reasons for this were unclear.

On a promising note, the majority (84%) of those referred agreed to be reviewed in the clinic for osteoporosis management when contacted by the fracture liaison nurse. The value of a fracture liaison service that actively identifies and proactively encourages patients to seek assessment has also been demonstrated in previous studies.[20-24] One strategy that should be considered in future is to contact all patients presenting to the ED with a fracture to offer them advice and follow-up and provide multimodal care, as described here and in a study by Bogoch et al.[22]

The persistent low level of awareness of osteoporosis remains a significant concern and is likely to remain a barrier to patients seeking medical review and accepting and complying with preventive treatment. At best, after our intervention, 43% of patients in the ED setting were aware that they may have osteoporosis. This was in spite of being provided with an information sheet and

4 Levels of osteoporosis awareness, investigation and treatment before and after the intervention*

	Pre-intervention survey†	1st post-intervention survey‡	2nd post-intervention survey§
Osteoporosis awareness	na	17 (38%)	18 (43%)
Bone mineral densitometry done	6 (3%)	18 (40%)¶	21 (51%)¶
Calcium supplements	24 (12%)	17 (38%)¶	12 (29%)¶
Vitamin D supplements	24 (12%)	16 (36%)¶	16 (38%)¶
Specific osteoporosis treatment	12 (6%)	14 (32%)¶	12 (29%)¶
Total initiated or changed osteoporosis treatment		*21 (47%)*	*14 (33%)*

ED = emergency department. na = not available. * Data are number (%) of respondents. † From Bone Protection Project survey of patients discharged from the ED between 2003 and 2005 (local *n* = 200; national *N* = 1829).[15] ‡ From ED patient survey, March to June 2008 (*n* = 45; response rate, 45/200 [23%]). § From ED patient survey, July to October 2008 (*n* = 42; response rate, 42/200 [21%]). ¶ Statistically significant ($P < 0.05$) compared with pre-intervention results. ◆

5 Review of patients with fragility fracture, and referrals to the Fragile Bone Clinic (FBC), 1 January to 30 September 2008

Review/referral	Number	Proportion
All patients reviewed in ED	37 854	
Patients aged ⩾ 65 years reviewed in ED	11 436	30% of all ED admissions
Patients aged ⩾ 65 years with MTF presenting to ED	569	5% of patients ⩾ 65 years admitted to ED
Patients aged ⩾ 65 years after MTF discharged directly from ED (eligible for referral to the FBC)	194	34% of patients ⩾ 65 years with MTF admitted to ED
Patients referred to FBC	51 over 9 months (6/month)	26% of patients eligible for referral to FBC
Referred patients who were reviewed in FBC	43 over 9 months (5/month)	84% of patients referred to FBC
Historical referrals, 2006–2007	20 over 24 months (< 1/month)	

ED = emergency department. MTF = minimal trauma fracture. ◆

osteoporosis education material by staff. It is possible that the ED may not be the best setting for giving patients educational information about fracture prevention and osteoporosis, given that they are preoccupied at the time with more acute issues of pain, comorbidity and anxiety in an overwhelming environment. A phone call by a fracture liaison nurse may be a more appropriate means of providing follow-up and advice once the acute episode has subsided.

CONCLUSIONS

Our evaluation of a multimodal intervention confirms the difficulty of identifying and managing patients with osteoporosis at a level that will substantially reduce fragility fractures in the community. Relying solely on patient education, provision of guidelines and action by busy clinicians appears not to provide a satisfactory solution, although improvements are possible. The key is to actively identify all patients at risk and proactively engage patients and encourage them to seek assessment and management. A dedicated fracture liaison service may offer the most effective means of follow-up.

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COMPETING INTERESTS

Denise Glennon has received speaker fees from Sanofi-Aventis and Servier.

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REFERENCES

1 World Health Organization. Prevention and management of osteoporosis. Geneva: WHO, 2004. (WHO Technical Report Series No. 921.)
2 Access Economics. The burden of brittle bones: costing osteoporosis in Australia. Canberra: Access Economics for Osteoporosis Australia, 2001.
3 Sambrook PN, Seeman E, Phillips SR, Ebling PR. Preventing osteoporosis: outcomes of the Australian Fracture Prevention Summit. *Med J Aust* 2002; 176 (8 Suppl): S1-S16.
4 Eisman J, Clapham S, Kehoe L; Australian Bone-Care Study. Osteoporosis prevalence and levels of treatment in primary care: the Australian Bone-Care Study. *J Bone Miner Res* 2004; 19: 1969-1975.
5 Cooper C. The crippling consequences of fractures and their impact on quality of life. *Am J Med* 1997; 103 (2 Suppl): 12S-19S.
6 Chilov MN, Cameron ID, March LM. Evidence-based guidelines for fixing broken hips: an update. *Med J Aust* 2003; 179: 489-493.
7 Scaf-Klomp W, Sanderman R, Ormel J, et al. Depression in older people after fall-related injuries: a prospective study. *Age Ageing* 2003; 32: 88-94.
8 Nguyen TV, Center JR, Eisman JA. Osteoporosis: underrated, under diagnosed and undertreated. *Med J Aust* 2004; 180 (5 Suppl): S18-S22.
9 Klotzbuecher CM, Ross PD, Landsman PB, et al. Patients with prior fractures have an increased risk of future fractures: a summary of the literature and statistical synthesis. *J Bone Miner Res* 2000; 15: 721-739.
10 Delmas PD. Treatment of osteoporosis. *Lancet* 2002; 359: 2018-2026.
11 Brooks P, Hooper M, Smallwood R. Bone and joint diseases: prevention and control. *Med J Aust* 2004; 180 (5 Suppl): S4-S5.
12 Philips P, Braddon J. Osteoporosis — diagnosis, treatment and management. *Aust Fam Physician* 2004; 33: 111-119.
13 Seeman E, Eisman JA. MJA Practice Essentials 7: Treatment of osteoporosis: why, whom, when and how to treat. *Med J Aust* 2004; 180: 298-303.
14 Inderjeeth CA, Glennon D, Petta A. Study of osteoporosis awareness, investigation and treatment of patients discharged from a tertiary public teaching hospital. *Intern Med J* 2006; 36: 547-551.
15 Teede HJ, Jayasuria IA, Gilfillan CP. Fracture prevention strategies in patients presenting to Australian hospitals with minimal-trauma fracture: a major treatment gap. *Intern Med J* 2007; 37: 674-679.
16 Zochling J, Schwarz J, March L, Sambrook P. Is osteoporosis undertreated after minimal trauma fracture [letter]? *Med J Aust* 2001; 174: 663-664.
17 Gross P, Greenfield S, Cretin S, et al. Optimal methods for guideline implementation: conclusions from Leeds Castle meeting. *Med Care* 2001; 39 (8 Suppl 2): II85-II92.
18 Grol R, Wensing M, Eccles M. Improving patient care: the implementation of change in clinical practice. Sydney: Elsevier, 2005.
19 Grol R. Between evidence-based practice and total quality management: the implementation of cost-effective care. *Int J Qual Health Care* 2000; 12: 297-304.
20 McLellan AR, Gallacher SJ, Fraser M, McQuillan C. The fracture liaison service: success of a program for the evaluation of patients with osteoporotic fracture. *Osteoporos Int* 2003; 14: 1028-1034.
21 Kimber CM, Grimmer-Somers KA. Evaluation of current practice: compliance with osteoporosis clinical guidelines in an outpatient fracture clinic. *Aust Health Rev* 2008; 32: 34-43.
22 Bogoch E, Elliot-Gibson V, Beaton D, et al. Effective initiation of osteoporosis diagnosis and treatment for patients with a fragility fracture in an orthopaedic environment. *J Bone Joint Surg Am* 2006; 88: 25-34.
23 Tosi L, Gliklich R, Kannan, K, Koval K. The American Orthopaedic Association's "own the bone" initiative to prevent secondary fractures. *J Bone Joint Surg Am* 2008; 90: 163-173.
24 Van Helden S, Cauberg E, Geusens P, et al. The fracture and osteoporosis outpatient clinic: an effective strategy for improving implementation of an osteoporosis guideline. *J Eval Clin Pract* 2007; 13: 801-805.

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