

Multifaceted guideline implementation strategies improve early identification and management of osteoporosis

Cheryl M Kimber and Karen A Grimmer-Somers

Abstract

Background: Osteoporosis contributes significantly to fractures, subsequent disability and premature mortality in Australia. Better detection and management of osteoporosis will reduce unnecessary health expenditure.

Objective: To evaluate, in one large tertiary metropolitan hospital, the orthopaedic health care team's approach to osteoporosis guideline implementation to improve early identification and management of osteoporosis.

Methods: This paper describes the implementation of multifaceted strategies to improve health-promoting behaviours and the uptake of osteoporosis guidelines by staff in the orthopaedic outpatient clinic at one metropolitan hospital, reflecting organisational and individual commitment to embedding guideline recommendations into routine practice. Implementation strategies were aimed at the requirements and perspectives of different stakeholder groups. Five audit datasets were compared: 62 patient records in two baseline audits, and three post-implementation audits of 31 patient records, collected over the following 3-month periods (August 2006 to April 2007). All audits used the same criteria to assess compliance with clinical guidelines, and outcomes of implementation strategies.

Results: There was consistent improvement in compliance with osteoporosis guidelines over the audit periods. Comparing baseline and immediate post-implementation data, there was a significant improvement ($P < 0.05$) in the percentage of patients with likely fragility fractures who were identified with an osteoporotic fracture. The percentage of patients who had a likely fragility fracture, with whom staff communicated about their problems and how to deal with them, increased consistently over all post-implementation audit periods. For patients with established osteoporosis who presented with fragility fractures, there was sustained improvement over the

audit periods in the percentage provided with guideline-based care.

Conclusion: This study highlights that appropriate and targeted intervention strategies can be effective if modelled on best practice guideline implementation approaches with the use of a coordinated post-fracture management approach to osteoporosis.

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What is known about the topic?

A number of high quality guidelines are available to support early detection and best practice management of osteoporosis in hospital settings. However, sustainable implementation of guidelines poses practical issues in terms of structure and processes in hospitals.

What does this paper add?

This study evaluated the outcome of implementation strategies used to improve use of osteoporosis guidelines, through de-identified records of all patients with any wrist fracture. The results suggested that over time, the management plans became increasingly aligned with best practice.

What are the implications for practitioners?

The findings highlight the importance of using a systematic approach that links secondary hospital care with community (primary) care in assisting the ongoing best practice management of patients with a chronic condition.

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OSTEOPOROSIS IS AN increasingly common chronic disease in the Western world, related to a range of risk factors including older age, being female, inadequate physical activity or exercise, inadequate dietary calcium, and use of certain medications.¹⁻⁶ Once established, osteoporosis places a significant burden on the individual, and society, in terms of avoidable fractures and increased fracture potential, reduced mobility and quality of life, and the associated increased health costs.⁷⁻⁸ Health professionals working in primary and secondary health care settings are well placed to educate the general public about osteoporosis risk factor identification and management, early diagnosis and appropriate intervention. There have been an increasing number of community health and hospital outpatient campaigns mounted around the world regarding good bone health. These often incorporate messages about regular exercise, maintaining a healthy balanced diet, seeking preventive medical advice, and preventing avoidable injury (such as falls) in the home and the community.⁵⁻⁸ Best-practice clinical pathways require early identification and intervention for patients who are potentially at risk of osteoporosis. This involves a range of appropriate and patient-centred primary health care interventions such as education, and appropriate referral to, and communication with, key primary health personnel. These personnel could implement early osteoporosis management strategies, and monitor ongoing osteoporosis status.

An all-too-frequent ramification of undiagnosed osteoporosis is a fractured neck of femur from a fall.⁹ For many patients, this spells the end of their community independence, and for others it further marks the final years of their life, related to a vicious cycle of reduced mobility, increased falls and body systems deterioration.^{9,10} Such events impose significant costs on the individual, their families and the health system.^{2,8} There are clear indications from the epidemiology of fractured neck of femur events that many sufferers could have been identified earlier, usually at the point of an earlier event such as a wrist fracture resulting from a minor trip or fall.¹⁰⁻¹⁴

Despite the availability of high quality clinical guidelines to guide best practice, consistent guideline implementation strategies and compliance with guideline recommendations are not widespread in either primary or secondary health systems.^{2,14-16} Uptake of guidelines requires organisation and individual commitment, cultural awareness and change champion intervention to ensure that guideline recommendations are consistently imbedded into routine practice.^{17,18}

We propose that application of guidelines commences with opportunistic identification of potential osteoporosis sufferers when they present at hospital outpatient fracture clinics with low trauma fractures resulting from a trip or fall from a sitting or standing height. This could provide the first warning of the presence of underlying osteoporosis. When bones are healthy, a trip or fall from such low height should not result in a fracture. Poor compliance with guidelines could be found in three scenarios: few patients with low trauma fractures are identified as at-risk for osteoporosis, only some are flagged as at-risk for further fractures, and/or treated appropriately for osteoporosis.

In our earlier paper¹⁹ we found in a retrospective clinical record audit how poorly guidelines for osteoporosis diagnosis and management were incorporated into routine outpatient clinic practice in one large metropolitan hospital in South Australia. As we suspected, there were low levels of identification of at-risk patients by the orthopaedic team, and low compliance with commencing patients who had been identified as at-risk on a coordinated clinical management pathway as per guideline recommendations. Communication with the primary health providers or specialists was variable and there was little evidence that the organisational culture included best practice health strategies such as proactive health promotion and osteoporosis prevention.¹⁹

In this paper we present the findings of follow-up prospective patient record audits which tested whether our efforts to implement best-practice management improved immediate compliance with the clinical pathway.

I Key elements of guideline recommendations

Key guideline recommendations	Actions taken
Identification of risk factors for osteoporosis	Assessment of risk factors such as age, sex, family history, past medical history including previous fractures and medications, menopause history, lifestyle approaches (ie, dietary intake, exercise level, smoking)
Identification of risk factors for falls	Assessment of current and previous falls, gait analysis, use of aids, past medical history
Identification of the presence of a fragility fracture	Medical and functional history of current falls or tripping (ie, from standing or sitting height), previous fractures, history of osteoporosis or osteopenia
Commencement on an osteoporosis management protocol	Identification fragility fracture, education of patient/carer, medication review, referral to general practitioner or metabolic clinic for further investigations and specific management
Implementation of a <i>coordinated</i> outpatient post-fracture osteoporosis education and management program	Automatic identification of fragility fractures, provision of patient education (written and verbal); communication with GPs using standardised letters
Orthopaedic units' active participation in the identification and assessment of fragility patients for osteoporosis	Engaging orthopaedic consultants, registrars, visiting fellows, residents and orthopaedic nurses in the osteoporosis management protocol
Increased education and awareness programs in osteoporosis and the fragility fracture cascade phenomena	Provision of multi-modal education sessions

Methods

Patient profile

Patients were referred to the tertiary hospital outpatient clinic from a variety of sources, including the tertiary hospital's Accident and Emergency Department, and orthopaedic and non-orthopaedic inpatient wards, local GPs and other hospitals. Data were collected by audit of patient notes including age, gender, osteoporosis risk, fracture site and mechanism of injury, medical management, patient education and referrals. Comparisons of the characteristics of the audit samples and those of the overall population of patients presenting with potential fragility fractures to the site was precluded by the lack of a comprehensive data system in the outpatient department. Ethics approval for this study was provided by the hospital clinical governance committee.

Guideline recommendations

We synthesised recommendations from the Scottish Intercollegiate Guidelines Network (SIGN), National Institutes of Health Consensus Development Panel on Osteoporosis Prevention, Diagnosis

and Therapy (USA), National Guidelines Clearinghouse, and the 2001 Australian Fracture Prevention Summit clinical guideline for osteoporosis diagnosis and management.^{1,3,5,7} These guidelines were chosen because of their high quality, clear primary health care recommendations, and relevance to the clinical site. The key elements of our guideline-based recommendations are outlined in Box 1.

Implementation

There is a growing body of literature on the multiple strategies that are required to effect a cultural change that supports and sustains guideline implementation.^{17,18,20-23} Based on our knowledge of current performance in the hospital site,¹⁹ we not only identified opportunities for improvement, but also ways in which improvement could occur. Then we made a concerted effort over 6 months from August 2006, to increase awareness of, and compliance with, the osteoporosis guideline recommendations. This took the form of several congruent and concurrent steps.

In the first step the change champion (CK, principal author, orthopaedic nurse practitioner) was funded by a National Institute of Clinical Studies (NICS) fellowship* with the aim of changing the organisation culture to improve practice and patient outcomes. Key intended outcomes from this project were 1) an increase in the percentage of individuals identified with fragility fractures[†] which could indicate underlying osteoporosis, 2) increased awareness of osteoporosis by all health providers in the fracture clinic, and 3) the application of an osteoporosis management plan which would decrease the fracture cascade phenomenon commonly associated with undetected and unmanaged osteoporosis.^{17,18}

The second step established the current culture of outpatient fracture clinic staff, which was to address patients' fractures with little consideration of any other underlying medical or social issues. Implementation of any guideline or protocol is about understanding local drivers for change, local barriers to uptake of better practices, negotiating around these barriers, and compromising on appropriate ways of operationalising change.^{18,20-23} The change champion thus attempted, in the third step, to understand each stakeholder's perspective and values relating to the implementation of guideline recommendations in each area of practice. This assisted her to tailor the way in which messages were delivered to different audiences.^{22,23} To do this she first developed an organisational chart to identify all relevant stakeholders within the hospital outpatient clinics and the primary health care environment surrounding the hospital. She then surveyed these stakeholders (including patients), before rolling out the guidelines (June–July 2006). This step used focus groups and written surveys with open-ended questions.

From this step, potential barriers to evidence uptake were identified within the organisational

structure, and specific strategies were developed to address these barriers. These included:

- obtaining local consensus from health providers (orthopaedic doctors and nurses) that the clinical problem of osteoporosis was important and the approaches proposed to manage the problem were appropriate and feasible;
- developing targeted education programs for different health disciplines regarding the guidelines and how they could best be implemented in the organisation. These education sessions included information on the benefits of long-term health and cost gains associated with guideline implementation for osteoporosis;
- obtaining overt support for the initiative from nursing and medical leaders;
- providing evidence of their support by directives and their presence at meetings and education sessions;
- establishing group brainstorming sessions to obtain stakeholder buy-in in identifying and addressing barriers to evidence uptake; and,
- presenting ongoing record audit findings regularly to provide incentives to adopt implementation strategies.

We recognised that the needs and perspectives of the different stakeholders, their educational backgrounds, and their health philosophies could influence their current and future behaviours, as well as the way they changed behaviours. Thus in the penultimate step, we developed and implemented multifaceted approaches which addressed the *Think, Do, Plan, Act* cycle²³⁻²⁵ as relevant to each stakeholder. The separate facets are outlined below.

1. Health professional education. No opportunity was lost by the change champion to bring the osteoporosis message to the attention of health professionals in the orthopaedic department. She provided education in a number of forums and formats, including weekly clinical multidisciplinary meetings, outpatient clinic meetings, on ward round, in orientation sessions for new medical and nursing staff, at hospital grand rounds and hospital conferences, and in the internal hospital newspaper and other media opportunities. Rotation of medical staff (from every 12 weeks to

* The NICS Fellowships, established in 2003, identify and support health professionals who are future leaders in evidence-based health care to improve health care by getting health and medical research into practice.

† Fragility fracture is one which occurs after minimal trauma, such as a fall from a standing or sitting height, which under usual circumstances (ie, good bone health) should not cause a fracture.

every 6 months) necessitated frequent and repeated explanations of the osteoporosis management and intervention strategy plan. Nursing staff in the fracture clinics were generally a more stable workforce whose education requirements decreased as the length of time of the project implementation increased. After the initial osteoporosis information sessions, nursing education consisted of reinforcement and encouragement of new practice as well as minor clarification of patient- and system-related issues. However, recent changes in nursing staff have required the change champion and permanent nursing staff to provide more frequent intensive explanations of the osteoporosis management protocol to new and relieving staff, and more closely monitor and supervise their input into the guideline-based interventions.

Given the hierarchical nature of the medical team in the orthopaedic unit, different messages had to be given in different ways to different medical staff. The senior and visiting consultants were engaged as change champions, who gave their approval to the process of highlighting osteoporosis as an issue for their department. The registrars, registered medical officers and interns were taught to operationalise the risk-identification process, and communicate with patients and families, other hospital staff, and health providers elsewhere.

2. Patient identification and management was the first element of the change process. In order to streamline patient identification, nurses were empowered to undertake front-line risk assessment when the patient arrived at the fracture clinic, usually for their first outpatient appointment after their fracture. The scope of the project was also extended to include *all* fractures resulting from a low trauma incident (as opposed to only wrist fractures), which potentially identified a wider pool of patients with a likely fragility fracture.

Nurses delivered a one-page, five-question triage tool to patients, to identify those with a low trauma fracture, who may be at risk of osteoporosis. The questions included age, gender, nature of fracture incidence, menopause history, and past history of fracture.

All potentially osteoporotic patients were then further surveyed by an orthopaedic nurse using a short, structured questionnaire to obtain additional information on osteoporosis risk. This survey largely sought more detailed information on medical history, and lifestyle factors such as smoking, diet, living arrangements, exercise behaviours, and current and past medications (including over-the-counter). This information was used as a flag to:

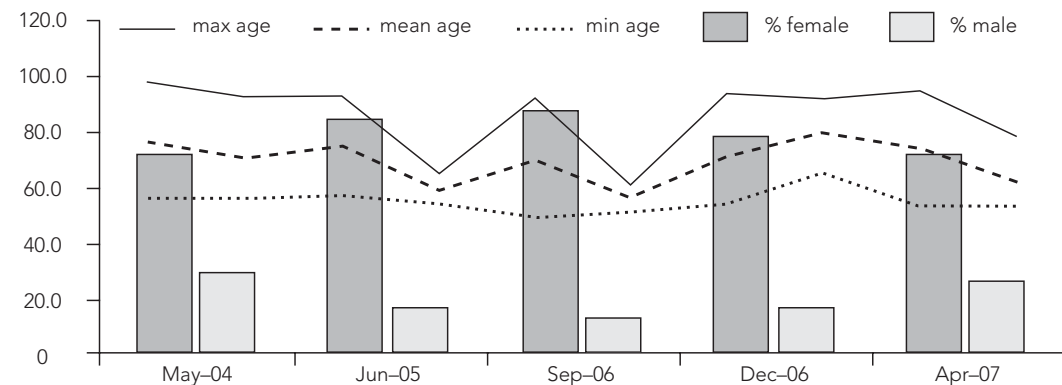
- provide targeted education to patients about osteoporosis risk factors and management; and
- facilitate a referral for ongoing care to the patient's GP or to a specialist.

Education was generally provided by nurses, but was also provided opportunistically by medical staff.

3. Communication. A standard letter was sent to the patient's general practitioner indicating the at-risk potential for their patient, and outlining the actions taken (or recommendations for treatment). This letter acted as a link between the primary health care environment and the metropolitan hospital. The patient was given a copy of this letter to ensure that they were part of the loop.

4. Celebrating and capitalising on the change process. Even in the early stages of implementing the osteoporosis guideline, there was evidence that the behaviour change process was active. Initially, any outpatient fracture clinic nurse conducted the in-depth patient survey and tracked the referral forms, however the nurses themselves recognised that this proved to be inefficient and ineffective, as patients were often missed. A change was subsequently instigated by the orthopaedic nurses, when they appointed an "osteoporosis nurse of the day" to facilitate completion of patient questionnaires, and provide osteoporosis education, facilitate orthopaedic doctors' involvement in the process (including completion of Medicare referral forms) and document any actions that had been instigated. Thus, all nurses in the clinic had an opportunity to regularly act as the liaison nurse, which increased their ownership of the project and the change process, facilitated their own education, increased their visibility in the fracture clinic as osteoporosis

2 Age (years) and gender profiles of the audit periods



May 2004 and June 2005 = baseline audits; Sept 2006, Dec 2006 and April 2007 = subsequent post-implementation audits.

champions, and assisted in better education uptake by other health professionals, patients and families. This element of the change process also had the spin-off of increasing the cohort of knowledgeable and committed change champions in the clinic, and increasing the number of people who were aware of, and supported, better processes and practices in identification and management of patients at risk of osteoporosis.

Once patients were identified as being at risk of osteoporosis, they were actively engaged in the referral and management process. They were given the choice to attend their GP or be reviewed by a metabolic bone specialist in the institution's outpatient clinic (or a clinic elsewhere). Where other comorbidities or risk factors were identified (such as increased falls risk, or multiple medication concerns), patients were referred, as relevant, to other health providers or community health services in the region.

All patients identified as being at risk of osteoporosis had an identification sticker placed in their case-notes flagging their risk potential and detailing the actions taken. This was to facilitate legible standardised accurate documentation, and ongoing monitoring.

Follow-up data collection and monitoring

After guideline implementation, three-monthly audits, each of 31 randomly selected patient

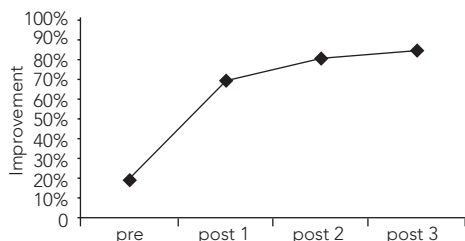
records, were undertaken over 9 months, to establish evidence of change in practice which might be attributed to the guideline implementation initiatives. These audits used the same audit tool as earlier reported.¹⁹

Post-implementation evaluation

Staff participating in the change process were interviewed throughout the post-implementation monitoring phase using semi-structured questions, either individually or in small focus groups. These findings will be presented elsewhere.

Here we present the findings of three post-implementation audits, focusing on the indicators with the poorest compliance in the baseline audit.¹⁹ Four datasets are reported in this paper: the 62 patients (combined) from the two baseline audits,¹⁹ and three post-implementation audits of 31 patients, consecutively identified from patient lists, over the three following 3-month periods. The repeat audit data were stored in Microsoft Excel format (Microsoft Corporation, Redmond, Wash, USA), and the performance indicators were reported as percentages calculated using appropriate denominators. Rates of change, and differences in proportions, were calculated using ANOVA or chi-squared statistics as appropriate, with significance set at $P < 0.05$. The performance indicators reported in this paper, and the average baseline audit figures used for comparison, were

3 Percentage improvement in the orthopaedic team's identification of patients with a likely osteoporotic fracture over the audit periods



Pre = baseline. Post 1 = 3 months post implementation. Post 2 = 6 months post implementation. Post 3 = 9 months post implementation.

the percentage of patients identified as potential osteoporosis sufferers who had presented with a low trauma fragility fracture (27.4%), and of these patients, the percentage:

- who were provided with education (47.0%);
- who were referred to a GP or specialist for ongoing osteoporosis management (10.8%);
- whose care was facilitated by structured communication with GPs (45.5%).

Results

Generalisability of audit findings

The age and gender profiles of the audit samples are outlined in Box 2. The consecutive recruitment of the patients in the audit samples at the specific time periods, and the consistency of age range and gender proportions across the time periods gave us confidence that selection bias had been minimised. We hypothesised, without any available information on the wider outpatient sample, that the gender and age profiles of the audit samples would be no different from that of the overall sample of patients presenting to the fracture clinic.

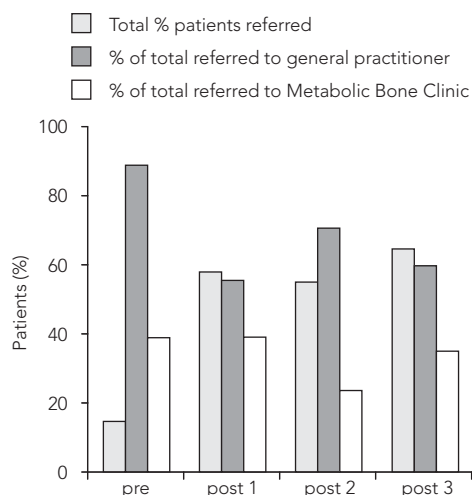
Overall, there was significant improvement in compliance with the performance indicators over the audit periods. Change was immediately observable in all indicators after implementation of the guideline education strategies, and improvements continued over the subsequent audit periods.

Percentage of patients identified with likely osteoporosis

There was an immediate and significant improvement in the percentage of patients with likely fragility fractures who were identified with an osteoporotic fracture ($P < 0.05$ between the baseline and first post-implementation audit). This provided early evidence of the success of the guideline implementation strategy, and provided positive reinforcement for all staff to continue the guideline implementation action plan. Although the subsequent rate of change was not significant, it showed a positive trend. This improvement is outlined in Box 3.

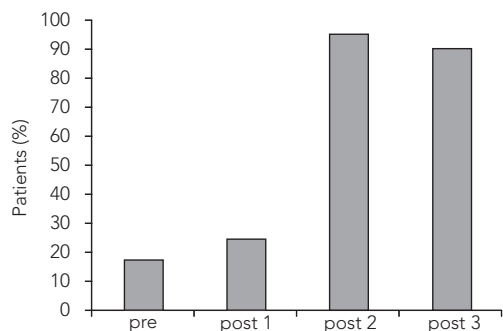
Not only were more patients identified, but their management plans were increasingly aligned with best practice. This was evidenced by the percentage of patients who were referred for further care to other health practitioners (Box 4), and the percentage of patients who were provided with information by hospital staff. The Metabolic Bone Clinic is a tertiary based outpatient clinic based in a nearby hospital where specialists in bone metabolic disorders (endocrinologists, rheumatologists)

4 Percentage of patients referred for osteoporosis management (anywhere) at each audit period



Pre = baseline. Post 1 = 3 months post implementation. Post 2 = 6 months post implementation. Post 3 = 9 months post implementation.

5 Percentage of patients who were provided with a guideline-driven package of care over the audit periods



Pre = baseline. Post 1 = 3 months post implementation. Post 2 = 6 months post implementation. Post 3 = 9 months post implementation.

review patients, instigate treatment if required and liaise with the patient's general practitioner. The percentage of patients who had a likely fragility fracture, with whom staff communicated about their problems and how to deal with them, increased markedly over the audit periods, from 19.6% in the baseline audit, to 69.2% in the first post-guideline period, 80% in the second and 84% in the third. This improvement was significant ($P < 0.05$) between the baseline and post-intervention periods, and although subsequent improvement was not significant, it continued to show a positive trend over the time periods.

Of note was the delay observed in the change in the percentage of patients who were provided with an overall guideline-driven package of care (Box 5). This strategy took another 3 months after the guideline implementation was commenced to show an effect.

For patients with established osteoporosis who presented with fragility fractures, there was also an improvement over time in the percentage provided with guideline-based care. This reflected a continued improvement in appropriate referrals over the audit periods, and in improving communication with GPs on current best practice guidelines (Box 6).

Anecdotally, from the implementation phase staff interviews, patients have been perceived by

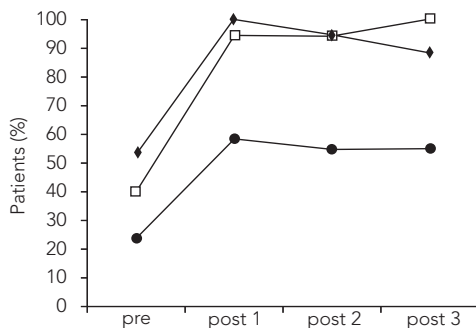
hospital staff to be responding to education by initiating better care for themselves. They have been reported to telephone the clinic for their results, to initiate appointments with their GP and engage in meaningful conversations with other health workers about their health and management strategies. Thus it would appear that patients are becoming drivers of their care, rather than recipients only.

Discussion

This is one of the first projects in Australia which demonstrates the outcome of a guideline implementation program in a busy hospital outpatient clinic. The findings highlight the importance of using a systematic approach that links secondary hospital care with community (primary) care in assisting the ongoing best practice management of patients with a chronic condition. It also highlights that appropriate intervention strategies, aimed at the requirements and perspectives of different stakeholder groups, can be effective if modelled on best practice guideline implementa-

6 The percentage of patients with established osteoporosis and no gold standard management plan (GSMP)

- Total with no GSMP
- % of those with no GSMP but appropriate referral
- ◆ % of those with no GSMP but subsequent GP communication



Pre = baseline. Post 1 = 3 months post implementation. Post 2 = 6 months post implementation. Post 3 = 9 months post implementation.

tion approaches.²⁰⁻²² Guideline-based care is often related to single disciplines and readily detectable conditions (such as blood pressure, cancer screens etc). In this instance the condition is detected almost by default (using a proxy measure of a fracture with or without low level trauma), and the management is multipronged and requires multidisciplinary input over the long term. Thus, this level of sustained success in implementing a multidisciplinary guideline highlights how a planned approach to understanding stakeholder perspectives, philosophies and potential for change can be a powerful driver for change.

Despite the disappointing baseline audit findings,¹⁹ the follow-up audits demonstrated that targeted guideline implementation could have a dramatic effect on key indicators, including the identification of patients with likely osteoporosis, and referral by hospital staff to appropriate care, as indicated by the guidelines. This suggests that the immediate guideline implementation phase significantly influenced behaviours of staff, and that the sustained improvement, albeit at a slower rate, demonstrated continuous improvement in behaviours. This indicates that the multifaceted behaviour change approaches were successful, in not only highlighting opportunities for change, but in sustaining for all stakeholders the profile of healthy bones, the need for changed behaviours, and continued enthusiasm for better practices.

We propose that the implementation strategy was effective because it was driven initially by one change champion, who quickly passed on responsibility for change to a team. The involvement of NICS in this project gave the change champion the financial support as well as the imprimatur to formally work with all levels of health care providers in the organisation. The success of this project highlights the importance of formal support at multiple levels in the Australian health care system (from funders, academic institutions through to health workers and patients) when best practices are implemented using behaviour change strategies. This concurs with other published research into guideline implementation, which highlights that there is no

one effective strategy, and that multiple strategies are required to change cultures and behaviours.²⁰⁻²⁴

Grol et al²⁵ discussed this issue of single or multifaceted interventions in changing professional behaviour and implementing guidelines to best practice. They stated that numerous intervention strategies and measures can be used to change behaviour and implement innovation. These could be broadly grouped into professional-orientated strategies, patient-orientated strategies, financial measures, organisational measures and legal regulation and/or rules. We found that the selection of our interventions depended upon the needs analysis of our target group, and the setting in which the intervention was to occur. Our findings concurred with those of Grol et al, as we observed that multifaceted interventions had a greater impact than single strategies, as they could address multiple barriers to, and facilitators to, change. It was not possible, however, to identify which specific combination of strategies would guarantee success. Our findings supported Grol et al's underlying premise that strategies and interventions needed to be tailored to target the specific group and setting in which the change process was to occur.²⁵

The education strategies that we put in place reflected not only the different needs of the outpatient clinic team, but also the importance of using a range of opportunities to pass on messages about guideline-based care. The implementation strategy was successful because it was modelled on staff perspectives that were current at the beginning of the project. By understanding how different groups perceived their roles in promoting healthy bones, and by identifying the interactions that were possible between the stakeholder groups, the guideline implementation strategies allowed for different types of change in different time frames. It also allowed for different groups to take different approaches to changing their own behaviour and in influencing others. Follow-up surveys should now show very different perspectives of each stakeholder group, regarding the way that patients are screened, managed and passed on to appropriate care after

their outpatient episode. It seems that the care has now become truly holistic and involves a range of health providers as well as patients themselves.

The outpatient fracture clinic in the metropolitan hospital site provides a trauma service which has an equal-access system, and thus is expected to accept and treat all patients without the selection process that can exist in other patient populations and settings. The diversity of trauma patients in this setting is thus unique, in that the patients are more like primary care patients than most patients in secondary care settings. These primary care interventions include identification of risk factors, education on diet, lifestyle issues and pharmacological options, as well as formalised timely communication aiming to protect the patient from increased bone fragility as well as to prevent increased morbidity and mortality related to future fragility fractures. Though the fracture clinic is situated in a tertiary hospital, our project has clearly shown that with the implementation of the appropriate multifaceted strategies, a primary care focus can develop in an environment traditionally not known to actively engage in preventive and primary care. This supports the argument that osteoporosis identification and the implementation of a management plan can occur in a variety of settings and is in fact essential no matter what type of health care environment the orthopaedic team is working in.^{26,27}

The sustained change in the key performance indicators suggests that enthusiasm for change has not altered in this staff group, despite personnel changes and increasing workloads. However, the current process still relies heavily on personnel involvement, and on manual (hand-generated) implementation of risk screening, and in communications with appropriate health providers. One strategy for sustaining the enormous changes made to date would be a mechanism of automatic osteoporosis consultation for outpatients with a fragility fracture. This would remove the human factors and errors in the identification and ongoing management of these patients that would leave best practice open to variations.

Conclusion

Orthopaedic surgeons and nurses, as the health professionals who most commonly treat low trauma fractures in secondary care settings, are in a unique position to facilitate holistic low trauma fracture care. Despite historical work practices in this hospital site which indicated reluctance by health care workers to take the care of at-risk patients beyond the care of the fracture, our experiences are of a new willingness on the part of the orthopaedic clinic health professionals to assume the challenge of improving the prevention of secondary fractures. There is now widespread recognition of the seriousness of early fracture episodes, as well as recognition of the opportunity this offers to orthopaedic surgeons and nurses, to affect the behaviour of patients as well as primary care physicians.

Osteoporosis is a chronic disease which is best managed in primary and secondary care settings. Osteoporosis is often not considered during routine health screening (such as for cancer). When the opportunity arises however, it needs to be identified in whatever setting is available. Osteoporosis can be identified after a fracture, and thus its identification and early management can be undertaken in any health care setting. This study highlights how sustainable change can occur in a busy hospital outpatient clinic using appropriate change behaviour strategies. It also highlights how sustainable linkages can be made between health care sectors, by planned interventions with the use of a coordinated post fracture management approach to osteoporosis.

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barriers to applying evidence and make a significant contribution to improving health care.

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Competing interests

The authors declare that they have no competing interests.

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