

# A team approach: implementing a model of care for preventing osteoporosis related fractures

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## Abstract

**Summary** The implementation of a multidisciplinary team-based model of care has led to significant increases in identification of patients with osteoporosis who are at risk of refracture, together with improved treatment uptake and ongoing management.

**Introduction** Osteoporosis-related fractures and consequent hospital admissions are largely preventable; however, little attention has been paid to how to achieve this, in particular, through improved models of care. Presentation to emergency departments (ED) with minimal trauma fracture (MTF) provides opportunity for patients at risk to be identified, referred and managed through a systematic process ensuring prompt intervention and continuing follow-up. This study is aimed to design and implement a care model for people over 50 years of age, presenting to ED with an MTF.

**Method** Established a multidisciplinary fracture prevention team to identify and capture at-risk patients for referral and management. Clinical data revealed the extent of lost opportunities. An electronic flagging system and data acquisition tool were developed and piloted. Established a referral pathway to detect, manage and follow-up patients, coordinated by a fracture prevention nurse.

**Results** Increased awareness of osteoporosis as a cause of MTF, better identification of at-risk patients across departments and services and development of a flagging and referral protocol has resulted in 100% capture of at-risk patients presented to ED. As a result there has been a significant increase in patients attending the fracture prevention clinic (FPC) ( $p < 0.001$ ) from 11% in 2007 to 29% in 2008 and a significantly reduced time between fracture and when patients are seen in the FPC ( $p < 0.001$ ).

**Conclusion** A multipronged systematic team approach to identifying and capturing patients with a high risk of refracture and a dedicated nurse coordinator role has created efficiencies in the detection and management of osteoporosis.

**Keywords** Fracture prevention · Interprofessional · Model of care · Osteoporosis

## Introduction

Osteoporosis is an insidious preventable disease that significantly impacts on the lives of many older Australians. In line with population predictions the incidence of osteoporosis and associated fractures will continue to rise [1]. This increase will occur in a climate of unprecedented demand on healthcare resources, particularly hospital beds and will result in significant social and economic implications for patients and their families. Presentation to the emergency department (ED) with a minimal trauma fracture (MTF) is often the first opportunity to diagnose and treat osteoporosis. Without intervention at this time many patients will incur significant subsequent, often debilitating consequences of continued bone loss and further fracture.

Evidence suggests that refracture can be prevented resulting in significant outcomes to patients and healthcare

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budgets [2–6]. Success is contingent on the coordination of interprofessional practice and streamlining of referral and treatment pathways. This paper highlights the importance of a coordinated collaborative approach to the capture, referral and management of patients who sustain an MTF due to osteoporosis.

### Literature review

Osteoporosis is a relatively common disease and a major cause of mortality and long-term morbidity in an ageing population worldwide. It is estimated that over 10% of the Australian adult population have osteoporosis, and in those aged over 60, 56% of women and 33% of men will have a fracture due to osteoporosis [7].

Parker and Johanssen [8], in a 2006 review of HIP fractures, found that more than half of patients with hip fracture have osteoporosis and nearly all have osteopenic. The mortality rate following hip fracture is reported as between 5% and 10% within the first month after fracture and 25% to 30% of patients with hip fracture will die within 12 months postfracture [7, 8]. Of the survivors, 50% require long-term assistance and will be unable to walk unaided and 25% will require full-time nursing home care [7]. This, in turn, impacts on the availability and cost of residential care [5]. The cost of hospitalisations alone for hip fractures in 2005 in Australia was estimated at A\$8.5 million [2]. Tosteson et al. [6] estimates the average cost of one hip fracture at US\$40,000 for the acute and chronic care involved. It has been identified that one-third of patients suffering an osteoporosis-related fracture will refracture in the following 5-year period [7].

There is strong evidence indicating that early identification and treatment of osteoporosis is critical in order to prevent recurrent fractures in older people [2, 5, 9], however, for many, osteoporosis remains undiagnosed and therefore untreated. Treatment instigated early following a first fracture can decrease recurrent fracture rates by between 30% and 60% [2, 5, 9]. Bisphosphonate therapy alone has been shown to reduce fracture risk by between 50% and 70%; however, less than 10% of patients with diagnosed osteoporosis are commenced on this or any other bone-strengthening therapy [2, 10].

Cost savings resulting from effective treatment regimes, i.e. those related to recurrent fractures, offset any additional costs related to diagnosis and treatment of osteoporosis [3, 4, 6] with treatment using bisphosphonates being the most cost-effective [6].

Pervasive failure to detect bone fragility and hence implement effective management strategies is well reported in the literature [11]. The extent of underdiagnosis of osteoporosis in Australia is similar to that reported worldwide. It is estimated that 75% of Australians

with osteoporosis are not diagnosed and therefore go untreated [1].

This underdiagnosis of osteoporosis can be attributed to a number of factors including failure of health professionals to report and refer and the lack of primary concern and knowledge amongst the general population [12]. Roerholt et al. [12] suggest that a significant factor contributing to failure to treat is that the responsibility for care of older people with chronic illness is often shared across several clinical specialties with no individual being accountable for instigating and monitoring bone status.

Treatment delays result when many fractures are treated in emergency rooms, where patients are being discharged with little or no follow-up regarding their bone strength. The presence of osteoporosis on X-ray is very rarely mentioned in reports unless it is specifically requested and rarely documented in patient records [13, 14] and patients themselves have very little knowledge or understanding of the impact of osteoporosis and their increased risk of future fractures [15]. Further delays occur when the treating orthopaedic surgeons fail to identify patients with osteoporosis or to commence treatment [13] and rely instead on general practitioners (GPs) for follow-up [13, 16].

Freedman et al. [17] in a US study of 1,162 menopausal women aged greater than 54 with distal radius fracture, found that only 2.8% were followed up with bone mineral density screening, and only 22.9% received treatment with approved medication for osteoporosis. Furthermore, there was a significant decrease in rate of treatment with increasing age. These figures are similar to those reported internationally [18] and in Australia [9, 19].

Treatment for osteoporosis is more likely to be initiated if the fracture is located in the spine [12], and although compression vertebral fractures have been identified as the most common fracture associated with osteoporosis, only 25% of patients with this type of fracture received a diagnosis of osteoporosis or treatment for osteoporosis [14].

Previous attempts to identify and target those most at risk of recurrent fracture have focussed on narrow target groups such as those with distal forearm fracture [20] or neck of femur (NOF) fracture [21], which, although individually are good indicators of osteoporosis, fail to take into account the whole of population at risk. Most studies reviewed reported findings drawn from the population of patients attending fracture clinics with no attention to the numbers that may have been discharged from ED without referral [9].

Recognition of the importance of interprofessional practice in healthcare is growing. This recognition is based on research that identifies improvements in patient and service delivery resulting from shared decision making and coordinated activity [22]. Several of the approaches to prevention of recurring fractures described in the literature are multidisciplinary in

design [9, 20, 21, 23]; however, their success has been hindered by failure to implement systematic and sustainable identification and capture systems.

Sidwell et al. [24], in a New Zealand study on 193 patients in an orthogeriatric rehabilitation ward, demonstrated the effectiveness of a protocol-driven assessment and treatment procedure for older patients admitted with MTFs. However, despite implementation of the protocol 13.3% of osteoporotic patients still remained untreated. The authors concluded that this protocol was insufficient and they recommended further studies that examined reasons for failure to treat.

Vaile et al. [9] instigated a first fracture project to capture patients presented to fracture clinics after discharge from hospital. This program established a dedicated osteoporosis nurse coordinator position to facilitate and coordinate education, management and follow-up and resulted in improved treatment and follow-up from the fracture clinic. However, lack of a systematic identification process meant that 25% of patients presenting to ED with fractures were not seen in the fracture clinic.

Finally, Wong et al. [19] identified the need for the implementation of a clinical pathway for osteoporosis management after identifying that only 13% of patients following MTF had received osteoporosis management.

## Background and context

The Royal Newcastle Centre and John Hunter Hospital campus is a level 1 trauma centre. There are over 2,000 fractures/year presented to the ED in the over 50 age group. Until our program began, there was no flagging system for MTFs. An important feature of our context is that most fractures are treated onsite at the tertiary referral centre which is colocated with the bone and joint clinics. An osteoporosis fracture prevention clinic (FPC) has been operating since February 2007. Initially, this clinic was run by one physician who relied on referrals from the ED, the fracture clinic and orthopaedic surgeons. Referral through these mechanisms was poor. In the first 5-month period from February to June 2007, only 5% (25/500) of eligible patients were referred to the clinic for assessment, treatment and follow-up management for osteoporosis. This disappointing referral rate, although similar to figures reported nationally, was the impetus for the development and implementation of an osteoporosis fracture prevention model of care.

## Method/intervention

In August 2007, a multidisciplinary osteoporosis fracture prevention project team was established which included stakeholders from the FPC, ED, fracture clinics, orthopaedic

wards, community health teams, physiotherapy, falls prevention team, allied health, GP as well as consumer representation and health information technology experts. The primary aim of the project was to develop and implement a model of care for at-risk patients that would improve the identification, referral and ongoing management of patients over 50 presenting to ED with an MTF and to decrease likelihood of refracture. Key elements of the model included:

- Identification of the extent of current lost opportunities and consequences
- A collaborative consultative approach to identifying and engaging potential capture sites of patients with minima trauma fracture
- Central coordination by a fracture prevention nurse (FPN)
- Development and implementation of a flagging system and specific clinical data acquisition tool
- The establishment of a capture and referral pathway for detection and prevention of osteoporosis-related fractures

A key component of the osteoporosis fracture prevention project is the collaborative partnerships that have been formed across many sections of our health community to provide a synergy of action. This ensures that the strategies developed and implemented by the team have the widest possible spread. This approach has assisted in identifying the complex nature of, and barriers to, the referral process within our healthcare system in the hospital setting as well as in the community. It has also facilitated the identification of opportunities to improve the holistic approach to referral and communication across a broader network base for greater spread and sustainability of the project. Identifying synergy with other projects, such as falls prevention program, were investigated and partnerships were established.

Funding secured for the project enabled the appointment of an FPN to begin this process. Initially the nurse liaised with ED, orthopaedic wards and the fracture clinic (where patients who are not admitted are reviewed). There were three main strategies. Firstly, a half day workshop provided education to staff across the facility regarding the importance of osteoporosis assessment, and treatment.

Secondly, and this was a pivotal point in the project, developing the ability to identify patients from the ED who had suffered an MTF. This involved accessing information captured on the ED patient management system and designing a report to extract data and filter according to eligibility criteria. Retrospective information from the previous 18-month period gave a thorough understanding of local data, and this was benchmarked with national figures. Once patients were identified, the next step was to develop and implement a referral process for assessment management and ongoing follow-up of patients at risk of osteoporosis. Thirdly, a referral process was developed and

implemented which could be applied in the fracture clinic as well as in the hospital wards, ED, the rehabilitation unit and from GPs in the community. This process reflected the multifaceted nature of the referral pathway and involved identification of patients from multiple sources.

The multidisciplinary team was invaluable during this process in identifying the patient journey, existing barriers, and where and how to enable the referral process. This involved not only collaboration between the members of the team but also negotiations with many other health-related services and personnel including the referral management centre, orthopaedic surgeons, rehabilitation consultants and falls prevention teams. The falls prevention project team were involved to assist in the identification of those patients who were not admitted to hospital but were cared for in the community. At the same time, the clinical nurse consultant coordinating the fracture clinic developed a system to identify and refer patients who were attended in their clinic.

The patients are identified from their ED presentation via the electronic ED report and this report is run on a weekly basis by the FPN. These patients are then tracked to see if they have entered the referral pathway and if not are captured for referral at this point. If the patient was not admitted or has already been discharged from hospital and there has been no intervention, they are contacted directly,

given relevant information regarding osteoporosis and advised to seek referral to the FPC from their GP or specialist. Their local GP is also sent a letter. Patients from nursing homes are followed up by a letter to their GP, and a letter to the patient or nursing home manager. Consequently, all patients presented with MTFs have intervention regarding their bone fragility.

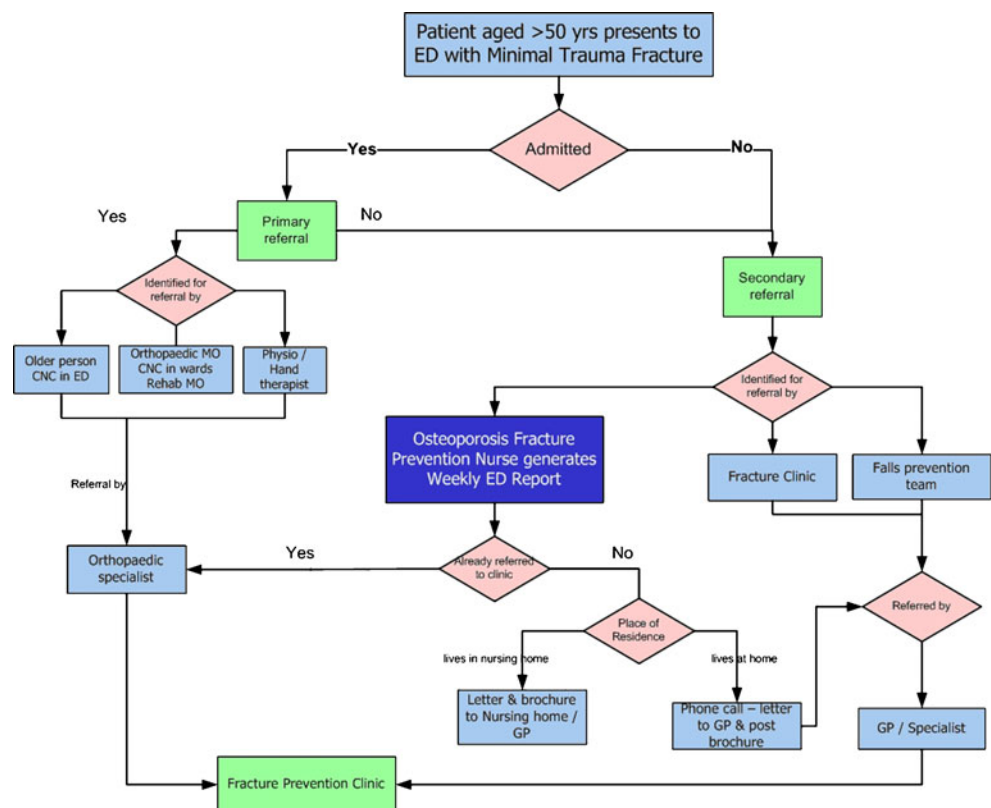
At the same time, a fracture prevention protocol was developed for the orthopaedic rehabilitation wards. This allowed many patients to be treated prior to discharge without the need for a referral to the FPC.

Finally, the electronic discharge referral system (EDRS) was also modified to improve communication with GPs in the community and as a prompt to medical officers for referral of eligible patients to the FPC after discharge.

The referral process is detailed in Fig. 1 and reflects the complex nature of healthcare delivery and the processes involved in identification and referral of eligible patients. Sometimes the system fails and many patients are not identified and referred to the osteoporosis FPC.

The referral pathway (Fig. 1) begins in the ED when a patient presents with an MTF and has a separate referral pathway for those admitted to hospital and those who are not admitted or those that are not referred before discharge. Those patients on treatment for osteoporosis at discharge from hospital do not require referral to the FPC. In addition,

**Fig. 1** Referral process map



patients who reside out of the area or in a nursing home are not referred to the clinic, but a letter is sent out to their GP recommending assessment and treatment for osteoporosis.

## Results

There is now a clear picture of a group of over 50 patients presenting with MTF locally, and the monthly ED presentations are detailed in Table 1. Figure 2 represents the monthly presentations to ED and the monthly mean is increasing annually (81 in 2007, 93 in 2009). The mean age of this population is 75 (median 78) and 75% are female. Over a 2-year period from March 2007 to February 2009, of the 2,049 patients over the age of 50 presented to ED with MTF, 38.1% (n 782) were NOF, distal or shaft of femur fractures. The “other” fracture category included sternum, skull and facial bones, clavicle, scapula, patella and coccyx. There were 95 patients (4.6%) who were presented to ED with a fracture more than once in the 24-month time frame, and three of these patients presented three times with an MTF fracture. In the refracture group, 44 (46%) of second fractures were NOF or distal femur fractures.

Implementation of the intervention outlined above has resulted in better intelligence and subsequent identification of patients at risk. There are now, increased numbers of patients being referred to and treated through the

osteoporosis FPC. Referral of eligible patients to the FPC has increased significantly from 9% in 2007 to 34% in 2008 ( $p < 0.001$ ).

Earlier identification of patients has also expedited referral to the FPC for assessment, ongoing management and follow-up, and this is demonstrated in Fig. 3, where the median days from fracture to clinic attendance has significantly decreased from 68 days in 2007 to 44 days in 2009 ( $p < 0.001$ , Mann–Whitney *U* test).

The clinic attendance alone does not fully reflect the rate or effectiveness of our fracture prevention program as many patients may be commenced on treatment by their GP prior to or after their admission to hospital or postfracture if there is no hospital admission. Patients already on treatment when they fracture commenced on osteoporosis treatment, whilst inpatients, patients who reside in nursing homes and patients who reside out of the area are not referred to the clinic.

Table 2 outlines the referral outcome for all patients 50 years of age and over who presented to ED with an MTF in the 6-month period from July to December 2007 and from July to December 2008, and numbers include those not hospitalised postfracture. Six percent died within 3 months of fracture in both time periods; of those hospitalised, the number on osteoporosis treatment at discharge has increased slightly from 24% to 27%. However, some patients were on treatment before their fracture. Improved identification of at-risk patients in the 2008 cohort has enabled those identified as not on current treatment or not yet referred to the clinic to have correspondence sent directly to their homes and/or to their GPs. This ensured that 100% of these at-risk patients had some type of osteoporosis-related contact from the osteoporosis team.

**Table 1** Details of patients presented to ED with fractures in >50 age group

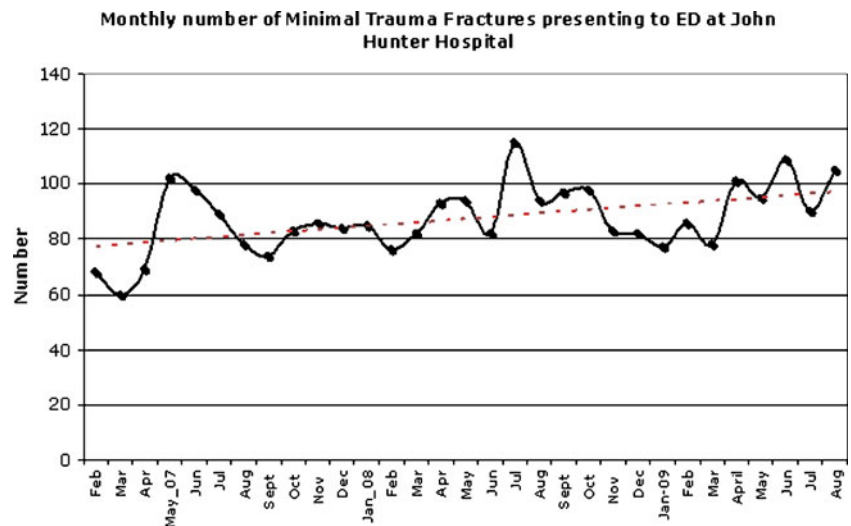
	Number	Percentage (%)
Total number in 24 months	2,049	
Monthly mean	86	
Refractures	95	4.6
Gender		
Male	513	25
Female	1,536	75
Age		
Mean	75	
Median	78	
Fracture types		
NOF	632	30.8
Distal/shaft femur	150	7.3
Lower leg/foot	272	13.3
Pelvis	74	3.6
Spine	32	1.6
Forearm/hand	450	22.0
Humerus	181	8.8
Ribs	86	4.2
Other	172	8.4

## Discussion

In line with other studies, the results of this project demonstrate the need for, and effectiveness of, a coordinated and systematic approach to assessment and treatment of osteoporosis in older people who were presented to ED with an MTF [9, 19, 24]. The significant success of the program to date has been achieved primarily through the committed and coordinated efforts of the team. The dedicated fracture prevention coordinator position, in particular, has enabled concentrated effort that has not previously been achievable. This position, together with efficient data collection and retrieval systems, has facilitated the drawing together and utilisation of previously unavailable or incomplete information and follow-up with individual patients and their GPs.

The number of patients 50 years of age and over who presented to ED with MTF fractures is increasing. The

**Fig. 2** Number of fractures per month presented to ED in the 50 years and over population since February 2007 when this data became available. The dotted line is a trend line



increased risk of subsequent fracture amongst those who have had a previous fracture [7, 25] points to the urgent need for improved processes for identification and referral of patients who suffer an MTF in order to reduce mortality and morbidity and increased quality of life [10].

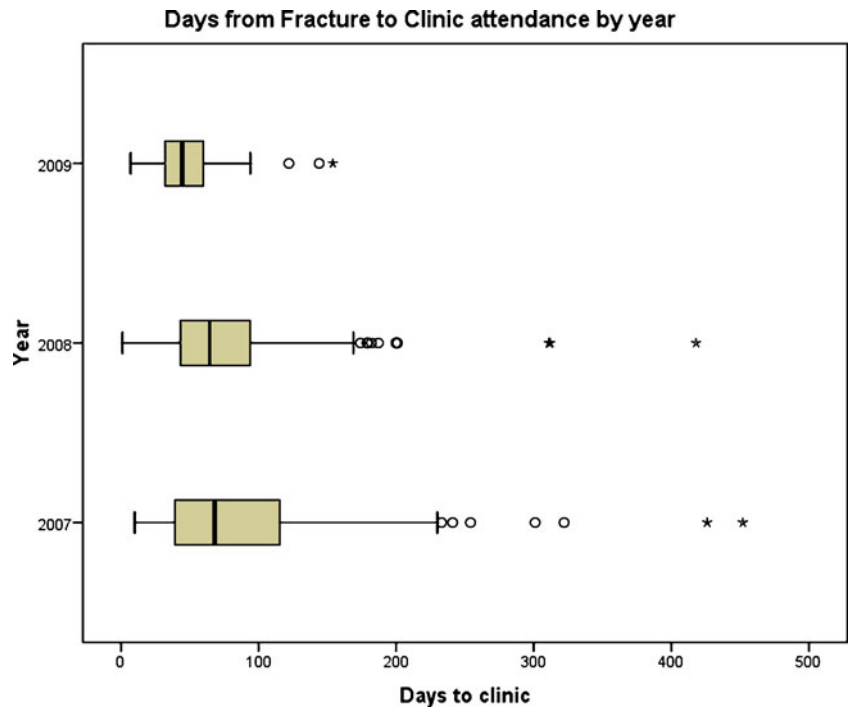
Compliance with treatment is an essential component of the long-term management strategy and will require continued efforts. Osteoporosis-related medication compliance has been identified as being generally low over the long term [10, 12] and is the next step in the management process for this team. Huybrechts et al. [10] associated low compliance with increased all-cause hospitalisation as well as average monthly medical service costs. The long-term considerations

relate to potential impact on hospitalisation, long-term disability and pain and suffering for individuals and the cost burden associated with all of these factors.

Successful referral of patients is hindered by increasing complexity in healthcare service delivery where care is fragmented across divisions, specialities and disciplines [12]. Although this project has addressed the referral process and found some ways of overcoming this gap, our referral process is reasonably resource-intensive so further attention needs to examine ways of embedding referral into routine clinical practice.

In spite of these difficulties, improvements in early referral rates have been realised, with consequent early

**Fig. 3** Mean number of days from fracture to clinic visit



**Table 2** Outcomes for the osteoporosis referral pathway

	2007 (Jul–Dec)	2008 (Jul–Dec)
Total number MTF presented to ED in 6 months	408	570
Died (within 3 months)	26 (6.4%)	34 (6.0%)
Number of patient not eligible for referral (already on treatment)	93 (24%)	145 (27%)
Patient eligible for referral (not already on treatment)	289 (76%)	389 (73%)
Not referred to clinic	263 (91%)	282 (72%)
Resides locally and at home—phone call to patient and letter sent to home and GP		204
Resides in NH—letter sent to NH and GP		56
Resides out of area—letter to GP		22
Referred to clinic	26 (9%)	107 (34%)

instigation of treatment and reduction in lost opportunity for individuals to receive specialist assessment and ongoing management [2, 5, 9]. Greater awareness amongst staff, together with the inclusion of an osteoporosis fracture check list on the ED discharge summary, has reduced the incidence of discharge without referral and follow-up. Education and follow-up provided by the FPN for GPs and nursing homes has resulted in increased referrals from these sources.

Our fracture prevention model has now been fully implemented, and the role of the FPN coordinator, which was initially funded on a part-time basis and funded through external grants and scholarships, is now being maintained on a recurrent basis through revenue raised by increased attendance at the FPC. Although the current referral and follow-up program is still somewhat dependent on the fracture prevention coordinator, the referral pathway is slowly becoming embedded into normal practice and process by clinicians both in hospitals and within the community. The fracture prevention team will continue to work collaboratively to identify initiatives across healthcare contexts to ensure increased scope and sustainability. The team is currently exploring options to expand this model into rural locations across the area health service and has been successful in gaining funding to proceed with expansion of the program.

The potential benefits for the area health service within the longer term include having information to identify the scope of osteoporosis in our local community, compliance with best practice for osteoporosis identification and management and reduced admission of patients over 50 with fracture. The literature indicating reduction in recurrent fractures by between 30% and 60% in patients treated following a first fracture would support this [2, 5, 9]. The mean length of stay for a patient over 50 with a fracture in our facility is 16 days with a median of 8 days, so preventing a fracture will reduce occupied bed days and increase bed availability particularly in orthopaedic wards where the demand for beds is high. Fracture prevention will also

reduce the demand for nursing home places related to long-term disability. When comparing the cost of diagnosis and treatment of patients with osteoporosis with the cost savings associated with preventing refracture in this at-risk group, studies have shown that cost savings from fracture prevention outweigh the other associated costs [3, 4, 6].

The collaboration of the project team and inclusion of stakeholders from a variety of health-related services and the community has enabled the group to identify and make better use of available health-related programs and resources. Our approach, unlike others reported in the literature, takes a whole of hospitalisation and whole of hospital approach, looking for all opportunities to identify and capture patients in ED, wards, other clinics and programs as well as in the community after discharge. It capitalises on the services outside the normal fracture treatment programs with the focus being on osteoporosis treatment beyond treatment of the fracture. In addition, we have sought out and worked with other groups to try to identify people at risk, e.g. falls programs, healthy heart, chronic diseases unit.

Better coordination, reduction of fragmentation within the acute hospital setting and increased awareness amongst staff and patients have led to early implementation of treatment and potential preventative measures against the expected refracture rate. Follow-up phone calls have improved compliance with treatment. The employment of an FPN coordinator has been the key to the success of the program.

There are still some hurdles to overcome, e.g. policy and infrastructure barriers such as the current practice whereby referral of an inpatient to the clinic which must be done by the treating specialist consultant only, usually an orthopaedic surgeon, although they do not see the patients in the fracture clinic postdischarge. Guidelines for referral that widen the responsibility and capacity for referral need to be developed to allow clinicians such as resident medical officers, physiotherapists and specialty nurses who are better positioned to refer, to do so.

Whilst there are early indications of significant improvements, a formal evaluation of the model, currently underway,

will quantify key success measures and indicate areas for improvement. This evaluation involves a comprehensive follow-up of all referrals during the 2007–2009 period.

## Conclusion

Based on the findings of this project, it is clear that efficiencies in the detection and management of osteoporosis can be achieved when patients who seek treatment for MTF are captured for diagnostic review and follow up. Success is contingent on a designated coordination role together with reliable communication strategies both within the hospital system and beyond. Whilst this project confirms the importance of tertiary prevention models, further work is required to link these improvements with secondary and primary prevention strategies.

**Conflicts of interest** None.

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