

# When continuity of care breaks down: a systems failure in identification of osteoporosis risk in older patients treated for minimal trauma fractures

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The prevalence of osteoporosis and the consequent incidence of minimal trauma fractures are rising in Australia, in large part because of the ageing population.<sup>1</sup> These fractures may be the first indication of a patient's osteoporosis, and the risk of fracture after an initial osteoporosis-related fracture increases significantly. The absolute risk of refracture varies by age, sex and fracture type, and has been estimated to be 62/1000 person-years (95% CI, 55–70/1000; relative risk [RR], 1.95) for women, and 57/1000 person-years (95% CI, 45–72/1000; RR 3.47) for men.<sup>2</sup> Minimal trauma fractures affect patients' physical, psychological and emotional health, and also the community through health care costs. In 2007, they resulted in 262 hospitalisations per day in Australia.<sup>3</sup> There is clear evidence that identifying and treating osteoporosis can reduce the likelihood of future fractures.<sup>4,5</sup>

A significant proportion of patients suffering minimal trauma fractures are treated initially in emergency departments (EDs). If they are admitted to hospital for further treatment, the responsibility lies with the treating unit to arrange testing, treatment and follow-up. For patients treated in and discharged from the ED, responsibility is less clear. Patients could fall between the cracks, perhaps because of an assumption that fracture clinics or general practitioners will follow them up. Another reason for this failure is that no single professional group takes responsibility for osteoporosis. Responsibility is spread among endocrinologists, rheumatologists, geriatricians, emergency physicians and GPs. Other barriers may include a lack of recognition of osteoporosis, presence of more pressing medical problems, perceived lack of treatment efficacy, inappropriate concerns about side effects of treatment, and unrealistic beliefs that lifestyle modification alone will prevent further fractures. The consequence may be that patients who might benefit from osteoporosis treatment are undertreated and may potentially suffer fractures that challenge their quality of life and independence. Available evidence from North America suggests that only 5%–15% of ED patients who should be investigated and treated for osteoporosis are actually treated.<sup>6–8</sup> A study of an Australian

## ABSTRACT

**Objective:** Minimal trauma fractures may be the first indication of osteoporosis. Our aim was to determine the proportion of patients who underwent bone density testing for osteoporosis of those with a minimal trauma wrist fracture treated in the emergency department (ED).

**Design:** This observational retrospective cohort study used explicit medical record review and scripted telephone interviews.

**Setting:** EDs of three metropolitan hospitals in Melbourne in 2006.

**Participants:** Patients aged 50 years and over who were treated for wrist fracture due to minimal trauma. Data collected included demographic details, fracture details, causes of injury, any bone density testing and any osteoporosis-related medication change.

**Main outcome measure:** The proportion of patients who underwent bone density testing in the follow-up period.

**Results:** 131 patients were studied; 83% were female, and the median age was 71 years. No patient was referred by an ED or fracture clinic for bone density testing (95% CI, 0–3.5%). Telephone follow-up data were obtained from 91 patients. Of these, 28 reported having bone density testing after their fracture, of whom 14 (50%; 95% CI, 32%–67%) were found to have osteoporosis. Seven were treated with a bisphosphonate and one with a selective oestrogen-receptor modulator.

**Conclusion:** Follow-up of patients suffering minimal trauma wrist fractures treated in the ED is poor. Systems to improve the identification and treatment of osteoporosis in this group are needed if future osteoporotic fractures and their consequences are to be avoided.

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cohort, of whom 70% required treatment as hospital inpatients, also reported low investigation and treatment rates.<sup>9</sup> No data on Australian patients with minimal trauma fracture discharged from an ED are available.

The aim of this project was to determine the proportion of patients who were tested for osteoporosis of those aged 50 years and over with a minimal trauma fracture of the wrist treated in the ED.

## METHODS

This study was an observational retrospective cohort study, which used explicit medical record review<sup>10</sup> and scripted telephone interview methods. Participants were all patients aged 50 years and over who were treated in the ED of Western Hospital, Sunshine Hospital, or the Williamstown Hospital in Melbourne (annual ED census: about 135 000 patients combined) for an x-ray-confirmed wrist fracture due to a minimal trauma event during 2006.

Patients were identified from existing computer-based patient management databases, which include all patients treated in the EDs.

Patients admitted to hospital for treatment, patients with known documented osteoporosis at the index ED visit, and those currently taking bisphosphonates were excluded.

Data collected from medical records and recorded on a specifically designed data form included demographic details, the site and type of fracture (verified from x-ray report), the cause of injury and any indication that bone density testing was ordered or recommended to the patient, either in the ED or at subsequent outpatient visits.

Data collected by scripted telephone interview during the first half of 2007 included whether the patient had had testing for osteoporosis since the index fracture, what drugs the patient was taking, and whether any medication had been commenced since the event. These questions were asked initially as open questions and were followed by specific questioning about any bone density testing and any prescriptions for calcium, named bisphosphonates and a selective oestrogen-modulating drug, raloxifene. At the time of the study, strontium ranelate was not yet available on the Pharmaceutical Benefits

Scheme for osteoporosis treatment. This approach was taken to maximise the quality of the information. Data extractors and interviewers were not blinded to the aims of the study. No attempt was made to verify patients' self-report of testing or medication, as this was not covered in the study's ethics approval.

The primary outcome of interest was the proportion of patients who underwent bone density testing in the follow-up period, between 2 months and 1 year. Secondary outcomes were the proportion referred by the health service for testing and the proportion commenced on new medications for osteoporosis or osteopaenia. The defined medications included calcium supplements, vitamin D and bisphosphonates.

Inter-rater agreement for data extraction from medical records was tested by comparing 39 records for the items "distal radial fracture", "known osteoporosis" and "not on osteoporosis medication".

Data were analysed by descriptive statistics, and by  $\kappa$  analysis for inter-rater agreement, with Microsoft Excel (Microsoft Corporation, Redmond, Wash, USA). The project was approved under the National Health and Medical Research Council quality assurance guidelines. Verbal patient consent was required for telephone interviews.

## RESULTS

The study criteria were fulfilled by 131 patients, of whom 83% (109) were female, and the median age was 71 years (range, 50–93 years). All fractures but one were sustained as a result of falls from a standing height or less; the other was a trip on a single step. Fracture locations were the distal radius (125; 95%), the distal radius and ulna (3; 2%), and the distal ulna (2; 2%). One patient had bilateral radial fractures (0.7%).

### Medical record review

No patient was referred by the ED for bone density testing (CI, 0–3.5%), although one ED discharge letter to a GP recommended bone density testing. No patient was referred by a fracture clinic for bone density testing (95% CI, 0–3.5%), although one entry recommended the patient see their GP "re osteoporosis medication".

### Telephone survey

We were able to contact 104 patients, of whom 91 agreed to the telephone interview (69% of the original sample). Of these, 41 reported having had bone density testing at

some time; 28 thought this had been after the fracture. Fourteen patients had been informed that they had osteoporosis on bone density testing. Of 41 tests, 36 had been organised by the GP.

Sixteen patients (18%; 95% CI, 11%–27%) had commenced new treatment for osteoporosis after the index fracture; 11 had had bone density testing and five had not. Seven were being treated with a bisphosphonate (with or without a calcium supplement), 11 had started taking calcium, and one had started raloxifene.

Inter-rater agreement for the items "distal radial fracture", "known osteoporosis" and "not on osteoporosis medication" was  $\kappa=0.79$ ,  $\kappa=1.00$  and  $\kappa=0.74$ , respectively.

## DISCUSSION

The proportion of patients tested for osteoporosis after treatment in the ED for a wrist fracture (45%) was suboptimal, and no screening was initiated by the ED or fracture clinic. This is consistent with other studies that have reported screening rates of 5%–15% for similar patient groups.<sup>6–9</sup> This has potentially serious implications for the patients who were not screened. If it is assumed that the osteoporosis rate is similar to that reported in a meta-analysis (median rate 53% among six studies where osteoporosis was confirmed with dual-energy x-ray absorptiometry scan),<sup>11</sup> this implies that about 71 patients in the cohort would be expected to have osteoporosis, of whom only 14 were identified. That said, all patients in the cohort would qualify for the clinical diagnosis of osteoporosis, given the occurrence of a minimal trauma fracture. More importantly, only a small minority of the cohort received treatment for osteoporosis, again consistent with others' findings.<sup>9,11</sup> Given the higher risk of fracture in patients with osteoporosis and a minimal trauma fracture,<sup>2</sup> this represents significant missed opportunities for secondary prevention.

Identification of osteoporosis in this at-risk cohort of fracture patients relies on part of the ED–fracture clinic–GP system taking responsibility for this process.<sup>12</sup> Our data suggest that the continuum of care is breaking down. Although this study was not designed to identify the reasons for its failure, possible explanations might include lack of knowledge about the benefits of osteoporosis investigation and treatment by the ED, fracture clinic staff or GP, failure to identify the patient as being at risk of osteoporosis, the assumption that another part of the system will

organise osteoporosis investigation and treatment, failure to recognise secondary prevention as an ED or fracture clinic activity, high ED and fracture clinic workloads, lack of access to bone density testing and lack of systems to facilitate referral.

Methods to improve system performance include institution of a specific fracture clinic to deal with fragility fractures in older patients,<sup>13–15</sup> employment of a fracture liaison nurse,<sup>16</sup> systems to facilitate referral from the ED<sup>16</sup> and fracture clinic,<sup>17</sup> improved staff education, and improved communication between hospitals and GPs. There is evidence to suggest that these strategies are cost-effective. One prevented hip fracture (estimated cost, \$23 000) would pay for a fracture liaison nurse for 6 months or for osteoporosis testing for 54 patients.<sup>18</sup>

These patients' injuries resulted from falls. Although not the focus of this project, prevention of falls is another important secondary-prevention initiative for this patient group. There is good evidence that it is effective,<sup>19</sup> and it has been included in evidence-based guidelines for osteoporosis management.<sup>20</sup>

This study has some limitations that must be considered when interpreting the result. Primary data on injury and referral were obtained by medical record review. Although conducted explicitly, this method has recognised problems with missing data. In particular, any verbal recommendations for osteoporosis screening from ED or fracture clinic staff were not identifiable, thus underestimating them. We contacted 69% of patients for follow-up. Although it is unlikely, they may not be truly representative of the whole sample. The follow-up component of this study relied on verbal report by patients, with potential recall bias. This project was conducted at a single area health service, so may not be generalisable to other settings.

## CONCLUSION

Follow-up of patients suffering minimal trauma wrist fractures treated in the ED is suboptimal. Systems to improve identification and treatment of osteoporosis in this group are needed if future osteoporotic fractures and their consequences are to be avoided.

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## COMPETING INTERESTS

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