An evaluation of an enhanced fracture liaison service as the optimal model for secondary prevention of osteoporosis

IR Wallace[1] • F Callachand[2] • J Elliott[2] • PV Gardiner[1]

[1]Department of Rheumatology, Altnagelvin Area Hospital, Western Health and Social Care Trust, Londonderry, UK
[2]Regional Orthopaedic and Trauma Service, Royal Victoria Hospital, Belfast Health and Social Care Trust, Belfast, UK
Correspondence to: Ian Wallace. E-mail: i.wallace@qub.ac.uk

DECLARATIONS

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IRW performed the initial audit at site A, collated and analysed comparative data from the two sites and was the principal author for the manuscript; FC performed the initial audit at site B, assisted with the collation and analysis of comparative data and assisted with drafting the manuscript; JE supervised the initial audit at site B, assisted with the collation and analysis of

Summary

Objective To assess secondary preventative therapy among postmenopausal female inpatients (aged 75 years and over) receiving surgical management for a fractured neck of femur using two service delivery models.

Design Practice in two fracture units was audited and compared using the NICE guidelines (TA 87) as an audit standard.

Setting Two fracture units: one with a fracture liaison service and one without.

Participants Postmenopausal female inpatients (aged 75 years and over) receiving surgical management for a fractured neck of femur.

Main outcome measures Rate of anti-resorptive treatment and rate of enquiry into risk factors.

Results There was a significantly higher rate of anti-resorptive treatment (90.5% compared to 60.9% with a difference of 29.6%, $p < 0.001$) and enquiry into risk factors (83% compared to 7%) in the unit with a fracture liaison service.

Conclusions We propose that a hospital-based enhanced fracture liaison service may result in higher osteoporosis treatment rates among postmenopausal hospitalized hip fracture patients aged 75 years and over.

Introduction

The care of osteoporotic fractures presents a significant challenge to healthcare systems and to society in general. Postmenopausal women are a group at high risk of osteoporosis. In the UK approximately 200,000 patients sustain a fragility fracture each year, a figure which is predicted to rise further as the population continues to age.[1] A significant proportion of this group (up to 50%) do not return to their pre-morbid level of mobility,[2] with healthcare costs in the UK totalling £1.8 billion annually[3] and £12,163 for the acute surgical episode following a fractured neck of femur.[4] These are serious fractures with associated mortality of 10% within 1 month and 33% within 1 year of a neck of femur (hip) fracture.[5]

The benefits of secondary preventative therapy with bisphosphonates are known with a reduction in fracture incidence of up to 50%,[6] and a more recent study also noted a reduction in mortality of 28% among patients receiving an intravenous

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Reviewer

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bisphosphonate infusion following neck of femur fracture.[7] Currently assessment rates for secondary prevention of osteoporosis are low,[8–10] with a substantial gap existing between known evidence-based therapy and clinical practice. A range of models exists with the aim of optimizing secondary preventative treatment.

In this report we compare assessment and treatment rates in two fracture units utilizing different models of service delivery.

Methods

Our aim was to compare and contrast practice in two fracture units in Northern Ireland in order to assess the effects of an enhanced fracture liaison service. Both units have similar population demographics with regard to age, social class and fracture incidence.

Site A is a district general hospital providing treatment in a 36-bed Trauma and Orthopaedic Unit, with no formal policy for the secondary prevention of osteoporosis currently in existence. Patients are admitted to the trauma unit via A&E. Care is provided by trauma department doctors and a staff-grade orthogeriatrician (3.5 days per week) who will provide a medical assessment of a significant proportion of the unit's inpatients. Consultant geriatrician ward-level assessment is available on a referral basis.

Site B is a tertiary referral trauma centre (comprising 95 beds) which utilizes a continuous acute orthogeriatric care model for ward patients (one associate specialist 5 days per week, and one staff grade 3.5 days per week). In addition there are three consultant geriatrician-led ward rounds per week. This model has previously been described.[11] A fracture liaison service was instituted in 2006. This consists of two fracture liaison nurses (one full-time equivalent nurse) who are responsible for assessing patients and making specific treatment recommendations. This involves requesting dual energy X-ray absorptiometry (DEXA) scans and the correspondence of results and treatment recommendations to general practitioners. At present the fracture liaison nurses only assess those inpatients who are referred to the service.

Initial audits were performed independently at both sites (100 patients at both sites) and included all postmenopausal women who had sustained a low-trauma fracture of neck of femur, distal wrist or vertebra. Those who had sustained a pathological fracture, a fracture as a result of high trauma, a peri-prosthetic fracture or who did not survive to discharge were excluded. We defined a low-trauma fracture as one sustained as a result of a fall from standing or less.

For the purpose of comparison of data from both sites, we included only women aged 75 years and over who had sustained a fractured neck of femur. We excluded women aged under 75 years, those who had sustained a fracture at another skeletal site, those who had sustained a fracture as a result of high trauma, those who had sustained a pathological fracture, those who did not survive to discharge from hospital and those with a peri-prosthetic fracture.

For site A, patients were identified using the Emergency Department case-note coding system; for site B, patients were identified using the Fracture Liaison Service database. Each individual audit only included small numbers of patients aged under 75 years and non-comparable groups of patients with distal wrist and vertebral fracture. These subjects were excluded and in our comparisons we assessed all women from the initial audits who were aged 75 years and over and who had sustained a fractured neck of femur. This left a group of 46 patients treated between January 2005 and December 2006 at site A and a group of 42 patients managed between January 2006 and December 2007 at site B. We reviewed case-notes and recorded patient demographics, enquiry into risk factors, DEXA scan and treatment prescription. General practice clerical staff were contacted by telephone to review medication histories following hospital discharge and to identify reasons for non-commencement of therapy.

Guidelines contained in the National Institute for Clinical Excellence Technology Appraisal 87 (NICE TA 87)[12] were the standard for each audit. The NICE TA 87[12] guidance for women aged 75 years and over who have sustained a fragility fracture is that anti-resorptive treatment may be commenced without the requirement for a DEXA scan to confirm osteoporosis.

Statistical analysis (Chi-squared test and Mann-Whitney U test) was performed using the Statistical Package for the Social Sciences (SPSS for Windows, version 16.0, Chicago, IL, USA).

Table 1
Baseline characteristics of patient groups for sites A and B

	Site A	*Site B*	P *value*
Cases (*n*)	46	42	
Median age (years)	84	84	0.445
Range	13 (75 – 88)	13 (75 – 88)	
Standard deviation	3.55	3.61	
Previous fracture (%)	8.7	9.5	0.827
Steroid use (%)	6.5	9.5	0.447

Results

Both groups comprised elderly women aged 75 years and over. Table 1 details baseline characteristics and Figure 1 illustrates the age distribution of the groups from site A and site B.

Table 2 and Figure 2 illustrate the absolute frequencies of the various treatment modalities at both sites. At site A 28 of 46 subjects (60.9%) were prescribed a bisphosphonate, strontium or raloxifene with or without a calcium and vitamin D supplement. Strontium (one patient at site A) and raloxifene (one patient at site A) were prescribed appropriately in women who had previously failed to tolerate a bisphosphonate. At site B 38 of 42 subjects (90.5%) were prescribed a bisphosphonate with or without a calcium and vitamin D supplement. Anti-resorptive treatment was commenced in 60.9% (site A) and 90.5% (site B) of patients (difference 29.6%, p <0.001) (Figure 3). Bisphosphonates were the most commonly prescribed anti-resorptive therapy at both sites. At site A three patients and at site B one patient received only calcium and vitamin D supplementation. There was no documented reason for non-commencement of bisphosphonate therapy in these patients.

Figure 1
Distribution of fracture neck of femur by age at both sites

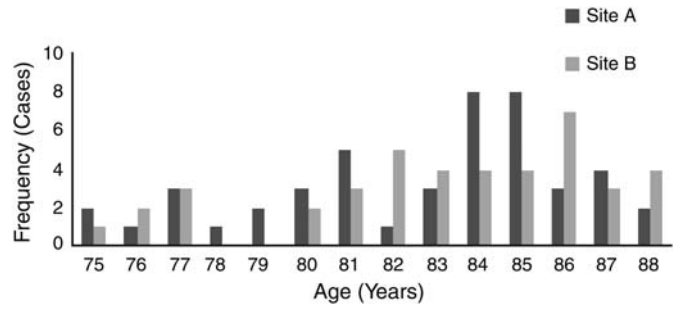


Table 2
Frequency of prescription of the various secondary preventative therapies and of no treatment at sites A and B

	Site A (%)	*Site B (%)*	P *value*
Bisphosphonate alone	4	5	0.733
Bisphosphonate and calcium	0	38	<0.001
Bisphosphonate and calcium and vitamin D	52	48	0.572
Strontium and calcium and vitamin D	2	0	0.155
Raloxifene and calcium and vitamin D	2	0	0.155
Calcium alone	0	0	
Calcium and vitamin D alone	4	2	0.407
No treatment	36	7	<0.001

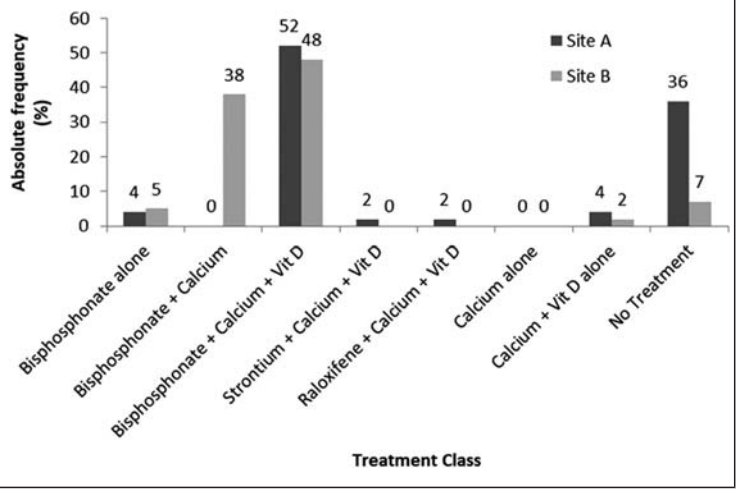
While at site B more patients were prescribed anti-resorptive treatment, it was more common for calcium and vitamin D supplementation to be prescribed alongside anti-resorptive therapy at site A. At site A 56.5% of patients and at site B only 47.6% (*P* value 0.231) of patients were treated with both an anti-resorptive agent and a calcium and vitamin D prescription.

At sites A and B, 0% and 2% underwent a DEXA scan, respectively. Documentation of enquiry into risk factors was recorded in 7% (site A) and 83% (site B) of cases (p < 0.001) (Figure 4). In both groups only four patients (sites A and B) had previously fractured a bone, and three patients at site A and four at site B were on steroid therapy for a concomitant condition. These values did not show a statistically significant difference between the groups (Table 1).

Discussion

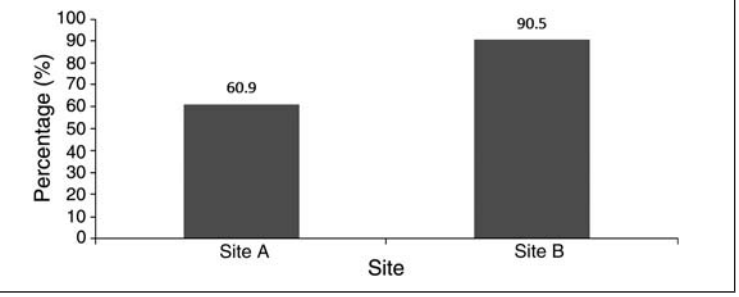
We compared osteoporosis secondary prevention assessment and treatment in women aged 75 years and over managed for fractured neck of femur in two fracture units utilizing different models of service delivery. We demonstrated a

Figure 2
Absolute frequency of treatment modality for each site



statistically significant difference (29.6%, $p < 0.001$) in the rate of anti-resorptive prescription between the two models with the enhanced fracture liaison service model (site B) performing more favourably. Of those receiving treatment, prescriptions varied at both sites, with patients at site A more likely to receive concomitant prescription of calcium and vitamin D alongside anti-resorptive treatment. More patients at site B (fracture liaison service) were prescribed secondary preventative therapy, however not all were prescribed calcium and vitamin D also. We also demonstrated a difference in the rates of documentation of enquiry into osteoporosis risk factors between the two models. In site B inpatient notes had a clearly documented record of risk factor data in 83% of cases, compared with 7% in site A.

Figure 3
Percentage of patients from site A and site B who were prescribed anti-resorptive treatment

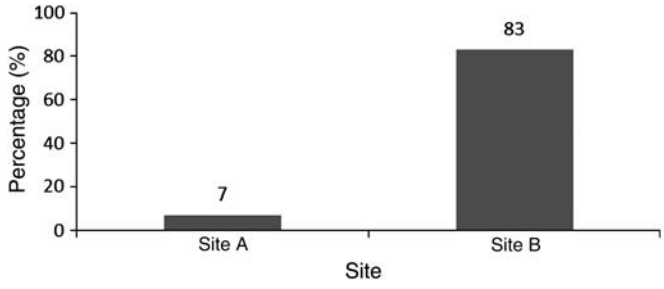


Our findings have a number of limitations and are only applicable to postmenopausal women aged 75 years and over who were treated for a fractured neck of femur. The initial audits at each site included women who were postmenopausal and aged under 75 years and also women who had sustained a fragility fracture of distal wrist and vertebra. The numbers of patients aged under 75 years included in the initial audits at each site were too few to allow meaningful comparisons to be drawn, and therefore these younger ladies were excluded from our comparative audit. The numbers of patients with a vertebral fracture were also small and were excluded. At site B a greater proportion of wrist fractures were managed operatively than at site A. On further inspection this included a significant proportion who were transferred from other units for management of their complex fractures. The wrist fractures managed at site B were more complex than those managed at site A and so we excluded these from our comparative analysis. The subjects included in the comparative analysis were from a clearly defined group, however after these withdrawals the numbers involved are small.

Also the two sites utilized different methods of case coding and it was necessary to use two different systems to identify eligible patients. The time period for case identification was different at each site, but did overlap. The initial audits at each site were performed independently and it was only after they had been completed that the usefulness of comparing results from both sites was identified. The NICE guidelines were applicable during the time periods for both audits. During the time periods a much larger number of patients could have been included in our initial audits, however there were difficulties obtaining some case-notes. We are not able to state definitively if this affects the representative nature of the sample from each site.

A strength of this study is that all information identified from case-notes was verified by contacting the patient's primary care practice. We can state that our documented treatment rates represent prescriptions which were continued after discharge from hospital.

Figure 4
Percentage of patients at each site in whom an enquiry into possible risk factors for osteoporosis was document



A Scottish study comparing a unit with a fracture liaison service to one with an orthogeriatrician model of care similar to that at site A demonstrated higher rates of DEXA scanning and anti-resorptive treatment (35.5% to 19.5% post hip fracture) among patients managed in the unit with a fracture liaison service.[13] These figures are lower than for both sites that we audited, however this study used different audit standards and assessed patients aged over 50 years, whereas both audits that we have described included patients aged 75 years and over.

The fracture liaison service has been demonstrated in a previous Scottish audit to be a highly effective model of care with 97% of patients assessed for osteoporosis following a neck of femur fracture.[14] Results obtained for site B were not as impressive as those obtained in the Scottish fracture liaison service. We feel this may be explained by the different responsibilities of fracture liaison nurses in the Scottish centre (where they are responsible for case finding) and at site B (where they are referred cases). The fracture liaison service at site B is evolving and it is proposed that the fracture liaison nurses will assume responsibility for case identification in the future. It is hoped that this will improve practice in site B further.

We have demonstrated higher rates of anti-resorptive treatment (90.5% at site B and 60.9% at site A). Patients treated for fractured neck of femur are usually hospitalized for at least a week and we feel that as both units have similar orthogeriatric models of care, most patients will have been assessed by an orthogeriatrician. While both units have performed favourably we suggest that the 29.6% difference in prescription of an anti-resorptive agent with or without a calcium and vitamin D supplement may be attributed to the additional presence of an enhanced fracture liaison service at site B. However there are almost certainly other differences between the sites which we have failed to recognize.

At the site with a fracture liaison service (site B) a larger number of patients received treatment, however a significant proportion of this group (47%) were not prescribed a calcium and vitamin D supplement alongside their anti-resorptive treatment. The NICE TA 87[12] guidelines suggest that calcium and vitamin D supplementation should be considered unless the clinician is certain the patient is calcium and vitamin D replete. If in our analysis we had used the rate of concomitant prescription of anti-resorptive and calcium and vitamin D supplement as our outcome measure, our outcome would be different. At site A 56.5% of patients and at site B only 47.6% (P value 0.231) of patients were treated with both an anti-resorptive agent and a calcium and vitamin D prescription. This may weaken our suggestion that treatment was better at the unit with a fracture liaison service.

There was a difference in rates of enquiry into risk factors (7% at site A and 83% at site B). It is likely that in site A an enquiry into osteoporosis risk factors was made, but not documented. As the fracture liaison service evolves at site B, a pro forma may be introduced, which would be likely to result in higher rates of enquiry into risk factors. We suggest that the rates of enquiry into risk factors may not be quite as marked as we have demonstrated. We suggest that it is likely that if a larger sample was examined there may also be more noticeable treatment benefits.

We have demonstrated modest differences in practice among women aged 75 years and over with a fractured neck of femur in the sites with and without a fracture liaison service. We feel that both models have performed well in this patient group, and compare favourably to a reported 25% rate of treatment in women aged 75 years and over with a recorded previous fragility fracture in a community-based audit.[15] We suggest that a fracture liaison service may be more beneficial in increasing osteoporosis assessment and treatment rates in patients who receive treatment for wrist, vertebral, proximal humerus or ankle fracture. These patients may have more

to gain from appropriate secondary preventative therapy. They may only be admitted to hospital for a short period or may be managed solely on an outpatient basis and are less likely to be assessed by an orthogeriatrician. A fracture liaison service may also show more benefit among patients who are not admitted to hospital. Future work should aim to examine the effects of a fracture liaison service on the assessment and treatment of all patients with low trauma fractures.

Conclusions

The implementation of best practice guidelines in the clinical setting often presents a logistic challenge and our audit allows two of the commonest systems to be compared. Our audit findings showed that both ward-based orthogeriatric care and fracture liaison services can result in higher levels of secondary prevention than noted in previous community studies. Our audit results provide modest support for the view that the fracture liaison service (combined with orthogeriatric care) results in a higher rate of secondary preventative therapy than orthogeriatric care alone. We did find that in some cases calcium and vitamin D had not been added to bisphosphonate therapy. Our findings also support the view that ward-based orthogeriatric care is an effective model for secondary prevention of osteoporosis for female patients aged 75 years and over who are admitted following fractured neck of femur. We suggest that a fracture liaison service may show additional benefit in patients who are not admitted to hospital. The local choice of a model of service delivery is likely to vary throughout the UK and Ireland, but audits such as ours can help to inform service planning. An accurate costing of the fracture liaison service model is also required, and it is likely that different models of care will be appropriate for different units.

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