Low rates of treatment in postmenopausal women with a history of low trauma fractures: results of audit in a Fracture Liaison Service

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Summary

Background: A past history of low trauma fracture is a strong risk factor for future fractures in postmenopausal women and national guidance recommends treatment in the majority of such women

Aim: To establish the prevalence of bone protective therapy use in postmenopausal women with a history of low trauma fracture

Design and Methods: Clinical audit of 1641 postmenopausal women presenting with a low trauma fracture to the Fracture Liaison Service at Addenbrooke’s Hospital, Cambridge between January 2006 and December 2007.

Results: A total of 526 (31%) women presenting with a fracture had a past history of fracture, defined as a low trauma fracture after the age of 45 years. The wrist was the most common site of previous fracture, followed by hip, hand or foot, lower leg and humerus. Of these women, only 27.6% were receiving bone protective therapy with a bisphosphonate (89%) or other medication. Calcium and vitamin D supplements were received by 35.6%. The highest rates of treatment were seen for spine and hip fracture (61.9 and 49.3%, respectively). Only 45.1% of women aged 75 years and over with a previous history of fracture were receiving bone protective therapy.

Conclusions: The results of our audit demonstrate low rates of treatment in postmenopausal women with a history of low trauma fracture. Better education of healthcare professionals, more consistent recording of fractures in primary care and the use of clearly defined care pathways that involve patients and their carers provide rational approaches to reducing this care gap.

Introduction

Osteoporotic fractures are widely recognised as a major cause of morbidity and mortality in the elderly population, and impose huge economic costs on health services. In recent years there have been major advances in the treatment of osteoporosis and a range of interventions is now available to reduce fracture risk. A past history of low trauma fracture is a strong risk factor for future fracture, an effect that is to some extent independent of bone mineral density (BMD). For example, the presence of a prevalent vertebral fracture increases subsequent fracture risk 5-fold and a past history of any low trauma fracture, 2–3-fold. These observations provide a strong rationale for bone protective therapy in older people who suffer low trauma fractures.
In the UK, there has been a number of government-led or supported initiatives to improve the care of patients who suffer low trauma fractures. These include the National Service Framework for Older People, guidance from the Royal College of Physicians and from the National Institute of Health and Clinical Excellence (NICE). However, a recent large audit in 172 Trusts in the UK of patients with low trauma fractures indicated that implementation of these various initiatives was extremely poor. Thus only 20–35% of older women presenting with a fracture were assessed for risk factors for osteoporosis and in the age group 65–74 years, in which NICE mandates that areal BMD (BMDa) assessment by dual energy X-ray absorptiometry (DXA) should be performed, this was achieved in <20%. The results of this audit again highlighted the low intervention rates with pharmacotherapy following fracture, only 42% of individuals with hip fracture and 19% of those with other fractures being treated with bone protective therapy other than calcium and vitamin D. In an audit of standards in primary care, evidence of treatment was present in only 25% of women aged 75 years or older with a recorded previous fragility fracture. These data are consistent with those reported in a systematic review of the management of osteoporosis between 1996 and 2005 in the US, Canada, Europe, Australia and New Zealand, which found that only a minority of patients was receiving bone protective therapy following a low trauma fracture and that the rates of clinical diagnosis of osteoporosis and BMD testing did not improve significantly following the index fracture.

One model that seeks to address this care gap is the Fracture Liaison Service (FLS), in which patients with a low trauma fracture are assessed by a specialist nurse or other healthcare professional and, where appropriate, referred for further investigation and treatment. These services also provide a structure in which the implementation of guidance can be audited. The 2002 RCP guidance recommends that treatment with bone protective therapy should be considered in all individuals aged 65 years or over who sustain a low trauma fracture. NICE guidance, issued in 2005 and 2008, mandates that women over the age of 75 years who present with a low trauma fracture should receive treatment without the need for prior estimation of BMD, whereas younger postmenopausal women must be shown to have osteoporosis (BMDa T-score \( \leq -2.5 \)) before they can receive bone protective therapy. The main aim of this audit was to investigate the proportion of postmenopausal women presenting to the FLS with a low trauma fracture and a previous history of fracture who were receiving bone protective therapy.

### Materials and methods

The Fracture Liaison Service at Addenbrooke’s Hospital in Cambridge was set up in 2005. It is situated in the Fracture Clinic where a specialist nurse (LP) sees all postmenopausal women attending the clinic with a recent low trauma fracture. Patients are counselled about risk factors and, in keeping with current NICE guidance, those aged <75 years are referred for bone densitometry. The study was an anonymous audit of a clinical service and informed consent was therefore not required.

Information recorded included fracture site, previous history of a low trauma fracture since age 45 years, tobacco and alcohol use, medications, age at menopause and past medical history. BMDa in the lumbar spine (L1–L4) and proximal hip was measured in women aged <75 years within 4 weeks of the fracture by DXA using a Hologic bone densitometer (Hologic QDR 4500A, Hologic Inc., Bedford MA). The short term in vivo precision of measurement at these two sites is 1 and 1–2%, respectively. Total hip BMDa T-scores were calculated using data from the NHANES reference female population.

According to the WHO classification, osteoporosis was defined as a BMDa T-score in the lumbar spine and/or total hip of \( \leq -2.5 \), osteopenia as a T-score between \(-1\) and \(-2.5 \) and normal BMDa as a T-score \( > -1 \). If the T-score was \( \leq -2.5 \) at one site, a diagnosis of osteoporosis was made regardless of the T-score at the other site. Osteopenia was diagnosed when at least one T-score was between \(-1\) and \(-2.5 \) and neither T-score was \( \leq -2.5 \) and normal BMDa was diagnosed only in cases where the T-score was higher than \(-1 \) at both sites.

Height and weight were measured at the time of bone density measurement and the body mass index (BMI) was calculated as weight (kg)/[height (m)]^2. Fractures were considered to be low trauma fractures if they occurred spontaneously or from standing height or less. All incident fractures were verified radiologically.

### Statistics

The study statistics were mainly descriptive. The prevalence of previous fracture, use of bone protective medication, use of calcium and vitamin D, fracture sites, and previous fracture were calculated. The student t test was used to compare age, BMI and T-score between women with or without a previous history of fracture. In addition, Fisher’s exact
test was used to evaluate the differences in use of bone protective therapy, and calcium and vitamin D in these two groups. This test was used also to evaluate differences in the prevalence of fracture sites in women with and without fractures. Differences were considered significant when the two-tailed $P$-value was $< 0.05$. The statistical analysis was performed using the SPSS® statistics package for Windows® version 16.0.

**Results**

Data from 1641 postmenopausal women presenting with a fragility fracture to the Fracture Liaison Service between January 2006 and December 2007 were examined. Of these women, 1005 were under the age of 75 years, of whom 801 (80%) agreed to undergo bone densitometry. In the remaining 20%, the patient either declined to have bone densitometry or was unable to undergo the examination for physical or logistical reasons. Women who did not undergo $\text{BMD}_a$ measurement did not differ significantly from those who did in terms of age, fracture site, BMI, tobacco use or alcohol intake but were more likely to be taking glucocorticoids (3.6 vs. 0.6%; $p < 0.003$) and bone active medications (29.7 vs. 7.2%; $p < 0.0001$).

Demographic details of all 1641 women, including the fracture sites, are shown in Table 1. The wrist was the most common site of fracture, followed by the lower leg, humerus and hand or foot. Information about previous fracture history was available in all but one woman. 526 (32.1%) of the remaining 1640 women had a past history of fracture. The mean (SD) spine T-score in women undergoing bone densitometry was $-1.22 \pm 1.4$ ($n = 804$) and the mean total hip T-score was $-0.82 \pm 1.05$ ($n = 797$). Overall, when both spine and hip $\text{BMD}_a$ were considered, osteoporosis was present in 19.3%, osteopenia in 41.2% and normal $\text{BMD}_a$ in 39.4% of women.

Table 2 shows that women with a past history of fracture were significantly older than those without fracture and had significantly lower $\text{BMD}_a$ both in the hip and spine ($p < 0.0001$ and 0.02, respectively). Only 27.6% of women with a previous history of fracture were receiving bone protective therapy, as compared to 12.1% of women without a known fracture history ($p < 0.0001$). Bisphosphonates were the commonest form of treatment in both groups (89 and 76.3%, respectively), followed by strontium ranelate (6.2 and 5.2%, respectively).

| Table 1 Characteristics of postmenopausal women presenting at the Fracture Liaison Service between January 2006 and December 2007 |
|-----------------|-----------------|
| **Clinical data** |                  |
| Age (years) | 70.2 ± 11.7 ($n = 1641$) |
| BMI (kg/m²) | 27.28 ± 5.6 ($n = 849$) |
| Previous history of fracture | 526/1640 (32.1%) |
| On bone protective therapy |                  |
| Bisphosphonates | 280/1641 (17.1%) |
| Hormone replacement therapy | 31/1641 (1.9%) |
| Strontium ranelate | 16/1641 (1.0%) |
|Raloxifene | 1/1641 (0.1%) |
|Calcium plus vitamin D supplementation | 365/1641 (22.2%) |
|Current glucocorticoid use | 24/1641 (1.5%) |
|Use of more than 14 units alcohol per week | 26/1640 (1.6%) |
|Current smokers | 80/1640 (4.9%) |
|Bone mineral density (DXA; mean ± SD) |                  |
|Spine T-score | $-1.22 ± 1.4$ ($n = 804$) |
|Total hip T-score | $-0.82 ± 1.05$ ($n = 797$) |
|Fracture sites |                  |
|Wrist | 628/1641 (38.3%) |
|Lower leg | 276/1641 (16.8%) |
|Humerus | 225/1641 (13.7%) |
|Hand or foot | 218/1641 (13.3%) |
|Hip | 158/1641 (9.6%) |
|Spine | 2/1641 (0.1%) |
|Other | 134/1641 (8.2%) |

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respectively). Information about the indication for bone protective therapy in women without a history of fracture was not recorded in the audit.

The site of previous fracture is shown in Table 3. Wrist was most common, followed by hip, lower leg and hand or foot. Table 4 compares the proportion of women without and with a previous fracture according to incident fracture site. Women presenting with a wrist fracture were more likely to have a previous fracture history ($p=0.057$) whilst those presenting with a hand or foot fracture were less likely to have a previous history of fracture ($p=0.001$). No woman reported a previous history of vertebral fracture.

Figure 1 shows the frequency of bone protective therapy in women with a previous fracture according to fracture site. The highest rates of treatment were seen for spine and hip fracture (61.9 and
49.3%, respectively). The lowest rates were seen in women with a previous history of lower leg and hand or foot fracture (16.1 and 11.5%, respectively). Women aged 75 years or older were more likely to be receiving bone protective therapy and/or calcium and vitamin D supplements than women aged <75 years. The rate of treatment with bone protective therapy in women aged ≥75 years was 45.1% compared with 23.1% in women aged <75 years. The corresponding figures for calcium and vitamin D supplementation were 43.6 and 23.2%, respectively.

**Discussion**

Our results confirm low rates of bone protective therapy in postmenopausal women with a history of low trauma fracture, only 27.6% of those with a known past history of fracture in this audit receiving treatment. The highest rates of treatment were seen in women with previous spine or hip fracture, and women aged 75 years or older were more likely to be taking treatment than those aged <75 years. The use of calcium and vitamin D supplements was slightly higher but overall was reported by only 36.5% of women with previous fracture.

Overall, a previous history of fracture was recorded in approximately one-third of women presenting to the Fracture Clinic with a low trauma fracture. A previous fracture history is a well-documented risk factor for future fracture; this relationship is particularly strong for previous vertebral fracture but is also seen for other fracture sites. Klotzbuecher et al. reported that overall, a previous fracture was associated with an ~2-fold increase in the risk of subsequent fracture; however, in women with a previous vertebral fracture the risk was increased 4-fold. This effect is largely unchanged after adjustment for BMD, and little affected by whether the previous fractures are classified as low trauma or not.

A range of options has been shown to be effective in reducing low trauma fractures in postmenopausal women including bisphosphonates (alendronate, risendronate, ibandronate and zoledronate), strontium ranelate, raloxifene and parathyroid hormone peptides. Their use in the prevention of fractures in high-risk women is cost-effective and can reduce vertebral fractures by up to 70%, non-vertebral fractures by up to 15–20% and hip fractures by up to 40%. Current guidelines in the UK are consistent in recommending bone protective therapy in postmenopausal women aged ≥75 years who have sustained a low trauma fracture without the need for...
BMD$_a$ measurement, although there is a general consensus that BMD$_a$ measurements should guide treatment decisions in younger postmenopausal women.$^{5-10,17}$ European guidelines recommend that all postmenopausal women with a previous fracture can be considered for treatment without the need for DXA$^{18}$ whilst in the USA, DXA is recommended before treatment in all postmenopausal women with a fracture.$^{19}$ The majority of postmenopausal women with a low trauma fracture have osteoporosis or osteopenia and on the basis of their probability of future fracture would be considered as candidates for bone protective therapy.$^{20-23}$ However, in other cases BMD$_a$ is normal and the case for bone protective therapy is uncertain. In this context it should be recognised that measurements of spine BMD$_a$ may be falsely elevated by the presence of scoliosis and osteophytes; in addition, increased risk of falling increases fracture risk independent of BMD$_a$. Nevertheless, the rates of treatment reported in this audit are suboptimal; for example, treatment would be considered appropriate in the vast majority of women with a previous hip or spine fracture, yet only 49 and 61%, respectively, in our sample were treated. Similarly, in the population of women aged over 75 years with a previous low trauma fracture, less than one half were receiving treatment. Our audit results are consistent with the low rates of treatment reported in other studies and emphasise the missed opportunities to prevent further fractures in women who are known to be high risk as a result of their previous fracture history.

Consistent with other reports, we found that the majority of postmenopausal women presenting with a low trauma fracture did not have osteoporosis as defined on the basis of BMD$_a$.$^{20-23}$ and normal BMD$_a$ (T-score $> -1$) was recorded in nearly 40% of the women aged $<75$ years in whom it was measured. The WHO classification of osteoporosis as a BMD$_a$ T-score $\leq -2.5$ was intended as an operational definition that identified women at highest risk of fracture, but few postmenopausal women have a BMD$_a$ in this range and numerically the most fractures occur in women with a BMD$_a$ T-score higher than $-2.5$. Using peripheral BMD measurements Siris et al.$^{20}$ reported that only 7.2% of women who developed a fracture within 1 year of BMD$_a$ measurement had a T-score below $-2.5$, whilst 39.6% had a T-score between $-1$ and $-2.5$ and 53.2% had a T-score higher than $-1$. Schuit et al.$^{21}$ reported normal baseline femoral neck BMD$_a$ in 12.6% of postmenopausal women with incident non-vertebral fractures during a mean follow-up period of 6.8 years, osteopenia in 43.3% and osteoporosis in 44.1%. In the Study of Osteoporotic Fractures (SOF), baseline total hip BMD$_a$ showed osteoporosis in 46% of women who developed a hip fracture during 5 years of follow-up, whereas 48% were osteopenic and 6% had normal BMD$_a$.$^{22}$ Pascoe et al.$^{23}$ reported that only 26.9% of fractures over a median follow-up period of 5.6 years occurred in women with osteoporosis as defined by a baseline BMD$_a$ T-score $\geq -2.5$, whilst 56.5% occurred in women with osteopenia and 16.6% in women with normal BMD$_a$. In clinical trials the anti-fracture efficacy of bone protective treatments has mostly been established in postmenopausal women with low BMD$_a$, with or without prevalent fractures. The results of these studies provide a strong rationale for treating postmenopausal women who present with fracture and have low BMD$_a$; evidence from a number of sources supports the efficacy of these interventions in women with osteopenia as well as those with osteoporosis.$^{24-29}$

Our study has several limitations. Vertebral fractures were under-represented in this audit, because the majority do not come to medical attention$^{10,31}$ and those that do may be referred to a specialist metabolic bone clinic rather than a fracture clinic. Only total hip, and not femoral neck BMD$_a$ was recorded for the purposes of the audit, since only total hip BMD$_a$ is routinely included in our DXA reports to referring physicians. Hip fractures were also under-represented, since they are not routinely followed up in the fracture clinic. We were only able to assess those women who attended the fracture clinic and do not know the characteristics of those who failed to keep their appointment. Only current medications were recorded, so it is possible that some women recorded as not receiving bone protective therapy had taken this in the past. We did not record the date of previous fractures and it is likely that some of these occurred before national guidance for secondary prevention of fractures became available in 1999. Nevertheless, the history of a low trauma fracture after the age of 45 years should have triggered further intervention and, where appropriate, bone protective treatment following the availability of national guidance. Finally, previous fractures were self-reported and not verified radiologically.

A number of factors are likely to contribute to the persisting care gap in the secondary prevention of fracture.$^{13,32-37}$ The financial costs of diagnosis and treatment may act as barriers, as may the lack of availability of DXA in some parts of the UK, although this has improved in recent years. Second, bone disease is an ‘orphan’ speciality and the care of patients with osteoporosis is shared between primary care and a number of different specialties in secondary care including
rheumatology, endocrinology, gerontology and orthopaedics. Third, there is often a lack of clarity regarding the allocation of responsibility for prescribing treatment; funding pressures may be used to deny adequate access to treatment, although the cost-effectiveness of secondary prevention of fracture is well documented. Fourth, publicity about perceived or real side effects of treatment, for example osteonecrosis of the jaw, may make both patients and their doctor reluctant to initiate and continue therapy. Finally, the patient is often poorly informed about their disease and its treatment. Better education of healthcare professionals involved in the management of osteoporosis, more consistent recording of fractures in primary care and the use of clearly defined care pathways that involve and empower patients and their carers provide rational approaches to reducing the care gap. Fracture Liaison Services and similar models have proven value in improving the assessment of patients with osteoporosis and should be more widely utilised to target high-risk individuals for bone protective therapy. 

In addition use of the FRAX® risk algorithm to assess 10 year fracture probability and guidelines that provide treatment advice based on FRAX® outputs should facilitate the much needed improvement in the management of postmenopausal women with low trauma fracture.

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Conflict of interest: None declared.

References


