ORIGINAL ARTICLE

Preventing fragility hip fracture in high risk groups: an opportunity missed

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Objective: The national guideline recommends selective case finding as the main strategy by identification of high risk people. This study assessed whether high risk patients were identified before their presentation with fragility fracture.

Methods: A prospective study for 3.5 consecutive months on patients with low energy hip fractures to Brighton and Sussex University Hospital NHS Trusts, which serves a population of 460 000. Data were collected by interview using standardised form, medical record review, and communication with family physicians. Definition of high risk: (1) untreated hypogonadism (2) corticosteroid users (3) disorders with increased bone loss (4) previous fragility fractures.

Results: 98 patients were admitted with hip fracture. Thirty nine (40%) had at least one high risk factor. High risk patients (7 of 39, 18%) were no more likely to receive prophylaxis compared with patients without high risk factor (5 of 59, 8%) ($p=0.21$). Previous fragility fracture (23) was the commonest risk factor followed by disorders with increased bone loss (10), premature menopause (10), and corticosteroid users (5). Fifteen patients (15%) had susceptibility to frequent falls and two had maternal history of osteoporosis. The proportion of treated patients were 20% (2 of 10) in premature menopause, 10% (1 of 10) in diseases with secondary osteoporosis, 13% (3 of 23) in previous fragility fracture, and 80% (4 of 5) in corticosteroid users ($p=0.01$).

Conclusion: Prevention of hip fracture is still inadequate in high risk patients. Discrepancy seemed to exist in treatment frequency among different high risk groups suggesting that emphasis on prevention of osteoporosis has not been reinforced in all people at risk.

Osteoporosis is a well recognised public health problem. The most widely acceptable definition for osteoporosis is a progressive systemic skeletal disease characterised by low bone mass and deterioration of microarchitectural structure with consequent increase in bone fragility and susceptibility to fractures.¹ Osteoporotic fractures place a great demand on health resources and lead to significant morbidity, pain, and disability. In the UK, it results in more than 300 000 fractures per year with a cost of £1.7 billion per annum to the NHS.²

Strategies for the prevention of osteoporotic fractures include population based and selective case finding strategies.^{1–4} In the latter, prevention is targeted only to those people at high risk. Population based strategies include increasing the level of physical activity at all ages, reducing the prevalence of smoking, and increasing dietary calcium intake. There is, however, no clear evidence to advocate these population based strategies.^{1–4} There is also no scientific evidence to support mass screening of asymptomatic people including menopausal women.^{1,2}

In March 1999, an evidence based clinical guideline on prevention and treatment of osteoporosis was prepared under the auspices of the Royal College of Physicians of the UK, acknowledged by the National Institute for Health and Clinical Excellence (NICE). In the absence of validated population based screening strategies, the working party, which also comprised the Bone and Tooth Society and the National Osteoporosis Society, recommended the important thrust to prevent osteoporotic fracture should be directed towards selective case finding by identifying the high risk groups. This strategy is also recommended by all other national and international collaborations including the World Health Organisation, International Osteoporosis Foundation, and the American Society of Bone Mineral Research.

The incidence of hip fractures, the most disabling outcome of osteoporosis, is increasing by 1%–3% per year because of the ageing world's population.⁵ Despite the existence of clinical guidelines and evidence based treatment in preventing osteoporotic fracture, whether they have been actively applied is not clear. Therefore, we decided to evaluate all the admissions with hip fractures into our institution using the Royal College of Physicians (RCP) Guideline to assess the adequacy of evaluation and treatment of high risk people before their presentation with fragility fracture.¹

METHODS

Data were collected prospectively over 3.5 months between 1 June 2003 and 15 September 2003. During the study period, all patients admitted to the Royal Sussex County Hospital (RSCH) with low energy hip fractures were reviewed. Low energy hip fractures were those that occurred after simple fall from a standing height. The RSCH under the Brighton and Sussex University Hospital NHS Trusts serves a population of about 460 000 people within Brighton and Hove and East Sussex region.⁶

High risk factors for osteoporotic fracture are defined as:

- Untreated hypogonadism (premature menopause <age 45: spontaneous or surgical, secondary amenorrhoea, male hypogonadism);
- Corticosteroid users (7.5 mg per day prednisolone for three months or more);
- Disease associated with increased prevalence of bone loss (for example, hyperparathyroidism, hyperthyroidism, chronic liver disease, person with epilepsy taking anti-convulsant therapy, etc);
- Previous fragility fractures

Table 1 Comparison between patients with and those without high risk factors

Presence of high risk factors	Present (n = 39)	Absent (n = 59)	p Value
Sex (female:male)*	33:6	51:8	p = 1.00
Mean age (SD) (range)†	81.0 (10.4) (56–96)	82.8 (9.5) (54–97)	p > 0.05
Proportion of patients who received treatment/prophylaxis*	7/39 (18%)	5/59 (8%)	p = 0.21
Combined vitamin D/calcium	3	5	
Alendronate	1	–	
Alendronate + combined vitamin D/calcium	2	–	
Raloxifene	1	–	

*Two tailed p value Fisher's exact test; †Mann-Whitney test.

A standardised data form for all patients was used to record information, including patient details, presence of risk factors, and previous assessment and treatment for osteoporosis. Pharmacological interventions for treatment of osteoporosis include those from the biphosphonate group, selective oestrogen receptor modulators, calcitonin and combined calcium and vitamin D. Interviews of the patients were undertaken using a standardised format. As the recollections of the patients were subjected to memory bias, their past hospital records were reviewed to further verify the information. Where interviews were not possible (for example, because of patient fragility, mental confusion) or hospital records were not available, their respective family doctors were contacted to obtain further information.

Statistical analysis

Fisher's exact (two tailed) test was used to compare whether high risk people were more likely to be evaluated and treated for osteoporosis compared with patients without any high risk factor. Mann-Whitney test was used to compare mean age. A p value of less than 0.05 is considered to be significant.

RESULTS

A total of 98 patients were admitted into our unit with low energy hip fractures within the 3.5 months' study period. There were 84 women (86%) and 14 men (14%). The mean age (SD, range) of the patients was 82 (9.9, 54–97). The projected incidence of hip fracture within the catchment area was about 73 fractures per 100 000 population per year.

Thirty nine patients (39 of 98, 40%) had at least one high risk factor for osteoporosis. High risk factors were present in six of the men and 33 of the women (6 of 14 v 33 of 84; p = 1.00, Fisher's exact test, table 1). There was no statistical difference in the mean age between patients with and without risk factor (table 1). Thirty patients had single high risk factor, while nine had two high risk factors.

Only 7 of the 39 high risk patients (18%) had received some form of treatment for osteoporosis before their presentation with hip fracture. The patients with high risk factor(s) were no more likely to receive treatment to prevent fragility fractures compared with patients without these risk factors (7 of 39 v 5 of 59; p = 0.21, Fisher's exact test; table 1). In the latter group, the patients had been receiving combined vitamin D and calcium supplement from their family doctors before their presentation.

Twenty three patients were found to have previous fragility fracture, which was the most common high risk factor identified. Ten patients had disorders associated with secondary osteoporosis (four taking anticonvulsants, one hyperthyroidism, one chronic liver disease, one chronic renal impairment, one hyperparathyroidism, one rheumatoid arthritis, one gastric surgery). Ten patients had premature menopause (seven spontaneous, three surgical). Five patients were receiving long term corticosteroid treatment. In addition, two patients were found to have a maternal history of hip fracture. Fifteen patients were also found to have

Table 2 Proportion of patients with one and two risk factors who received treatment

Risk factors	Number of patients	Receiving treatment
Two risk factors	9	3
Corticosteroid + fragility fracture	1	1
Corticosteroid + premature menopause	3	2
Fragility fracture + premature menopause	3	0
Anticonvulsant + premature menopause	1	0
Anticonvulsant + fragility fracture	1	0
One risk factor	30	4
Previous fragility fractures	18	2
Premature menopause	3	0
Diseases associated with bone loss	8	1
Corticosteroid users	1	1

increased susceptibility to frequent falls (previous cerebrovascular accident, dementia, Parkinson's disease, history of frequent fall, alcoholism).

There was no significant difference in the proportion of patients who received treatment whether they had single or two risk factors (4 of 30 v 3 of 9, p = 0.32, table 2).

Each high risk group was then compared separately. The proportion of treated patient varied in different high risk groups and were 20% (2 of 10) in premature menopause, 10% (1 of 10) in diseases with secondary osteoporosis, 13% (3 of 23) in previous fragility fracture, and 80% (4 of 5) in corticosteroid users (p = 0.01) (table 3). None of the women with premature menopause had been given hormone replacement therapy. None of the patients taking anti-convulsants had received any evaluation or treatment.

DISCUSSION

Despite the availability of effective therapeutic agents that reduce risk of fractures among osteoporotic patients, only few have received adequate treatment after their fragility fracture. Less than one fifth (18%) of high risk people in

Table 3 Proportion of patients who received treatment when each high risk group was considered separately

Risk factors	Number of patients	Receiving treatment (%)
Previous fragility fractures	23	3 (13)
Premature menopause	10	2 (20)
Diseases associated with bone loss	10	1 (10)
Corticosteroid users	5	4 (80)

this study had received some form of medical treatment for osteoporosis before the occurrence of hip fracture.

Several pharmacological agents are available to prevent and treat osteoporosis but one of the most well studied and perhaps most commonly used is the biphosphonates drug group. They are antiosteoclastic agents that reduce bone resorptive rate. Alendronate's effectiveness in reducing fracture risk in both patients with and without existing vertebral fractures has been shown in large randomised controlled trials such as the fracture intervention trial.^{7,8} Selective oestrogen receptor modulator (SERM) has a role in reducing vertebral fractures in post-menopausal osteoporosis.⁹ Studies have shown that combined vitamin D and calcium has a role as standard treatment as well as preventive measure for osteoporosis, especially in frail elderly people.¹⁰⁻¹²

Low energy hip fractures are those that occurred after a simple fall. This was obtained from history. Only patients with hip fracture that had occurred by this mechanism were included in the study as it was easy to identify them, they were a common occurrence, and osteoporosis was most probably a factor in the fracture. Patients who have been involved in motor vehicle accidents or fall from height were not included in the study. Other osteoporotic fractures were excluded as not many were admitted for any length of time so their impact on bed use and hospital costs is less significant than hip fracture patients.

Previous fragility fracture was the most frequently identified high risk factor, but only few (13%) had received some form of treatment for osteoporosis before their second fracture. There is good evidence that previous fragility fracture is a significant risk factor for another fracture, and those who have sustained an osteoporosis related fracture have at least twice the risk of subsequent fracture.¹³ Previous fragility fracture serves as an independent risk factor to require treatment, without the need for BMD measurement when the clinical history is unequivocal.¹ The orthopaedic and rehabilitation wards are probably the best and earliest opportunity for treatment to be started in patients with hip fracture before their discharge back to the community. The role of an osteoporosis specialist nurse based in the wards as well as in the fracture clinics would be useful in this context.

Premature menopause, either spontaneous or induced by surgery, is an important and common cause of female hypogonadism. Only 20% of the patients had received some form of antiosteoporotic treatment. No patients had received hormone replacement therapy (HRT). While previous randomised controlled trials had shown reduction of vertebral fracture using HRT by 40%–60% compared with placebo¹⁴ and was once considered the gold standard prevention of post-menopausal osteoporosis, the benefits and risks of HRT should be carefully discussed with this patient group in the light of WHI (women's health initiative) study.¹⁵ Although the WHI study further clarified the risks and benefits of the use of HRT in healthy post-menopausal women with an intact uterus, its role in women with premature menopause, either spontaneous or induced by surgery, is less clear. Certain medical disorders are associated with loss of bone density and this has been shown by various case controlled studies.^{16,17} Besides these medical disorders, previous history of gastric surgery and anticonvulsant therapy are recognised causes of increased loss of bone density. Ten patients had disorders related to increased bone loss and only one had treatment (with vitamin D/calcium). Maternal history of hip fracture is an independent risk factor and associated with twofold increase of risk for fragility fracture.¹⁸ Not all fractures are attributable to osteoporosis alone, clinical risk factors related to tendency to fall are strong predictors of fragility fracture. Increased risk of frequent falls attributable to various factors (previous stroke, dementia, Parkinson's

disease, history of frequent fall, alcoholism) have been shown to be associated with significant risk of fragility fracture,^{17,18} and was found in 15% of our patients. Existing clinical guidelines recommend a supplement of calcium and vitamin D, fall prevention measures, and use of external hip protectors for frail elderly patients in nursing or rest homes.¹⁻⁴

Discrepancy was seen in the proportion of treated patients among the high risk groups. It was evident from this study (tables 2 and 3) that corticosteroid users were more likely to receive treatment compared with other high risk groups. Only a small proportion of people in other high risk groups were identified and treated. The reasons why certain high risk people are still inadequately assessed may be because of a low level of awareness of the current screening recommendations among healthcare staff involved, reluctance to assess and treat a condition outside their specialties, insufficient resources or time, and lack of liaison between the secondary and primary care services. Most high risk patients are in fact readily identifiable and can be assessed and treated within the secondary or primary setting to prevent fragility fracture.

Existence of a national clinical guideline alone is not sufficient, and a clear local policy within a NHS trust is important to ensure guideline implementation. It should be acknowledged that although the patients were recruited to the study prospectively, information regarding their prior treatment was based on medical records and retrospective recollection of the patients, which might be subjected to possible memory bias. A larger population based study is probably best to further evaluate adequacy of assessment and treatment of patients with high risk factors. Despite the limitation of this study largely because of its size, the results suggests that among a group of patients admitted with hip fractures, few of the higher risk people were identified or treated before admission with fragility fracture.

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