

## ORIGINAL ARTICLES

### Osteoporosis Assessment and Treatment in Older Patients who Have Sustained a Hip Fracture

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#### Abstract

##### Background and aims

Currently fracture sufferers are not being assessed or treated for osteoporosis. Osteoporosis guidelines differ in their secondary prevention recommendations, with the Scottish Intercollegiate Guideline Network (SIGN) advocating bone densitometry in all fracture patients and anti-resorptive treatment only if evidence-based criteria are confirmed, but the National Institute of Clinical Excellence (NICE) technology appraisal recommends treatment for all older females without this bone densitometry confirmation. We aimed to determine the rate of referral for bone densitometry, the numbers achieving SIGN criteria for anti-resorptive therapy, and the rate of osteoporosis treatment in patients with hip fracture

##### Methods

A retrospective review of all patients older than 65 years who had sustained a hip fracture in Tayside between April 2003 and July 2005 was performed

##### Results

Only 8.6% of hip fracture patients underwent bone densitometry, of which 90.6% of females older than 75 years met SIGN criteria for anti-resorptive treatment. 74.3% of all patients referred for bone densitometry were treated with an anti-resorptive agent, compared to only 12.7% of the large majority group who were not assessed for osteoporosis

##### Conclusion

Osteoporosis investigation and therefore treatment remains sub-optimal in hip fracture patients. Almost all females, older than 75 years, with a hip fracture met evidence-based criteria for anti-resorptive treatment. NICE guidance, recommending anti-resorptive treatment without bone densitometry confirmation of reduced bone mineral density, should maybe be implemented for this specific group of patients in an attempt to increase osteoporosis treatment rates.

##### Key words

osteoporosis, hip fracture, bone densitometry, older people, guidelines

#### Introduction

Osteoporosis and the resultant fragility fractures are a major public health concern. Hip fractures, in particular, are associated with substantial morbidity, mortality and health service costs.<sup>1</sup> In these patients, who have proven osteoporosis with a bone mineral density T-score lower than -2.5, pharmacological therapy is known to reduce future fractures by 40% to 60%.<sup>2</sup>

Studies, mainly from North America, have highlighted low rates of osteoporosis assessment and treatment in high-risk groups<sup>3-7</sup>. A systematic review in 2004 by Elliot-Gibson et al<sup>8</sup> concluded that the median rate of osteoporosis investigation in patients who had sustained a fragility fracture was 11% (0.5-32%) and fewer than 10% of patients were treated with anti-resorptive therapy. Various guidelines have been published regarding the optimal management and prevention of hip fractures in older people<sup>9-14</sup>. These guidelines do however differ in their recommendations. The Scottish Intercollegiate Guidelines Network (SIGN) recommends all fracture patients be considered for bone densitometry and treatment only if evidence-based Bone Mineral Density (BMD) criteria are met<sup>15-19</sup> (Figure 1). The Royal College of Physicians of London (RCP), recommends treatment of older patients who have sustained a fragility fracture if BMD T-score at the femoral neck or spine is less than a -1.0. More recently the National Institute of Clinical Excellence (NICE) technology appraisal on treatments for the secondary prevention of fracture recommends that females over 75 years of age, who have sustained a fracture, should be treated with an anti-resorptive agent, without the need for BMD assessment.

The objective of this study was to look at osteoporosis assessment and treatment in patients over the age of 65 years, who had sustained a hip fracture. We aimed to assess the rate of referral for bone densitometry, the prevalence of osteoporosis and other anti-resorptive evidence-based indications, and the rate of anti-resorptive prescribing.

## Methods

This study retrospectively looked at all patients sustaining a hip fracture, over the age of 65 years, who underwent bone densitometry in Tayside between April 2003 and July 2005. Over this period of time data from the Information and Statistics Division (ISD) of NHS Scotland revealed that there were 1217 patients over the age of 65 years, admitted to hospitals in Tayside as a consequence of a hip fracture. The NICE technology appraisal was only available from the end of our study period and amongst the many other guidelines available in Tayside, we are advised to adhere to the SIGN guidelines. We therefore used SIGN as our gold standard for care. Osteoporosis assessment was therefore defined as undergoing bone densitometry and osteoporosis treatment was defined as initiation or continuation of anti-resorptive therapy, namely: bisphosphonates, selective oestrogen receptor modulators, hormone replacement therapy, strontium or teriparatide. Later three other guideline criteria were used, namely: NICE technology appraisal 87,<sup>13</sup> RCP London,<sup>12</sup> and Glasgow fracture liaison service guideline<sup>14</sup>.

We used our Dual Energy X-Ray Absorption (DEXA) technicians' patient assessment records to identify which hip fracture patients subsequently underwent osteoporosis assessment. These recorded all fragility fractures documented on the DEXA request form and as a backup all patients were asked directly at the time of attendance about hip fracture history. This method of recording began in April 2003. The medical notes and axial DEXA scan results were reviewed (by DL), looking specifically at SIGN indications for anti-resorptive therapy, and subsequent osteoporosis treatment.

In-order to study osteoporosis treatment rates and identify possible reasons for omitting osteoporosis assessment in the remaining 1112 patients, we aimed to review the medical notes of at least a 10% sample of these patients. We therefore identified 120 consecutive patients who had been admitted with a hip fracture in Tayside between September 2003 and January 2004, but who did not undergo bone densitometry.

**Table 1 Evidence-based indications for anti-resorptive therapy identified in the 105 patients who attended for bone densitometry following a hip fracture**

	BMD T-score $\leq$ -2.5	Alternative Indication	Anti-resorptive Indication
All patients	71/105 (67.6%)	15/105 (14.3%)	86/105 (81.9%)
Age 65 -75 years	22/42 (52.4%)	7/42 (16.7%)	29/42 (69.0%)
Age > 75 years	49/63 (77.8%)	8/63 (12.7%)	57/63 (90.5%)
Female	60/84 (71.4%)	12/84 (14.3%)	72/84 (85.7%)
Male	11/21 (52.4%)	3/21 (14.3%)	14/21 (66.7%)
Female > 75 years	42/53 (79.2%)	6/53 (11.3%)	48/53 (90.6%)

## Results

Of the 1217 patients who sustained a hip fracture in our study, only 105 underwent subsequent bone densitometry. The mean age of these patients was 77.8 years, and 80.0% were female. Of these 105 patients, 71 (66.7%) were found to be osteoporotic (Table 1). Patients who were older than 75 years were more likely to be osteoporotic than those aged 65 - 75 years, 77.8% versus 52.4% ( $p=0.006$ , chi squared test). In terms of osteoporosis treatment, 95.8% (68/71) of these patients with proven osteoporosis were commenced on an appropriate anti-resorptive agent.

Despite 34 patients not meeting BMD criteria for a diagnosis of osteoporosis, 15 (44%) met another evidence-based criteria for anti-resorptive therapy (Figure 1). The commonest reason being a lumbar spine BMD T-score of less than -2.0, and 6 patients fell into this category. Four patients were taking steroids for longer than 3 months duration, and a further 4 patients had sustained more than one vertebral fracture. Finally 3 patients had a history of single vertebral fracture, in conjunction with a hip BMD T-score less than -1.6. A vertebral fracture was defined as meeting the 20-25% vertebral height reduction criterion<sup>20</sup>. In terms of osteoporosis treatment only 10 of these 15 patients (66.7%) were commenced on an anti-resorptive agent. Therefore, in the over 75-year-old female group, 48/53 (90.6%) of patients met evidence-based criteria for anti-resorptive therapy, and so may have benefited from treatment. The number

**Figure 1 Evidence based indications for bisphosphonate therapy**

1. Commitment or exposure to oral steroids for  $\geq$  3 months and age  $\geq$  65 years or previous fragility fracture.<sup>15</sup>
2.  $\geq$  2 vertebral fractures (after exclusion of tumour/myeloma).<sup>16</sup>
3. Non-vertebral fracture and femoral neck T-score  $\leq$  -2.5.<sup>2 17</sup>
4. Non-vertebral or vertebral fracture and lumbar spine T-score  $\leq$  -2.0.<sup>18</sup>
5. Single vertebral fracture and femoral neck T-score  $\leq$  -1.6.<sup>19</sup>

**Table II Potential reasons for not being assessed for osteoporosis in the 118 patients studied with hip fracture**

	Number	Percentage (%)
Death within 3 months of fracture	30	25.4
General frailty	18	15.3
Already prescribed anti-resorptive medication	6	5.1
Non-compliance	3	2.5
Unable to transfer onto DEXA scan plinth	1	0.8
No reason identified	60	50.8

was significantly lower for patients in the 65-75 year old group, with only 29/42 (69.0%) potentially benefiting ( $p=0.005$ , chi squared test).

The medical notes of 118 of the 120 patients identified were reviewed. The mean age of this sample group was 82.3 years, and 77.2% were females. This matched well with the characteristics of the 1112 patients who were not scanned who had a mean age of 82.9 years and 78.1% were female. The commonest reason identified in these patients that may have explained why they were not assessed for osteoporosis was death, with 30 (25.4%) patients dying within 3 months of their hip fracture (Table II). A further 18 (15.3%) patients were considered to be too frail for bone densitometry and subsequent anti-resorptive therapy. Frailty was classified as either suffering from severe dementia, or another end stage disease i.e. severe cardiac failure, or having multi-factorial medical problems that required continued hospital or nursing home care.

There were 3 patients who would not have complied with the treatment regime, and 6 patients who were already on bisphosphonates, mainly because of long-term corticosteroids. One patient was unable to transfer onto the plinth in order to be scanned. We therefore determined that bone densitometry might have been inappropriate in 58 (49.2%) of the 118 patients studied.

In terms of osteoporosis treatment in this group, in addition to the 6 patients who fractured while already on bisphosphonate therapy, a further 9 patients were commenced on bisphosphonate treatment, but did not undergo bone densitometry to confirm osteoporosis or another BMD criteria. Therefore the osteoporosis treatment rate in the group of hip fracture patients who were not referred for bone densitometry was 12.7% (15/118).

## Discussion

Assessment and treatment of patients who sustain a hip fracture remains sub-optimal, and our study confirms that most patients at high risk of further fracture still did not receive appropriate assessment or treatment despite various osteoporosis guidelines. Less than 10% of patients were referred for bone densitometry. However on closer analysis of these patients who did not get referred for bone densitometry, almost 50% had a valid reason for not undergoing osteoporosis assessment. These patients were significantly older than the group who do undergo bone densitometry, with a mean age of 82.3 versus 77.8 years ( $p<0.001$ ). As a consequence of not including the 9 patients who were commenced on a bisphosphonate without BMD confirmation of osteoporosis, it could be argued that more than 50% of patients not referred for bone densitometry have a valid reason. Best practice in this area is subject to debate at present, following recent NICE guidance.

Patients who undergo bone densitometry are nearly six times more likely to receive anti-resorptive treatment than patients who did not get assessed (74.3% versus 12.7%). Over 95% of patients were treated with anti-resorptive medication, if BMD assessment confirmed osteoporosis. The barrier to osteoporotic treatment therefore seems to be in assessing these patients who sustained a hip fracture for osteoporosis, and not in implementing treatment. Simonelli et al<sup>21</sup> reported that densitometry may be a barrier to osteoporosis treatment, with 39% of physicians saying that densitometry was unnecessary for treatment. Patient transportation issues were another concern.

There are numerous sets of osteoporosis treatment guidelines and because their recommendations differ, clinical practice may be affected<sup>22</sup>. There is no debate that older patients who have sustained a fracture and who have a T-score less than -2.5 should be treated with anti-resorptive therapy, if tolerated. However guidance varies firstly in whether female patients older than 75 years need densitometry confirmation of osteoporosis, and secondly in those fracture patients with osteopenia. In implementing four different sets of guidelines<sup>10 12 13 14</sup> to

**Table III Contrasting rates of anti-resorptive treatment criteria met depending on guideline implemented**

	SIGN 71 (10)	NICE technology appraisal 87 (13)	RCP London (12)	Glasgow fracture liaison service guidelines (14)
Patients >65 years	86/105 (81.9%)	87/105 (82.9%)	103/105 (98.1%)	93/105 (88.6%)
Patients age 65-75	29/42 (69.0%)	27/42 (64.3%)	42/42 (100%)	34/42 (81.0%)
Patients age >75	57/63 (90.5%)	60/63 (95.2%)	61/63 (96.8%)	59/63 (93.7%)
Females	72/84 (85.7%)	75/84 (89.3%)	82/84 (97.6%)	76/84 (90.5%)
Males	14/21 (66.7%)	12/21 (57.1%)	21/21 (100%)	17/21 (81.0%)
Females >75 years	48/53 (90.6%)	53/53 (100%)	51/53 (96.2%)	49/53 (92.5%)

the patients in our study we found that the rate of treatment recommended ranged from 81.9% to 98.1% (Table III). The fact that 95.8% of patients, who had osteoporosis confirmed by densitometry, were treated with anti-resorptive therapy, compared to only 66.7% of those with another BMD criteria, suggests that doctors may be affected by conflicting guidance in this area. For females over the age of 75 years, where NICE suggest that patients do not need bone densitometry, between 90.6% and 96.2% of patients met treatment criteria in alternative guidelines.

If NICE guidance is implemented in this patient group, then we may see an increase in osteoporosis treatment for this high-risk group by removing the potential barriers of bone densitometry and conflicting treatment criteria.

The downside of not scanning this group is that some patients with severe osteoporosis will not be identified who would potentially benefit from teriparatide therapy, and some patients who may have normal bone density will be treated with anti-resorptive therapy, although our study suggests this to be less than 10%.

There are several limitations associated with our study. We examined a 10% sample of all fractures, but we believe this to be representative. Because the study was a case note review we did not obtain fracture history directly from patients, therefore possibly some traumatic hip and vertebral fractures may have been included in analysis, although the history of all hip fractures and most vertebral fractures was obtained from the notes and traumatic fractures were excluded.

## Conclusion

Osteoporosis treatment remains sub optimal in hip fracture patients. Problems with triggering osteoporosis assessment seem to be the main barrier to getting appropriate treatment, rather than subsequently starting treatment after bone densitometry. However in women over 75 years formal assessment may not be necessary as 90-96% have an indication for anti-resorptive therapy, and NICE guidance should maybe be implemented. This may improve treatment rates by removing the need for bone densitometry in such patients. Efforts at improving osteoporosis treatment in patients who have sustained a fragility fracture need to be focused at assessing males and younger women for osteoporosis, and treating older females, as long as they are well enough to potentially benefit from therapy.

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