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An audit of current clinical practice in the management of osteoporosis in Nottingham

O. Sahota, A. Worley and D. J. Hosking

Abstract

Background Osteoporosis is now recognized by the World Health Organization and the Department of Health as a major public health problem. In 1994, the Advisory Group on Osteoporosis (AGO), set up by the Department of Health, recommended that Health Authorities and general practitioner fundholders should purchase bone densitometry services for the management of osteoporosis. The aims of this study were to assess the criteria for requests for bone densitometry from primary care in comparison with the AGO recommendations and to compare the numbers of patients referred with a low-trauma osteoporotic fracture with the expected number of fractures in the Nottingham area.

Methods Patient referral data and requests for bone densitometry were collected by case note review of all new patients referred to the Nottingham Osteoporosis Clinic over a 12 month period and then compared with the AGO recommendations. The patients referred with a history of a low-trauma fracture were then compared with the expected incidence of fractures, calculated using age–sex-specific fracture incidence data applied to the Nottingham population Census statistics.

Results A total of 413 patients were referred to the Osteoporosis Clinic for bone densitometry. Almost two-thirds of the patients had no clinical indicators for requests for scanning, in comparison with the AGO recommendations. Seventy-seven patients were referred with vertebral fracture, 12 hip, 20 colles and 26 other fractures. Using age–sex-specific fracture incidence data applied to the Nottingham population Census statistics, it was estimated that the expected incidence of hip fractures would be 812, distal forearm fractures 514 and vertebral fractures presenting to clinical attention 625. This represents 1.5 per cent of the total hip fractures, 3.9 per cent distal forearm and 12.3 per cent vertebral actually presenting to the Osteoporosis Clinic.

Conclusion Bone densitometry was requested in up to 60 per cent of the patients with no clinical risk factors to warrant bone densitometry. Osteoporosis-related fractures remain unrecognized in clinical practice. The majority of patients do not receive specialist assessment despite being at high risk of future fracture. Further steps are necessary to educate health care professionals in primary and secondary care, but more importantly, to direct services more proactively in those at high risk of future fracture.

Keywords: osteoporosis, bone densitometry, health authority, fracture incidence

Introduction

The problem

Osteoporosis has now been recognized by the World Health Organization (WHO) and the Department of Health as a major public health problem. It is a common disease associated with pain, disability and increased mortality. The clinical significance of osteoporosis lies in the fractures that arise, of which the most common are those of the vertebra, distal forearm and the proximal femur. The remaining lifetime risk of sustaining one of these fractures in a Caucasian women, at the time of the menopause, lies between 35 and 40 per cent.[1] In men, lifetime risk is less, but substantial and approximates to one-third that of women, although the risk varies appreciably between countries.[2–4] Among British postmenopausal women, the estimated annual fracture incidence is 60 000 at the hip, 50 000 at the distal forearm and 40 000 at the spine, resulting in an annual estimated cost to the National Health Service of approximately £942 million.[5]

Morbidity and mortality

Osteoporotic fractures are associated with significant morbidity, but the most serious consequences arise in those with a hip fracture. There is a significant increase in mortality in patients suffering a hip fracture, with an overall 12–20 per cent reduction in expected survival and a 5–20 per cent excess mortality within the first year after the fracture.[6] Approximately half of the previously independent patients become partly dependent and ultimately one-third totally dependent.[7] Distal forearm fractures cause less morbidity, although the consequences are often underestimated. These fractures are painful, may require multiple surgical reductions, 20 per cent of patients are hospitalized and the frequency of algodystrophy is high.[8]

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Morbidity associated with vertebral fractures remains uncertain, but up to 35 per cent may reach clinical attention because of back pain.[9] In patients with severe vertebral deformity, there is a high degree of functional impairment[10,11] and, furthermore, recent data also suggest that vertebral fractures are associated with significantly increased mortality.[12]

The WHO has predicted that osteoporosis will reach epidemic proportions if preventive measures are not undertaken now. The projected, explosive, worldwide increase in incidence is expected from the continued ageing of the population in developed countries and the exponential increase in life expectancy in the population of underdeveloped countries. In England and Wales, the number of people aged 65 years and over is predicted to rise by 860 000 between 1996 and 2015, and by a further 3.3 million between 2015 and 2030.[13] Ageing will result in a disproportionate increase in the number of fractures because of the exponential relationship between fracture rate and age. This increase will further be accentuated by an increase in the secular trends of fracture incidence, particularly with respect to the rates of hip fracture.[14–16] In 1990 the estimated incidence of hip fractures worldwide was 1.66 million, which is expected to increase to 6.23 million by 2050.[17]

The role of bone densitometry

Primary prevention is the major strategy for reducing osteoporotic fractures, because of the large number of patients at risk. There are methods of optimizing skeletal mass at puberty[18] and preventing bone loss throughout life.[19] This intervention can be applied to the whole population without knowledge of individual fracture risk, although the effectiveness of this strategy in reducing fractures, patient compliance and the cost savings is unknown. Despite increasing public awareness and demand for screening, the role of bone densitometry in population screening remains controversial. Currently there is insufficient evidence to show that universal screening would prevent fractures,[20] although bone densitometry still remains a valuable tool in the clinical assessment of 'at-risk' individuals and monitoring the effectiveness of treatment.

In 1994 an Advisory Group on Osteoporosis (AGO) was set up by the Department of Health and recommended that Health Authorities and general practitioner (GP) fundholders should purchase services for osteoporosis including bone densitometry in the context of a case-finding strategy rather than population screening.[21]

Study aims

The aims of this study were to assess the criteria for requests for bone densitometry from primary care in comparison with the AGO recommendations and to compare the numbers of patients referred with a low-trauma osteoporotic fracture with the expected number of fractures in the Nottingham area.

Methods

Primary–secondary care referrals

To evaluate the pattern of referral, a retrospective audit of all new patients referred to the Nottingham City Hospital Osteoporosis Clinic was performed. This clinic has been established since 1988 and receives all primary and secondary referrals for the assessment and treatment of patients with osteoporosis, and is the only specialist clinic in Nottingham. In 1997 there were no local specific criteria for referral and all patients referred to the Osteoporosis Clinic were referred under the judgement of the individual clinician on the perceived risk of osteoporosis of their patients. National guidelines were available as a report published by the Department of Health in 1994. All physicians within both primary and secondary care had open access to refer patients to the Osteoporosis Clinic. Data were collected from 1 January to 31 December 1997 and included information on reason for referral, referral specialty, patient demographics and fracture presentation, where applicable. Risk factors for osteoporosis were evaluated by examination of the referring letter and by a risk factor proforma collected on patients presenting to the clinic.

AGO recommendations for DXA

Nottingham does not operate a direct open access Dual X-ray Absorptiometry (DXA) service and thus where a primary care physician felt a DXA scan was warranted, patients have to be referred to secondary care via the Osteoporosis Clinic, requesting a DXA. The reasons for requesting DXA from primary care were recorded and compared with the AGO recommendations for the use of DXA.

Fracture incidence

To determine the incidence of vertebral, distal forearm and hip fractures, the age–sex-specific 1998 hip fracture incidence rates from Nottingham [Queen's Medical centre (internal audit)], distal forearm fracture data published by Donaldson *et al*.[22] and vertebral fracture data published by Cooper *et al*.[9] were applied to the Nottingham population statistics, obtained from the Nottingham Census data for 1996.[23] Local age–sex-specific incidence rates were available only for hip fractures, and therefore rates for distal forearm and vertebral fractures were extrapolated from other studies.

A retrospective audit was performed from 1 January to 31 December 1998 at the Queen's Medical Centre, Trauma and Orthopaedic Unit, Nottingham, and data were collected on all patients admitted to the unit with a hip fracture and the age–sex-specific incidence rates calculated.

The study by Donaldson *et al*. was undertaken in the largest health district in England, where a diagnostic index was developed to identify all patients who were admitted to the accident and emergency department with a suspected fracture. The study by Cooper *et al*. was undertaken in Rochester,

Minnesota, where all patients diagnosed as having one or more vertebral fracture over a 5 year period, presenting to clinical attention, were identified. Fracture trauma was categorized as asymptomatic–mild, moderate–severe and pathological. Age–sex incidence rates in the asymptomatic–mild trauma group were used in this study.

Statistical analysis

Analysis was performed using SPSS® for Windows™ 8.0 software (SPSS Inc., Chicago, IL, USA). Anthropometric data were expressed as mean ± standard deviation (SD).

Results

The audit of the Osteoporosis Clinic showed that 428 patients were referred for the assessment and treatment of osteoporosis between 1 January and 31 December 1997. Data were collected on 413 patients; 388 (94 per cent) were referred from primary care and 25 (6 per cent) from secondary care (within-hospital referrals: 12 orthopaedics, six rheumatology, five respiratory and two gynaecology).

The age–sex distribution of the referrals is shown in Table 1.

Approximately half the referrals were in the 55–64 year age group and 46 per cent were over the age of 65 years. Table 2 summarizes the AGO recommendation for DXA, which was compared with the request for DXA from the primary care physician.

The comparisons are summarized in Table 3.

DXA was requested appropriately (i.e. requested in a patient with a risk factor to warrant DXA imaging, consistent with the AGO recommendations) in the majority of the patients over the age of 74 years (history of a low-trauma fracture). In the 55–64 year age group there were no clinical indicators for requests for DXA in 41 per cent of the patients, with the main reason for request being patient concern. Among patients under the age of 45 years, risk factors for secondary causes of osteoporosis and anorexia nervosa were the main clinical indicators for DXA request.

Data from the DXA department revealed that during the period 1 January–31 December 1997 all DXA requests were referred from this single Osteoporosis Clinic source.

Table 1 Age–sex distribution of referrals (numbers, with percentages of total referrals given in parentheses)

Age group	Female	Male
<45	49 (12)	4 (1)
45–54	90 (22)	9 (2)
55–64	125 (30)	9 (2)
65–74	83 (20)	10 (2)
75–84	27 (7)	5 (1)
85 and over	2 (1)	–
Total	376 (91)	37 (9)

Table 2 AGO recommendations for bone densitometry

Clinical finding	Objective
Oestrogen deficiency Early natural or surgical menopause Prolonged amenorrhoea Critical decision-making following the menopause	Selective case finding
Vertebral deformity X-ray osteopenia Low-trauma fracture	Confirm diagnosis
Long-term corticosteroids	Identify fast bone loser
Conditions predisposing to secondary osteoporosis	Quantify bone loss
Monitoring therapy	Quantify response

Only a small proportion of patients (135; 32.6 per cent of the total) with a recent low-trauma fracture were referred for assessment of osteoporosis. Other fractures included fractures of the ribs, pelvis, long bones and small bones (hands and feet).

Age–sex-specific population statistics revealed that the total population of Nottingham was 646 780 persons, of whom 160 253 were aged 55 years and over. The age–sex population statistics of those aged 55 years or over are shown in Table 4. It is estimated that by the year 2018, 208 310 persons will be aged 55 years or over, representing a 30 per cent increase.

Table 5 shows the age–sex-specific estimate of fractures for the Nottingham population in 1997. The total estimate of fractures in each group equates to 625 vertebral fractures, 821 hip fractures and 514 distal forearm fractures.

Figure 1 shows the distribution of fractures referred to the Osteoporosis Clinic and, in parentheses, the proportion of patients these represent compared with the expected number of fractures calculated using the age–sex-specific incidence applied to the Nottingham population statistics.

Discussion

Prevention of the first fracture is the ideal goal in developing a strategy for the management of osteoporosis. However, at present there is no universally accepted policy for screening

Table 3 Reason for referral for DXA from primary care compared with the AGO recommendations for DXA

Age group	Clinical indicators for DXA (%)	No clinical indicators for DXA (%)
<45	64	36
45–54	61	39
55–64	59	41
65–74	65	35
75–84	91	9
85+	100	–

Table 4 Nottingham population statistics (total persons)

Age group	Female	Male	Total
55–64	30906	30269	61175
65–74	29234	25385	54619
74–84	20113	12918	33031
85 and over	8590	2838	11428

with DXA to identify patients 'at risk'. Policies have now become focused on the case-finding approach and have been endorsed by the Department of Health. In 1994 the AGO published a report consisting of guidelines for the identification, diagnosis and management of osteoporosis. Nevertheless, this study highlights that this report has made little impact on the management of osteoporosis in clinical practice. This is further supported by a recent survey by the National Osteoporosis Society, which showed that only 20 per cent of Health Regions had any strategy for the prevention and treatment of osteoporosis.

Patient concern represented 40 per cent of the referrals for bone densitometry in the 55–65 year age group and with no risk factors to warrant screening. With the ever-increasing media attention on osteoporosis and steering groups for patient's rights, this will continue to escalate as a major Health Service problem.

Using population-based age–sex-specific fracture incidence data, there is a high predicted incidence of fractures of the spine, hip and forearm in Nottingham. Assuming that the majority of these fractures are related to osteoporosis and therapeutic interventions are not being prescribed before specialist assessment,[24] a large number of patients with osteoporosis are being missed and denied specialist treatment.

The epidemiology of vertebral fractures has been difficult to investigate because many fractures appear to be relatively asymptomatic and definite radiographic criteria for their diagnosis are uncertain. In this study the expected incidence of vertebral fractures presenting to clinical attention was calculated using the Rochester fracture incidence data. Thus 627 patients with a history of an asymptomatic–mild trauma vertebral fracture would be expected to present to clinical attention in Nottingham and require further assessment for osteoporosis. Only 77 patients (12.3 per cent of the expected) were referred for specialist assessment. Some of these patients may have been prescribed treatment by their primary care physician, in the absence of secondary care assessment, although it is unlikely that many were receiving treatment.

The majority of distal forearm fractures present to orthopaedic surgeons and the numbers expected for 1996 were in the region of 512 per year. Only 20 distal forearm fractures (3.9 per cent of those expected) were referred to the Osteoporosis Clinic for further evaluation, of which only eight were referred from an orthopaedic surgeon. A recent study by Earnshaw *et al.*[25] evaluated the prevalence of osteoporosis among patients presenting to the Nottingham accident and emergency orthopaedic unit with a distal forearm fracture, following minimal trauma. This showed that 56.4 per cent of patients were classified (WHO classification of osteoporosis T score ≤ -2.5) as osteoporotic at the wrist, 45.5 per cent at the spine and 36.4 per cent at the hip. The presence of an osteoporotic distal forearm fracture is associated with a two-fold increase in hip fracture risk,[26] which is further increased 1.5- to 2.5-fold for every 1 SD decrease in bone mass.[10] This sub-group is therefore at high risk of future fracture and is clearly another target for further intervention.

Only 12 (1.5 per cent) of the expected 821 patients presenting with a low-trauma hip fracture were referred to the clinic. It is expected that half of these patients will become partly dependent and ultimately one-third totally dependent following fracture, which has further and important implications in the management of osteoporosis.[6,7] The prevalence of vitamin D deficiency is high in the very elderly,[27,28] which may further be exacerbated after fracture, as a consequence of patients becoming more housebound or institutionalized. In this case, it thus may be appropriate to offer all these patients calcium and vitamin D treatment as a routine without the need for bone densitometric assessment. Furthermore, DXA has certain limitations in the elderly, particularly at the lumbar spine, where the presence of aortic, posterior facet joint sclerosis and/or osteophytic calcification may falsely elevate bone mineral density (BMD),[29] and multiple vertebral deformities limit the practicalities of scanning. It may thus be appropriate not to offer specialist clinic services to all these patients, although it is recognized that further strategies for the optimal management of these patients need to be defined.

Table 5 Expected number of fractures (age–sex incidence rates per 10 000 population)

	Vertebra		Hip		Distal forearm	
Age group	Female	Male	Female	Male	Female	Male
55–64	75 (24.1)	6 (1.8)	52 (17.1)	45 (14.7)	126 (40.8)	8 (25.1)
65–74	158 (53.6)	27 (10.8)	85 (28.9)	54 (21.3)	159 (54.2)	10 (25.4)
74–84	196 (97.5)	31 (23.8)	194 (96.6)	88 (68.3)	119 (59.2)	12 (15.1)
85 and over	100 (116.7)	35 (124.4)	244 (284.4)	59 (206.1)	52 (60.8)	28 (7.9)

Sources: vertebra, Ref. 9; hip, Nottingham Hip Fracture Audit; distal forearm, Ref. 22.

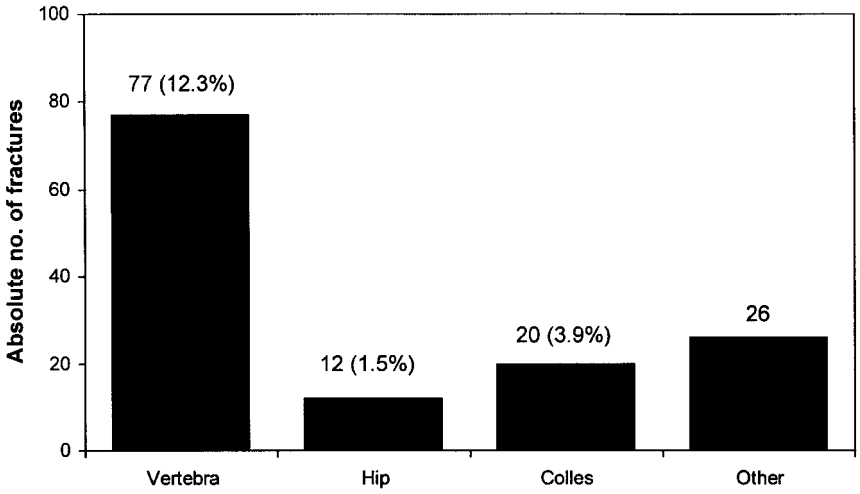

Figure 1 Distribution of fractures referred (per cent estimated fracture incidence).

Age–sex projection statistics estimate that the number of hip fractures will increase by 23 per cent in 2018, vertebral compression fractures presenting to clinical attention by 25 per cent and distal forearm fractures by 21 per cent. Such projections, however, do not take into account the secular trend increases in fracture incidence that have been seen in some countries, particularly with respect to fractures of the hip. In the United Kingdom, secular trend increases in hip fracture have, however, appeared to have reached a plateau,[30] but continue to rise in the developing countries, particularly in the Far East. Cooper[31] proposed three main explanations for these trends: (1) increasing physical inactivity leading to a decrease in bone density and or possibly increasing the risk of falls; (2) increasing frailty of the elderly population; (3) the effect of a cohort phenomenon, manifested by changes occurring in earlier generations, now presenting as a rising incidence in successive elderly generations.

Further strategies are obviously necessary to target the high-risk population. Bone densitometry is recognized as the goal standard for fracture risk assessment, but clearly even directed at the high-risk population would have major resource limitations. Of the major osteoporotic fractures, 109 patients were referred to the specialist osteoporotic clinic for assessment. If all the expected patients with a vertebra, distal forearm or hip fracture were referred, this would amount to 1960, which clearly would be unacceptable but consistent with the AGO recommendations. Local guidelines have been developed for primary care, in conjunction with national guidelines published by the Royal College of Physicians, to provide a local framework to identify patients at high risk of osteoporosis, provide indications for bone densitometry and outline the management of prevention and treatment of osteoporosis (see Appendices 1 and 2). Referrals will be re-audited to improve local health-care provision, but critically to ensure that treatment is offered to those who are most at need. Population screening at present to identify the patient 'at risk' is not universally accepted although it may be cost-effective in an elderly population.

A number of limitations, however, have to be recognized with this study. This was a retrospective audit and all the data collected were limited to what was accessible from the patient records. Extrapolation of age–sex-specific fracture incidence data may not be accurately reflect the expected fracture incidence, particularly with respect to US data, where it is known that fracture rates are higher than in the United Kingdom.

The AGO report was published in November 1994, although it is unclear how widely this was published to local clinicians; however, the availability and use of osteoporosis services should have encouraged individual clinicians to obtain further information. National opinion polls give limited information on community osteoporosis prescribing and it may thus be more useful to use community prescription data, particularly with respect to bisphosphonate therapy.

Conclusion

In summary, DXA was requested in up to 60 per cent of patients with no clinical risk factors to warrant bone densitometry measurement. Osteoporosis-related fractures remain unrecognized in clinical practice and the majority of these cases do not receive specialist assessment despite being at high risk of further fracture. Further steps are necessary to educate health care professionals in primary and secondary care, but more importantly to direct services proactively to those with established osteoporosis. Hip fractures remain the most serious complications of the disease in terms of patient morbidity, mortality and economic burden, and further cost-effective strategies are necessary to manage this problem.

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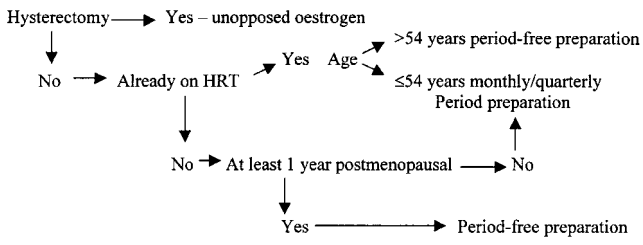
Appendix 1: Prevention of osteoporosis

High-risk group

(1) Family history	Low-trauma fracture <60 years in first-degree relative
(2) Thin body build	BMI <20 kg/m^2 (eating disorders, malabsorption, etc.)
(3) Early menopause	<45 years
(4) Premenstrual amenorrhoea	>6 months (excluding pregnancy)
(5) Hysterectomy <45 years	Premature menopause
(6) Secondary causes	Prednisolone >7.5 mg/day >6 months
	Hypogonadism (male/female)
	Other metabolic bone diseases

Lifestyle advice

(1) More weight-bearing exercises
(2) Increase calcium intake to 1 g/day premenopausal, 1.5 g postmenopausal
(1 pint semi-skilled milk = 660 mg calcium)
(3) Avoid excess alcohol intake (female 14–20 units; male 21–25 units)
(4) Stop smoking



FOR INFORMATION ONLY

Indications for DXA scan within Osteoporosis Clinic

(1) Problems with HRT in high-risk group (as defined above)
(2) Concern about breast cancer risk with HRT (first-degree relative)
(3) Before starting alternative drugs (Bisphosphonates, Tibolone, Raloxifene)
(4) Vertebral or major long bone fracture while on preventive treatment

Appendix 2: Management of established osteoporosis

Presentations of established disease

(1) Low-trauma fracture
(Common fractures include those of the vertebra, wrist and hip, but other fractures include those of the pelvis, long bones and ribs)
(2) Kyphosis, loss of height, back pain (as a result of vertebral collapse)
(All patients must have an X-ray confirmation of vertebral collapse or osteopenia for referral to Osteoporosis Clinic)

Investigations – to exclude secondary causes of disease

(1) History, including risk factors (see prevention)
(2) Examination to exclude non-osteoporotic bone disease
(3) Full blood count, erythrocyte sedimentation rate, calcium, phosphate, creatinine, urea and electrolytes, liver function
(4) X-ray appropriate skeletal sites, e.g. spine in patients with back pain
Lateral thoracic and lumbar spine is sufficient where non-osteoporotic bone disease has been excluded
(5) Thyroid function test and/or myeloma screen – where clinically relevant

FOR INFORMATION ONLY

Indications for DXA scan within the Osteoporosis Clinic

(1) Bone mass measurement where history of fracture in doubt
(2) Radiographic evidence of osteopenia
(3) Selection of treatment in patients with vertebra fracture depending on whether hip BMD is low (Alendronate/Risedronate) or normal (Etidronate–Didronel PMO)
(4) To assess response to and compliance with treatment (measurement at baseline and 12 months)