

Effectiveness of Strategies for the Secondary Prevention of Osteoporotic Fractures in Scotland

Executive Summary

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1. Introduction: fractures, osteoporosis and the secondary prevention of osteoporotic fractures

Osteoporosis and its associated fractures are common and are a major and costly public health problem because they result in significant morbidity and mortality. Each year, in Scotland, about 20,000 women \geq 50yr sustain low trauma, non-vertebral fractures (including wrist, hip, humerus and ankle fractures) that result in presentation to hospital; about 50% are managed as inpatients.

The impact of fracture on utilisation of health care differs depending on the site of the fracture; ~all fractures at non-vertebral skeletal sites result in presentation to trauma (A&E/Orthopaedic) services. However, <10% of patients with vertebral fractures present to hospital. While back pain and associated disability are the classic clinical consequences of vertebral fracture, about 50% are painless; when pain is present – it is often ascribed to other causes. If a spine X-ray is performed, vertebral fractures can be readily identified; most patients with vertebral fractures are not X-rayed. For these reasons about 67% of patients with vertebral fractures are not diagnosed. There are no data relating to vertebral fracture incidence in Scotland. As with non-vertebral fractures, the prevalence of vertebral fractures rises with age and ranges from around 20% of women of 50-59yr to around 40-60% of women over 80yr.

The impact on patients' quality of life and survival also differs depending on the site of the fracture. Hip and vertebral fractures are associated with increased mortality. Post-fracture morbidity is universal, but is greatest after hip fracture and often brings an end to independent living and necessitates subsequent institutional care. A key aspect of post-fracture morbidity that is common to fractures occurring at all skeletal sites is the substantial increase in risk of having another fracture; a fracture at any site is associated with a 2-3x higher risk (than in the general population) of having another fracture at any site. For all patients with a fracture, other than those with multiple vertebral fractures, reduction of this increased fracture risk (that is, the 'secondary prevention of osteoporotic fractures') requires axial DXA assessment of bone mineral density (BMD) to determine who will benefit from treatment. BMD is a powerful predictor of fracture risk, is used to diagnose who has osteoporosis, but crucially (and uniquely) axial-DXA-confirmed low BMD is the key modifiable skeletal risk factor for fracture that can be used to target treatment to reduce the incidence of non-vertebral and vertebral fractures (as endorsed by SIGN guideline 71: the Management of Osteoporosis). Osteoporosis, as measured by axial DXA, is present in between 30% (ankle) and 70% (hip) of women who fracture. Targeted appropriately with axial DXA, treatment with the bisphosphonates, alendronate & risedronate (plus calcium & vitaminD) can halve the incidence of vertebral and non-vertebral fractures including hip fractures; other treatment options that provide more limited fracture risk reduction include calcitonin, calcitriol, cyclical etidronate, raloxifene and teriparatide. The latter drug has been proven to have very marked fracture reduction at all sites except the hip, although due to cost the Scottish Medicines Consortium recommend restricted use in part predicated by the finding of low axial BMD. Axial DXA thus permits evidence-based treatments to be targeted specifically at those at greatest fracture risk to ensure that treatment costs are invested in those who will benefit most.

2. The aims of this audit programme

The main aims of this audit programme are to assess strategies in Scotland for the secondary prevention of osteoporotic fractures in women over 50yr through:

- identification of what services exist for this purpose
- comparison of the effectiveness of different approaches to fracture 'case-finding' of women with fractures of the hip (typically requiring inpatient management) of the wrist (the commonest non-vertebral, non-hip fracture that is usually managed as an outpatient) and of spine (where X-ray reporting is central to 'case-finding') for year 2000.
- comparison of the resulting success rates (and determining factors) of these models in offering and achieving assessment and treatment for the secondary prevention of osteoporotic fractures in women who have had a fracture
- review of issues that govern the success of two secondary care osteoporosis service models that have been established for primary care clinicians and
- review of the cost implications of models of service that provide effective case-finding for the secondary prevention of osteoporotic fractures.

3. Service provision for assessment and/or treatment of osteoporosis

Acute fracture care is provided by 89 centres with A&E/Casualty and orthopaedic services. In the year 2000, 6 of 15 Health Board areas had ≥ 1 centre that offered ≥ 1 service that was potentially available for osteoporosis assessment in patients following fracture. Axial DXA was available to NHS patients at 9 Scottish centres; only 5 were full-time NHS-funded. One centre provides assessment for osteoporosis using ultrasound, a modality that was not endorsed either as a diagnostic tool or as an aid to targeting treatment, by SIGN guideline 71. Of the 10 centres providing 'assessment for osteoporosis' either on the basis of DXA or ultrasound, all provided access for patients in secondary care. However, only one centre (Western Infirmary, Glasgow (centre W)) provided a service within secondary care (the Fracture Liaison Service (FLS)), that integrated with A&E/orthopaedic services, and was dedicated to the task of routinely providing all new fracture cases with the opportunity to undergo osteoporosis assessment. The FLS offers assessment for osteoporosis to all women and men over the age of 50yr, who sustain a fracture at any skeletal site (provided the fracture did not occur in the context of a RTA or in a fall from above head-height) whether their acute fracture care is provided as an inpatient or as an outpatient. Nine centres provided access for osteoporosis assessment to patients referred from primary care on the basis of 'open-' or 'direct-access' (hereafter 'open- or direct-access' DXA services will be referred to as DADS and the 'open-access' ultrasound service will be referred to as OAU) but was restricted to patients with ≥ 1 referral criterion (typically osteoporosis risk factors, that included a history of previous fracture; primary care was responsible for 'case-finding' of fracture patients and for referral for assessment. Specialist osteoporosis secondary care clinics were available in 2 health board areas (Grampian and Greater Glasgow), providing another route to DXA assessment.

Six centres (A,G,H,I,S & W – see Table 1a) were invited to participate in this audit; they were chosen because they provide a range of services from none (centre I) to multiple options (centre W) (table 1a) and differ strategically in how they addressed the challenges of fracture secondary prevention (table 1b).

Table 1a: Participating centres and their services for assessment and/or treatment of osteoporosis

Centre	A	G	H	I	S	W
	Aberdeen Royal Infirmary	Glasgow Royal Infirmary	Hairmyres Hospital, E. Kilbride	Inverness Royal Infirmary	St.John's Hospital, Livingston	Western Infirmary, Glasgow
Specialist secondary care bone clinic	Yes	Yes	No	No	No	Yes
Fracture Liaison Service provided by secondary care	No	No	No	No	No	Yes 'FLS'
Open- or direct-access service provided by secondary care	Yes	Yes	No	No	Yes	Yes
Ortho. Surgeon advises patient to attend GP for referral for DXA elsewhere	No	No	Yes	No	No	No
Local DXA access	Yes	Yes	No	No	No	Yes
Access to ultrasound	No	No	No	No	Yes	No

Table 1b: How Different Models of Service for Assessment for Osteoporosis Function

Service model	Direct Access DXA Service (DADS)	Open Access Ultrasound Service (OAU)	Fracture Liaison Service (FLS)
Centres providing service	A, G & W	S	W
Routinely offers ~all inpatient fracture cases assessment / treatment for osteoporosis?	No	No	Yes
Routinely offers ~all outpatient fracture cases assessment / treatment for osteoporosis?	No	No	Yes
Service available to fracture cases for assessment / treatment of osteoporosis if referred?	Yes	Yes	Yes
Is this service responsible for fracture 'case-finding'?	No	No	Yes
Who is responsible for fracture 'case-finding'?	Primary care	Primary care	FLS (secondary care)
Are orthopaedic or A&E staff required to refer fracture cases for assessment?	No	No	No
Which fracture cases are eligible?	≥50yr, fracture any site	≥50yr, fracture any site	≥50yr, fracture any site
Assessment / treatment decisions based on axial DXA?	Yes	No (Heel ultrasound)	Yes
Service available to fracture cases for assessment / treatment of osteoporosis in hospital providing acute fracture care	Yes	Yes	Yes
Location of service offering assessment for osteoporosis?	secondary care	secondary care	secondary care
Does service providing osteoporosis assessment provide GP with result of scan and a specific treatment recommendation?	Yes	Yes	Yes
Does service providing osteoporosis assessment provide GP with result of scan, but not a treatment recommendation?	No	No	No

4. Methods: hip, wrist and vertebral fracture case-finding

The protocol was approved by MREC and the service providers' LRECs (primary and secondary care). Hip and wrist fracture cases who had presented in year 2000, were identified from secondary care record systems and their pathways of care were followed back to primary care where their case records were reviewed by audit nurses. Vertebral fracture cases were identified from review of the original spine X-ray reports from year 2000 to identify all those on which a vertebral fracture had been noted. The pathway of care of vertebral fracture cases was followed back to the records of the clinicians in primary care or secondary care who had requested the spine X-ray. 4070 eligible fracture cases were identified (1145 wrist fractures, 1335 hip fractures and 2590 vertebral fracture cases). The purpose was to identify whether, following the index fracture, patients had been offered or had undergone assessment for osteoporosis and/or whether they had been prescribed treatment for the secondary prevention of fractures; this endpoint recognises that the desirable outcome is not necessarily treatment for all, but treatment targeted appropriately based on BMD (and a proportion will undergo assessment and will be recommended not to take treatment because their BMD is above a level where treatment is effective in reducing fracture risk). In addition, factors that might influence whether patients were offered assessment and/or treatment for fracture secondary prevention were sought – including the potential influence of access to services, service configuration, and specifically for vertebral fractures, the terminology used by reporting radiologists to describe the presence of a vertebral fracture.

Tracking of the patients' pathways of care back to their primary care records required 1) identification of the patients' current GPs and 2) the cooperation of their primary care clinicians. Death of patients, inability to identify the GP with whom the patients were registered and non-participation of GPs precluded data collection from primary care records; where possible these patients' secondary care records were accessed to ascertain what post-fracture assessment/treatment for osteoporosis had been offered. Across the 6 participating centres, the pathways of post-fracture care were analysed in: 1) 704 hip fracture cases (primary care records of 516 were accessed and secondary care records were accessed for 188); 2) 919 wrist fracture cases (primary care records of 733 were accessed and secondary care records were accessed for 186); and 3) 443 whose spine X-rays had been requested by primary care clinicians and 831 patients whose spine X-rays had been requested by secondary care clinicians.

Methods: statistical analysis

Data were recorded in a custom-built database. All fracture cases were entered on the database after their primary care or secondary care clinical records had been accessed. Comparison of outcomes among the 6 participating centres was by Chi-square. Multiple logistic regression analysis was used to elucidate factors that were associated with key outcomes. Statistical analyses were performed on Minitab V13.

5. Fracture-related mortality

Among the 4070 fracture cases originally identified, by the end of the audit data collection period (up to 3yrs after the fracture) the mortality among the hip, vertebral and wrist fracture cohorts was 41%, 18% and 10% respectively. Within the hip, vertebral and wrist fracture cohorts those who died were 12, 5 and 5 years older respectively than those who survived.

6. Fracture-related morbidity: fractures and fracture risk

In this audit two aspects of the relationship between the occurrence of fracture and subsequent fracture risk were recorded: a) the past fracture experience (≥ 50 yr) that preceded the index hip, wrist or vertebral fracture and b) the fracture experience that followed the index fracture in the time to data collection (from 0.5-3.1yr).

6a. Fracture history: fractures prior to the index fracture

A history of previous fracture that had occurred since the age of 50yr was present in up to 52% of hip fracture cases, up to 41% of wrist fracture cases and in up to 62% of the cases with vertebral fracture. The past fracture history was not trivial – as among the hip fracture cohort this included a previous hip fracture in between 8% to 15% of cases (depending on centre). The past fracture history often comprised ≥ 2 separate fracture events: among patients in the hip, wrist and vertebral fracture cohorts, 20%, 12% and 21% (respectively) had experienced ≥ 2 other fractures in the past, but since the age of 50yr.

6b. Fracture history: fractures after the index fracture

In the time from the occurrence of index fracture to data collection, on average (SD) 1.8 (0.6)yr (range (0.5-3.1)yr), depending on centre, up to 25% of hip fracture cases, up to 17% of wrist fracture cases and up to 25% of vertebral fracture cases sustained ≥ 1 further fracture. Eleven percent of those with hip fracture and up to 8% of vertebral fracture cases subsequently had a hip fracture. Three percent of the cases with vertebral fracture had 2 additional fractures during this time. The risk of having a further fracture in this follow-up period is 1.7 to 2 fold higher after wrist and hip fracture, if there is, in addition, a past history of ≥ 1 other fracture.

7a. Assessment and/or treatment for the secondary prevention of osteoporotic fractures after hip and wrist fracture

Rates for providing the offer of assessment and/or treatment for osteoporosis following fracture (whether the fracture requires inpatient management – as is the case with hip fracture, or outpatient management – as for wrist fracture) differ significantly among the participating centres. After hip fracture, osteoporosis assessment and/or treatment rates range from 16% (centre I) to 97% (centre W) ($\chi^2=239.738$, df = 5, $p<0.0001$) and are as variable after wrist fracture ranging from 11% (centre I) to 95% (centre W) ($\chi^2=407.323$, df = 5, $p<0.0001$).

Ninety-seven percent of hip fracture cases are offered assessment and/or treatment where there was a FLS Service (centre W) compared with 25% in the absence of a FLS (centres A,G,H,I,S) ($\chi^2=227.053$, df = 1, $p<0.0001$). Forty-five percent of hip fracture cases at centres providing any local osteoporosis service (whether DADS/OAU for primary care, FLS or clinic – that is centres A,G,H,S & W) were assessed and/or treated for osteoporosis compared to just 16% in the centre that lacks these services (centre I)($\chi^2= 36.565$, df = 1, $p<0.0001$).

Ninety-five percent of wrist fracture cases are offered assessment and/or treatment where there was a FLS (centre W) compared with 21% in the absence of a FLS (centres A,G,H,I,S)($\chi^2= 401.183$, df = 1, $p<0.0001$). Forty-five percent of wrist fracture cases at centres providing any local osteoporosis service (whether DADS/OAU for primary care, Fracture Liaison Service or clinic – that is centres A,G,H,S & W) were assessed and/or treated for osteoporosis compared to just 17% in the centre that lacks these services (centre I)($\chi^2= 50.271$, df = 1, $p<0.0001$).

The key success factor in providing the offer of assessment and/or treatment for osteoporosis after hip or wrist fractures that was identified was availability of a FLS; offer of assessment and/or treatment is achieved 6.1X and 5.6X respectively, more often than where no service exists, and 3.2X and 4.1X more often than is achieved by a DADS/OAU. Other lesser, but nevertheless favourable, influences were: 1) provision of rehabilitation in a geriatric unit after hip fracture (OR (Odds Ratio) 2.33 (95%CI (confidence interval) 1.09 to 4.99)($p=0.03$); and 2) past history of ≥ 1 other fracture prior to sustaining the hip or wrist fracture (after hip fracture OR 2.15 (95%CI 1.47 to 3.15)($p<0.0001$) and after wrist fracture (OR 1.7 (95%CI 1.19 to 2.42)($p=0.003$)).

The essence of delivery of effective secondary preventive therapy is that treatment is used not in all patients, but in those where it has the potential to reduce future fracture risk. A legitimate outcome of assessment is that drug therapy may be neither necessary nor appropriate; so at centre W where almost all patients were offered assessment (and/or treatment) for osteoporosis, few cases with hip fracture, but ~9% of wrist fracture cases were recommended not to receive drug therapy. All centres experienced finite rates of failure of patients to accept the offer of assessment and/or treatment (either through explicit refusal or through non-attendance for DXA); the impact of this was greatest at centre W where 20-30% of wrist and hip fracture cases either refused the offer of assessment or declined treatment. However, in the context of the FLS at centre W, substantially higher actual (targeted) treatment rates were achieved after hip and wrist fracture. After hip and wrist fractures 25% and 32% of wrist fracture cases received bisphosphonate (typically with calcium & vitamin D) (respectively) and 48% and 15% received calcium & vitamin D (alone) (respectively); after wrist fracture a further 9% received either raloxifene or HRT. Rates of bisphosphonate use are up to 10X higher after hip fracture and up to 15X higher after hip fracture in centre W with the FLS than are achieved at other centres.

Socioeconomic deprivation, that is associated with increased fracture risk at all sites, was associated with higher rates of assessment and/or treatment, but this surprising result reflects the higher representation of the more deprived deocat groups in

Glasgow, where there was better access to services for the secondary prevention of fractures.

7b. Assessment and/or treatment for the secondary prevention of osteoporotic fractures after vertebral fracture

Between 47% (centre I) and 84% (centre G) of vertebral fracture cases identified on X-rays requested by primary care clinicians and between 25% (centre H) and 69% (centre G) of cases identified by secondary clinicians were subsequently either offered assessment and/or treatment for fracture secondary prevention. Overall secondary care vertebral fracture cases were half as likely to be assessed and/or treated than cases from primary care (OR 0.39 (95%CI 0.3 to 0.51)($p < 0.0001$); 70% of cases from primary care were offered assessment and/or treatment compared with 52% from secondary care ($\chi^2 = 39.185$, $df = 1$, $p < 0.0001$). Among the entire vertebral fracture cohort, assessment and/or treatment were more likely when there was a past history of ≥ 1 other fracture prior to sustaining the vertebral fracture (OR 1.91 (95%CI 1.49 to 2.46)($p < 0.0001$)), and if patients had ≥ 2 vertebral fractures (OR 1.95 (95%CI 1.49 to 2.55)($p < 0.0001$)).

Actual treatment rates among patients with vertebral fractures were typically higher for cases identified on X-rays taken by primary care clinicians (7% to 44% higher than for cases identified in secondary care at 4 centres (A, H, S, & W), but were similar at centres G & I). For example, bisphosphonates were prescribed in 41% to 57% of primary care-identified cases and to 12% to 43% of secondary care-identified cases.

The availability of a local service (invariably provided by secondary care - whether DADS/OAU or FLS or secondary care clinic) trebles the chance of 'assessment and/or treatment of osteoporosis' after vertebral fracture (O.R. 2.56 (1.89 to 3.48)($p < 0.0001$). Almost all patients who were assessed and/or treated at centre A achieved this through a DADS. Highest rates of assessment and/or treatment overall were achieved at centres G and W, where although there is a DADS, assessment was usually achieved through referral to specialist Bone Metabolism clinics (in, respectively, 40% and 34% of cases); the DADS, however, accounted for an additional 27% and 34% of cases (respectively). At other centres, assessment and/or treatment was achieved through referral to secondary care clinics. It should be noted that in contrast to hip and wrist fractures, the FLS model, as currently configured, only deals with the occasional vertebral fracture cases who require hospitalization, and does not assess those patients who are only referred for X-ray and whose spine X-rays are reported to show the presence of a vertebral fracture.

8. The impact of reporting of vertebral fractures on osteoporosis assessment and/or treatment after vertebral fracture

The purpose of this component of the audit was to assess current radiological practice in reporting vertebral fractures and its impact on triggering intervention (including assessment if required) for the secondary prevention of osteoporotic fractures among the clinicians who requested the spine X-rays.

In one hospital alone, review of X-ray reports from year 2000, 26 different phrases had been used to report the presence of vertebral fracture. Core terms that were regarded by the Audit Steering Group to be synonymous with, and indicative of, vertebral fracture were agreed and were sought in the spine X-ray reports: these terms included: 'fracture', 'collapse', 'compression', 'wedging', 'height loss'; other terms suggesting fracture were grouped as 'other'. Where used, other descriptors (such as number of fractures, possible duration and grading of severity) were also noted.

The terminology used in reporting the presence of a vertebral fracture on a spine X-ray was shown to influence subsequent rates of assessment and/or treatment for osteoporosis. Sixty-five percent of reports that included explicit reference to the presence of a 'fracture' were associated with subsequent assessment and/or treatment for osteoporosis, compared to 57% following reports that did not mention 'fracture' ($p=0.03$). Sixty-six percent of reports that included explicit reference to the presence of a 'collapse' of a vertebra were associated with subsequent assessment and/or treatment for osteoporosis compared to 54% following reports that did not mention 'collapse' ($p=0.0001$). None of the other terms used to indicate the presence of vertebral fracture were associated with higher rates of post-fracture assessment and/or treatment. Thus, the terminology used by radiologists to report the presence of vertebral fractures is crucial in determining whether corrective intervention is triggered in the clinicians who receive the reports of the spine X-rays.

Multiple logistic regression confirmed the significant association between inclusion of the term 'fracture' in the original X-ray report and post-vertebral fracture secondary prevention (OR 1.57 (95%CI 1.12 to 2.12)($p=0.009$)). Reporting of multiple vertebral fractures was associated with higher rates of subsequent assessment and/or treatment for osteoporosis (67%) than when the X-ray report referred to the presence of a single vertebral fracture (54%) ($\chi^2= 19.545$ df = 1, $p=0.0001$). While it is reassuring that these patients who are at very high risk of further fracture are more likely to undergo assessment and/or treatment, current guidelines suggest that treatment for fracture secondary prevention after vertebral fracture in patients with multiple vertebral fractures is appropriate without prior DXA. If access to DXA is a potential barrier, the group of patients with multiple vertebral fractures should not be denied treatment on account of lack of access to DXA.

9a. Primary care, osteoporosis and the secondary prevention of osteoporotic fractures: perspectives and opportunities

To gauge primary care clinicians' perspectives of the importance of osteoporosis and post-fracture osteoporosis fracture management and of the DADS (Glasgow & Aberdeen) and FLS (Glasgow) service models, questionnaires were sent to 474 Glasgow GPs (46% responded), to 165 Glasgow practice nurses (59% responded) and to 92 Grampian practices (55% responded).

Ninety-eight percent and 95% respectively of Glasgow GPs and of Grampian practices rated the management of osteoporosis in primary care as a 'medium', 'high' or 'very high' priority. Ninety-five percent of Glasgow GPs rated prevention of osteoporotic fracture as 'quite' or 'very' important. Ninety-eight percent and 90% respectively of Glasgow GPs and of Grampian GPs rated the DADS Services as

useful”, or “very useful”. Virtually all of Glasgow’s and Grampian’s GPs had used the DADS. Eighty-seven percent of Glasgow GPs rated the FLS “quite” (30%) or “very useful” (57%). The vast majority of GPs report that they ‘always’ use the specific treatment regimens recommended by DADS & FLS.

The survey of Glasgow practice nurses confirmed that many practices had ≥ 1 clinic that would provide an opportunity to undertake a more strategic approach to osteoporosis management in women in primary care: practices run “Well Woman Clinics” (38%), HRT Clinics (18%) and clinics for over 75 year olds (29%). While offering potential to discuss osteoporosis or for ‘case-finding’ of those with a past history of fracture this currently does not happen routinely. Practice nurses would be well placed to take on a greater role in case-finding and in effecting strategies for the secondary prevention of osteoporotic fractures, but several educational needs require to be addressed before that would be appropriate.

9b. Primary care, osteoporosis and the secondary prevention of osteoporotic fractures: observations from primary care in and around Glasgow

Patients with a past history of fracture are at highest risk of fracture; patients with previous fracture or with other with risk factors for osteoporosis including early menopause, corticosteroid use (among many other risk factors) are eligible for DXA assessment. To assess the response of primary care clinicians in and around Glasgow to these 3 risk factors in the context of the availability (or not) of local access to DXA, 15 primary care practices (12 within Glasgow, with access to DADS, and 4 situated >20miles from Glasgow and without local access to DADS) were visited to assess the assessment and/or treatment rates among patients identified from primary care with these 3 risk factors. Visits to review primary care clinical records of patients with these risk factors who had been identified from searches of primary care patient databases were undertaken, and anonymised data were obtained from their records according to an MREC & LREC approved protocol.

Sixty-eight percent of patients with early menopause had undergone some form of assessment and/or treatment and local availability of a DADS service did not influence this outcome. However, early menopause typically might prompt use of HRT without the necessity for DXA, and not necessarily for reasons relating to risk of osteoporosis. Virtually all patients who were current or past users of steroid therapy had undergone assessment and/or treatment for osteoporosis (typically treatment), as guidelines support use of bone protective (anti-osteoporosis) treatments without prior DXA. However, for those with a history (of previous) hip fracture or “other non-vertebral fractures” who were identified from GP patient database search, 67% and 39% (respectively) of those residing within Glasgow with local access to DADS underwent assessment and/or treatment in contrast to 40% and 21% (respectively) among those practices that did not have local access to DXA. Eighty to eighty-five percent of cases with vertebral fracture underwent assessment &/or treatment – reflecting the potential to treat them (provided multiple fractures were present, without prior DXA).

9c. Primary care, osteoporosis and the secondary prevention of osteoporotic fractures: observations from primary care in and around Aberdeen

The Aberdeen DADS for primary care permits referrals based on a wide range of osteoporosis risk factors including past fracture. Thirty-six percent of referrals for DXA were because of previous low trauma fracture. Although typically GPs do prescribe treatments as recommended by the DADS, about 16% of patients who were shown to have osteoporosis were not prescribed treatment that had been recommended, and a proportion who did not have osteoporosis, and in whom treatment had not been recommended by the DADS, had actually been prescribed medication by their GPs.

9d. Primary care, osteoporosis and the secondary prevention of osteoporotic fractures: conclusions

DADS service models that offer access to axial DXA for primary care are highly regarded by GPs in managing osteoporosis, a condition that they regard as a 'medium' or 'high priority' disease area. Increasing the access to DXA for primary care clinicians is a prerequisite for improving delivery of strategies for the secondary prevention of osteoporotic fractures. It is essential to establish with primary care clinicians, appropriate prioritisation of indications for DXA assessment; patients with previous fracture should be accorded the highest priority for access to DXA. Even if a local FLS is available to address the assessment & treatment needs of patients with new fractures, DADS service models are necessary also to address the needs of patients who have previously sustained a fracture, provided they can be identified from primary care computerised record systems.

There was noteworthy variability in the number of fracture patients identified from the databases of participating practices. Currently, there is no central directive to encourage, endorse, or facilitate the recording of fracture history in primary care patient records/databases; fracture history is key clinical information that should trigger assessment for the secondary prevention of osteoporotic fracture. It thus appears that patients who are at highest risk by virtue of fracture may be neglected because their fracture may not be logged in primary care record systems and because of lack of access to DXA, which is a pre-requisite for appropriate fracture secondary prevention after non-vertebral fractures and after single vertebral fractures. However, where available, the DADS service model has a key role, in providing the opportunity for assessment of patients who sustained a fracture in previous years (a group who are at the same degree of increased risk of further fractures as those with new or incident fractures). Patients who had undergone DXA assessment via DADS included those who sustained a fracture up to 20 years previously, but nevertheless in their 60s. Assessment after fracture is 'never too late' and treatment of a woman who is now over 80yr, who previously has had a fracture (over the age of 50yr), provided her BMD is at a level where treatment can benefit fracture risk, is likely to effect greater absolute fracture risk reduction than many who still nevertheless merit treatment, but are 20yrs younger. It is clear from the national audit data presented here that access to DXA crucially influences treatment rates for the secondary prevention of fractures.

10. Osteoporosis Service Providers 2004

As of January 2004, 10 of 15 Health Board areas have ≥ 1 centre that offers ≥ 1 service (within that same Health Board area) that is potentially available to assess for osteoporosis in patients who have sustained a fracture. Axial DXA is available to NHS patients at 13 Scottish centres. In general DXA provision is insufficient, but paradoxically when available, is sub-optimally utilised (and often is only available part-time). Two centres provide assessment for osteoporosis using ultrasound, a modality that is not endorsed by the SIGN guideline. Of the 15 centres providing 'assessment for osteoporosis' either on the basis of DXA or ultrasound that were functioning by January 2004, all provide access for assessment to secondary care patients; 14 provide DADS/OAU for patients referred from primary care. By January 2004, 10 centres in 6 Health board areas have introduced services analogous to the FLS to provide systematic assessment for the secondary prevention of osteoporotic fractures to those presenting with new fractures.

It is possible to extrapolate from the experience of the incidence of new non-vertebral fracture cases assessed by FLS in Glasgow, and from the vertebral fractures identified through the 'case-finding' undertaken by this audit programme to model the number of DXA scans that would be required to address the needs of the Scottish population for the secondary prevention of osteoporotic fractures. Approximately 41,190 DXA scans per annum would be required to offer appropriate assessment to the majority of new vertebral and non-vertebral fracture cases, and to a proportion of those with previous fractures, in women and men ≥ 60 yr.

11. Conclusions & key recommendations

1. Approximately 20,000 women over 50yr present to acute fracture services in Scotland each year with new low trauma fractures at non-vertebral sites. The true additional burden from new vertebral fractures is unknown.
2. Non-vertebral and vertebral fractures are a substantial drain on NHS resources.
3. About half of the index cases of hip, wrist and vertebral fracture had previously had at least one other fracture over the age of 50yr - and the opportunity to reduce the risk of the index fracture occurring had been neglected.
A patient with a fracture is at high risk of having further fractures.
4. Non-vertebral and vertebral fractures are associated with considerable morbidity that includes increased risk of further fractures: a fracture at any skeletal site is associated with greatly increased risk of having other fractures – often soon after the original fracture. About 17-25% of the index hip, wrist and vertebral fracture cases had another fracture in the ~ 1.8 yr after the index fracture.
The occurrence of a new fracture (any site) should prompt early assessment for the secondary prevention of fractures because of the high risk of early, further fracture.
5. The occurrence of a fracture at any site presents an opportunity for assessment for osteoporosis with a view to targeting those patients with osteoporosis with appropriate treatment to halve their risk of experiencing further fractures at

vertebral and non-vertebral sites (including hip fractures). Identification of osteoporosis in patients who have had a fracture requires access to axial DXA. **Patients who fracture in Scotland require access to axial DXA – as this is the key tool for targeting treatment for the secondary prevention of fracture. Approximately 41,190 DXA scans per annum are required in Scotland to address the fracture secondary prevention needs of women and men \geq 60yr.**

6. There is marked regional variation within Scotland in rates of offering the opportunity for assessment for osteoporosis or for treatment for the secondary prevention of osteoporotic fractures after fractures as a consequence of inequity of service provision.
7. The Fracture Liaison Service model is uniquely effective in addressing the fracture secondary prevention needs of patients after non-vertebral fracture and achieves substantially higher rates (~95% to 97%) of offering assessment and/or treatment than other service models including those offering 'open-' or 'direct-access' to DXA for primary care clinicians.
The Fracture Liaison Service model, effected by nurse specialists, should be deployed throughout Scotland as the systematic solution to challenge of how to achieve the secondary prevention of osteoporotic fractures.
8. DADS models for primary care serve the fracture secondary prevention needs of two groups of patients – those with vertebral fractures identified on spine X-rays requested by GPs and for patients with previous non-vertebral fractures (provided their past fracture history has been logged in primary care clinical records).
DADS models have a complementary role to the FLS and should be developed throughout Scotland to address the need to provide patients with previous fractures who can be identified in primary care, with the opportunity to be considered for treatment for the secondary prevention of fractures.
9. Fracture secondary prevention after the identification of vertebral fractures on X-rays identified by secondary care clinicians is achieved less often than in primary care.
The FLS service model should be adapted to link with Radiology Departments to provide assessment for fracture secondary prevention to patients whose spine X-rays are reported to show vertebral fractures.
10. The terminology used by Radiologists to describe the presence of vertebral fractures plays a pivotal role in triggering intervention for the secondary prevention of fractures after vertebral fracture by the clinicians who request spine X-rays; currently Radiologists use confusing and diverse terminology that may hinder appreciation that a vertebral fracture has occurred.
Radiologists in Scotland should adopt a universal, simplified scheme to report vertebral fracture such as the semi-quantitative assessment devised by Genant & Wu; however, we recommend that when a fracture is perceived to be present, there should be specific and explicit inclusion of the term 'fracture' in all X-ray reports.

11. Primary care clinicians accord management of osteoporosis and prevention of osteoporotic fractures as a priority in their clinical practice. 'Case-finding' by primary care clinicians, of patients in the community with previous fractures, is feasible but requires past fracture history to be recorded in primary care patient databases.

Routine recording of past fracture history (over the age of 50yr) on primary care database should be encouraged.

There is potential for practice nurses to gain a greater role in fracture case-finding and in the delivery of strategies for fracture secondary prevention in primary care, after their training needs have been addressed.

12. Summary of main outcomes/results including implications for NHS Scotland

There is inequality in the provision of services for osteoporosis and assessment throughout Scotland. A fracture liaison service and direct access DXA facility allow patients who have sustained a fracture to be offered and receive appropriate therapies to prevent osteoporotic fractures in the future. The primary recommendation of this audit is that all health board regions in Scotland should be compelled to introduce such services without delay. This, accompanied by increased education of medical and paramedical staff and improved reporting and recording of fractures, will enable targeted therapy to be given to reduce the burden of future fractures in Scotland.

13. Brief details of any further work planned

The follow-up period after post-fracture assessment and treatment was too short in this report to detect an effect of therapy introduction on fracture rates, at least as determined by multiple regression analysis. It is recommended that a further audit be commissioned after introduction of further fracture liaison services to determine the relative rates of fractures in centres where patients over the age of 50 with fractures have only recently been identified and treated compared to the established centres. Research is also recommended as to the most effective methods of vertebral fracture identification to enable therapeutic intervention and a reduction of future morbidity and excess mortality.