Do reductions in out-of-pocket expenses for dual energy X-ray absorptiometry scans translate to reduced fracture incidence among older Australians? A population-based study.

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KEYWORDS: fracture incidence, policy evaluation, reimbursement, bone mineral density

This study aimed to compare fracture incidence in the elderly pre- and post-revision of bone density scan reimbursement guidelines, which changed in 2007. Fracture incidence by age group was calculated using population-specific data. Guideline changes did not appear to reduce fracture incidence in the study region located south eastern Australia.

ABSTRACT

Purpose: In 2007, Medicare Australia revised reimbursement guidelines whereby individuals aged 70 years and over received reduced out-of-pocket expenses for dual energy X-ray absorptiometry (DXA) scans. The current study aims to determine whether fracture incidence in the elderly has changed since the revision of reimbursement guidelines.

Method: Keyword searches of the two major radiological centres servicing the Barwon Statistical Division (BSD) were used to identify incident fractures for residents aged 75 years and over for 2006 and 2012. Pathological fractures were excluded. Fracture incidence by age strata (75-79 years, 80-84 years and 85+ years) were calculated using population-specific data from the Australian Bureau of Statistics (2006 and 2012). Standardised fracture ratios were calculated for men and women.

Results: In total, 996 fracture events were identified for BSD residents during 2006 and 1,260 identified in 2012. The standardised fracture ratios between 2006 and 2012 were 1.12 (95%CI 1.11, 1.25) for men and 1.08 (95%CI 1.11, 1.16) for women.

Conclusion: The change in reimbursement guidelines appears to have had little impact on reducing fracture incidence during this time frame for elderly men and women, in fact, fracture rates increased. Future research should investigate osteoporosis management following DXA over a longer time frame.

BACKGROUND

Osteoporosis is characterised by reduced bone mineral density (BMD), resulting in an increased risk for fracture and significant associated personal and economic burden [1], [2]. Approximately 4.7 million Australians aged 50 years and over were estimated to suffer low bone mass (osteoporosis and osteopenia) in 2012. This is projected to increase to 6.2 million, along with an almost \$1 billion increase in annual direct and indirect associated costs over the next decade [3]. The vast majority of deaths associated with fractures attributable to osteoporosis occur in those 70 years and over [3].

In effect from April 2007, the Australian government revised reimbursement guidelines regarding osteoporosis scanning and treatment for individuals aged 70 years and over. Revisions included reduced out-of-pocket expenses for BMD tests and expansion of the eligibility criteria for subsidised osteoporosis treatment with alendronate. A subsidy was already in place for treatment with alendronate for patients aged 70 years and over with a past history of minimal trauma fracture; however, subsidy revisions now include those with a high risk of fracture as indicated by a BMD T score of -3.0 or less [4], [5].

Previous research has investigated whether the changes to reimbursement guidelines have impacted dual energy X-ray absorptiometry (DXA) scanning rates amongst the elderly in the Barwon Statistical Division (BSD). A comparison of scanning rates between 2003 and 2010 for individuals aged 70 years and over revealed a two-fold increase in the number of DXA scans for men and three-fold increase for women [6]. Data from the same region reported the most common reason for attending a Bone Densitometry Service was being aged 70 years and over (64.6%) [7]. However, authors of both studies concluded the rate of scanning for osteoporosis was suboptimal [6], [7].

The current study aims to determine whether fracture incidence among the elderly in the Barwon Statistical Division (BSD) has changed since the revision of reimbursement guidelines.

METHOD

Study Region

The BSD is a geographically well-defined region of south-eastern Australia. The population of the BSD spans a wide range of social, cultural and geographical backgrounds, and was serviced by a centralised healthcare provider (the University Hospital Geelong, Barwon Health) during the study period [8].

Fracture Ascertainment

Keyword searches of the two major radiological centres servicing the BSD were used to identify all incident fractures for residents aged 75 years and over for the years 2006 and 2012 (5 years post subsidy change). Radiological reports were scrutinised by research staff with experience in fracture identification. Only clearly diagnosed fractures were included and descriptors such as 'possible' or 'suggestive' were disregarded unless confirmed by a subsequent radiological report. Pathological fractures were also excluded. Only the first fracture was recorded for individuals who sustained multiple fractures during the observation period. Single events which resulted in fractures at multiple sites were classified as 'multiple fractures'. Major osteoporotic fractures (MOF) included fractures of the hip, vertebrae, wrist and proximal humerus. Fractures were coded according to International Classification of Diseases-10th revision (ICD-10). Vertebral fracture refers to a clinical vertebral fracture. A detailed description of the fracture ascertainment method has been published previously [9, 10]. The use of radiological reports as a method of fracture ascertainment has been validated previously [9]. The study protocol was approved by the Human Research Ethics Committee at Barwon Health.

Statistical Analysis

Fracture incidence rates were calculated using population-specific data for the years 2006 and 2012 from the Australian Bureau of Statistics [11], a reliable source for population figures. Data are presented as number of fractures per 1,000 persons per year for men and women aged 75-79 years, 80-84 years and 85 years and over. Differences in fracture incidence, for all fractures and MOF, between 2006 and 2012 for each age stratum and confidence intervals were determined by a test of two proportions. A p-value of below 0.05 was considered significant.

Fracture incidence rates for both periods were standardised to the 2006 population figures to account for differences in age profiles during the two study periods and the standardised fracture rate ratio was calculated for men and women aged 75 years and over. Statistical analyses were performed using Minitab (version 16; Minitab, State College, PA, USA) and STATA (Release 11.0; StataCorp, College Station, TX, USA).

RESULTS

In total, 996 and 1,260 fracture events were identified for BSD residents aged 75 years and over during 2006 and 2012, respectively (see Table 1).

The highest fracture incidences were observed in 2012: 58.4 per 1,000 person years (95%CI 49.2-68.7) for men, 92.0 per 1,000 person years (95%CI 83.6-100.9) for women, and 80.3 per 1,000 person years (95%CI 73.9, 87.1) for men and women pooled.

The differences in fracture incidence for MOF between 2006 and 2012 were minimal and did not reach the 0.05 level of significance, see Table 2. The greatest difference in fracture incidence over time was observed for women aged 75-79 years whereby rates increased from 37.4 fractures per 1,000 individuals in 2006 to 45.4 in 2012 [RR 1.21 (95%CI 1.00, 1.48)]; however, this difference was of borderline significance. No further differences in fracture incidence were observed across age groups for men or women, separately or pooled (Table 2).

The standardised fracture ratios between 2006 and 2012 were 1.12 (95%CI 1.01, 1.25) for men and 1.08 (95%CI 1.02, 1.16) for women. For MOF, the standardised fracture ratio was 1.15 (95%CI 1.01, 1.31) for men and 1.06 (95%CI 0.98, 1.15) for women.

DISCUSSION

Standardised fracture rates have increased by 12% in men and 8% in women between 2006 and 2012. The previously-reported increase in the uptake of BMD scanning described by Brennan et al [6] in the same geographical region appears to have had little impact on reducing fracture incidence in this time frame.

Although previous studies have demonstrated increases in BMD scanning amongst those aged 70 years and over, it is the consensus amongst authors that scanning rates remain low [6, 12]. Qualitative research from the same region as the current study reported that general practitioners (GPs) considered osteoporosis to be of low salience [13], rendering bone health as potentially less likely to be investigated than other health conditions. The major hospital servicing the region was also without a fracture liaison service thus we cannot exclude the possibility that study findings might have been different if conducted in a region where the major hospital had a fracture liaison service. Inderjeeth and Smeath suggested one of the main reasons given by GPs for not ordering a BMD test for an elderly patient was that the patient was considered to be at low risk of osteoporosis [12], despite the prevalence of osteoporosis increasing sharply after 70 years of age [14]. Aside from the suboptimal levels of scanning for osteoporosis, there is a worldwide treatment gap where those at high risk of subsequent fracture are left untreated [15], especially men [16], [17]. The osteoporosis treatment rate also appears to have dropped over the past decade [15].

It is plausible that an increase in DXA referrals might have the capacity to reduce fracture incidence by informing clinical decisions regarding osteoporosis treatment. However, the increase in uptake of DXA scanning may require a longer time frame for osteoporosis management to impact on the fracture incidence than was examined in the current

analyses. Thus we suggest a longer term of follow-up may be warranted. In addition, approximately 45% of women and 58% of men aged 70 years and older have been shown to have osteopenia [14], and data suggest that the population burden of fractures may originate in those with osteopenia rather than osteoporosis [18]. Considering guidelines from Osteoporosis Australia state that treatment of osteopenia is not routine unless a previous minimal trauma fracture has occurred [19], this may have clinical ramifications for patients with osteopenia and is a factor for consideration when interpreting these results. Further investigation into the number needed to treat in order to reduce fracture incidence in those with osteopenia would benefit this discussion [20].

Several strengths and limitations of the study need to be considered. The study design does not enable us to control for confounding variables, including the uptake of anti-fracture treatment and changes in health behaviours. A major strength of the current study is the fracture ascertainment method. Accessing radiological reports allowed for the identification of all types of fracture including fractures that did not require hospitalisation. Although the study included the two major radiological centres servicing the BSD during 2006 and 2012, new radiological centres had opened during the period of review. To remain consistent, we included only radiological centres that were operating in both time periods; however, it is possible that we have underestimated the incidence of fracture during 2012.

Given the decline in hip fractures in the same region and the worldwide trend of stable or declining fractures prior to the change in guidelines [21, 22], it is unlikely that the effect of the change in guidelines has been masked by an increasing fracture incidence during this time, however this possibility cannot be ruled out. The current study has compared fracture incidence during the year before, and five years after the guideline changes in 2007,

however further exploration of the years post guideline changes could produce different results. It may also take more than five years for the benefits of this guideline change to become apparent. Finally, as the major hospital servicing the study region was without a fracture liaison service at the time of the study, comparisons with other regions may be less generalizable.

Previous research has shown that GP education can have small but significant improvements in the number of BMD referrals for patients both with and without a fracture [12]. We believe continuing education for both the medical community and the general public is the key for improvement in BMD referrals and scans, in turn influencing osteoporosis management and subsequent fracture incidence reductions to relieve the burden of fracture felt by the community. Currently in Australia, efforts are being made to relieve this burden through organizations such as the SOS Fracture Alliance, who are behind a push for the implementation of fracture liaison services nation-wide and engagement with primary healthcare services [23]. Future research investigating the osteoporosis management following DXA, including outcomes of fracture liaison services, and treatment of those with osteopenia could benefit this discussion.

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Table 1- Numbers of fractures for men and women aged 75+ years for 2006 and 2012.
Results presented as n (%).

Fracture site	2006		2012	
	Men	Women	Men	Women
Hip	63 (23.5)	136 (18.7)	59 (16.3)	164 (18.2)
Wrist	8 (3.0)	80 (11.0)	19 (5.3)	97 (10.8)
Vertebral	81 (30.2)	231 (31.7)	121 (33.5)	220 (24.5)
Humerus	12 (4.5)	48 (6.6)	19 (5.3)	79 (8.8)
Rib	16 (6.0)	25 (3.4)	33 (9.1)	46 (5.1)
Pelvis	7 (2.6)	43 (5.9)	15 (4.2)	43 (4.8)
Other	67 (25.0)	128 (17.6)	77 (21.3)	188 (20.9)
Multiple fracture sites	14 (5.2)	37 (5.1)	18 (5.0)	62 (6.9)
TOTAL	268	728	361	899

Table 2: Sex-specific numbers of fractures and fracture incidence for BSD residents aged 75+ years, separated into all fractures and major osteoporotic fractures (MOF). Data are expressed as fractures per 1,000 per year, together with 95% confidence intervals.

Year	2006					2012				
	Population	No. of MOF	Total no. of fractures	Fracture incidence -MOF	Fracture incidence -all fractures	Population	No. of MOF	Total no. of fractures	Fracture incidence --MOF	Fracture incidence- all fractures
Male										
75-79 years	3,899	56	91	14.4 (10.9, 18.6)	23.3 (18.8, 28.6)	4,018	61	101	15.2 (11.6, 19.5)	25.1 (20.5, 30.5)
80-84 years	2,562	49	88	19.1 (14.2, 25.2)	34.3 (27.6, 42.1)	3,030	72	124	23.8 (18.6, 29.8)	40.9 (34.2, 48.6)
85+ years	1,680	68	89	40.5 (31.6, 51.0)	53.0 (42.8, 64.8)	2,329	96	136	41.2 (33.5, 50.1)	58.4 (49.2, 68.7)
All	8,141	173	268			9,377	229	361		
Female										
75-79 years	4,738	123	177	26.0	37.4	4,671	138	212	29.5	45.4

				(21.6, 30.9)	(32.1, 43.1)				(24.9, 34.8)	(39.6, 51.8)
80-84 years	3,852	191	266	49.6 (42.9, 56.9)	69.1 (61.2, 77.5)	4,050	200	285	49.4 (42.9, 56.5)	70.4 (62.7, 78.7)
85+ years	3,321	210	285	63.2 (55.2, 72.1)	85.8 (76.5, 95.9)	4,370	272	402	62.2 (55.3, 69.8)	92.0 (83.6, 100.9)
All	11,911	524	728			13,091	610	899		
Males and Females pooled										
75-79 years	8637	179	268	20.7 (17.8, 24.0)	31.0 (27.5, 34.9)	8689	199	313	22.9 (19.9, 26.3)	36.0 (32.2, 40.2)
80-84 years	6414	240	354	37.4 (32.9, 42.4)	55.2 (49.7, 61.1)	7080	272	409	38.4 (34.1, 43.2)	58.8 (52.4, 63.5)
85+ years	5001	278	374	55.6 (49.4, 62.3)	74.8 (67.6, 82.4)	6699	368	538	54.9 (49.6, 60.7)	80.3 (73.9, 87.1)

Year						
	Estimate for	P value	Estimate for	P value	RR (95%CI)	RR (95%CI) -

	difference -MOF	-MOF	difference -all fractures	-all fractures	-MOF	All fractures
Male						
75-79 years	0.8 (-4.4, 6.0)	0.8	1.8 (-5.0, 8.5)	0.6	1.06 (0.74, 1.52)	1.08 (0.81, 1.42)
80-84 years	4.6 (-2.9, 12.2)	0.2	6.6 (-3.4, 16.6)	0.2	1.24 (0.87, 1.78)	1.19 (0.91, 1.56)
85+ years	0.7 (-11.6, 12.2)	0.9	5.4 (-8.9, 197.5)	0.5	1.02 (0.75, 1.38)	1.10 (0.85, 1.43)
All						
Female						
75-79 years	3.6 (3.1, 10.2)	0.3	8.0 (-0.02, 16.1)	0.05	1.14 (0.90, 1.45)	1.21 (1.00, 1.48)
80-84 years	-0.2 (-9.7, 9.4)	1.0	1.3 (-9.9, 12.5)	0.8	1.00 (0.82, 1.21)	1.02 (0.87, 1.20)
85+ years	-1.0	0.9	6.2	0.3	0.98	1.07

	(-11.9, 10.0)		(-6.6, 19.0)		(0.83, 1.17)	(0.93, 1.24)
All						
Males and Females pooled						
75-79 years	2.2 (-2.2, 6.5)	0.3	5.0 (-0.3, 10.4)	0.07	1.11 (0.91, 1.35)	1.16 (0.99, 1.36)
80-84 years	0.9 (-5.5, 7.5)	0.8	2.6 (-5.2, 10.4)	0.5	1.03 (0.87, 1.22)	1.05 (0.91, 1.20)
85+ years	-0.7 (-9.0, 7.7)	0.9	5.5 (-4.2, 15.3)	0.3	0.99 (0.85, 1.15)	1.07 (0.95, 1.22)

Note: Rate ratios (RRs) and 95% confidence intervals (95%CI) compare 2012 rates with those from 2006.