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Letter to the Editor,

Poor assessment of bone mineral density after a forearm fracture in women aged 50 years or older: data from a French health insurance database

Forearm fractures should be considered as an early sign of osteoporosis.[1] In 2010, 47,131 forearm fractures occurred in France, a country that comprises 22.5% women \geq 50 years old and 2.8 million osteoporotic patients.[2] In a recent meta-analysis, the risk of a subsequent hip fracture was reported to be increased in women who presented a forearm fracture.[3] Thus, bone mineral density (BMD) testing is recommended after a forearm fracture to assist clinicians in decision making.[4] We previously reported that in our district, only 10% of women \geq 50 years old had BMD testing after a forearm fracture.[5] However, the size of the population sample in that study was relatively small and it was restricted to the private sector.

We used the French national health insurance information system (*Système National d'Information Inter Régimes de l'Assurance Maladie* [SNIIRAM]),[6] which can be linked to the French medical program for information systems (*Programme de Médicalisation des Systèmes d'Information* [PMSI]), a medico-economic tool used for describing public or private hospital activity. The study included 4,120 women. Among the 4,120 women \geq 50 years old who had a forearm fracture between 2011 and 2012 in the *Centre-Val de Loire* area, 546 (13.3%) had a BMD assessment in the year after the forearm fracture (**Table 1**). The median delay between the fracture and BMD testing was 117.5 days (range 4-365). Among the 3574 women without BMD testing, 231 (6.5%) initiated or switched an anti-osteoporotic drug in the year after the fracture versus 168/546 women (30.8%) who had BMD testing (OR=6.4, 95% CI 5.2-7.9, $p < 0.001$). Women with BMD testing were younger than those without BMD testing (mean age: 67.4 [SD 9.4] versus 74.6 [SD 12.1] y; $p < 0.001$; OR=0.94, 95% CI 0.93-0.95)

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(Table 1). BMD testing was not associated with corticosteroids exposure on univariable analysis [35/297 (11.8%) versus 511/3823 (13.4%), OR=0.9, 95% CI 0.6-1.2, p=0.439], but was associated with aromatase inhibitors [21/79 (26.6%) versus 525/4041 (13.0%), OR=3.2, 95% CI 2.0-5.3, p<0.001]. BMD testing was performed most frequently in the *Loir-et-Cher* district (109 BMD tests, 19.2%) and the least in *Eure-et-Loir* (55 BMD tests, 9.8%). By contrast, accessibility to BMD testing was lower in *Loir-et-Cher* (3.97 densitometers per 100,000 women \geq 50 years old) and higher in *Eure-et-Loir* and *Loiret* districts (14.23 and 13.12 densitometers per 100 000 women \geq 50 years old). Having a comorbidity reduced the odds of BMD testing [184/1833 (10%) versus 362/2287 (15.8%), p<0.001; OR=0.6 (95% CI 0.5-0.7)]. The comorbidities in patients with or without BMD are presented in the **supplemental table**.

This finding confirms previous works and stresses the need to implement these guidelines in clinical practice.[5, 7] BMD testing was less frequent for women with than without comorbidities. This finding may be explained by a lesser attention given to the prevention of osteoporosis as compared with other diseases. In our study, aromatase inhibitors was associated with increased frequency of BMD assessment which is in good agreement with the recommendations for patients who receive such drugs. We found no association between accessibility to BMD testing and proportion of BMD tests performed. Since there is no apparent bias in identification of BMD assessment, the availability of BMD machines does not explain these inter-district differences.

To prevent secondary fracture, several successful initiatives such as Fractures Liaisons Service (FLS) were promoted.[8, 9] FLS have significantly decreased the fracture rate and increased anti-osteoporotic drug prescription in one study.[10] FLS, along with local communication campaigns, may help prevent osteoporosis after a forearm fracture in women. In 2017 we launched a FLS after forearm fracture in our hospital. Based on the present work, we will investigate the further trend of BMD assessment in our setting.

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Authors' contributions: ECL analyzed the results and drafted the manuscript; DCML and DM initiated and coordinated the work, participated in the analyses and drafted the manuscript; PG contributed to the development of the work; AH, EO and ECL performed the statistical analyses; EO, DCML participated in the analyses. All authors read and improved the entirety manuscript and contributed actively to the study.

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Table 1: Characteristics of women ≥ 50 years old with a forearm fracture in 2011 and 2012 in Centre-Val de Loire area in France by bone mineral density (BMD) testing in the year after the fracture

	BMD testing			
	Total	Yes	No	p value
	n=4,120	n=546	n=3,574	
Mean age (years) \pm SD	73.7 \pm 12.1	67.4 \pm 9.4	74.6 \pm 12.1	<0.001
Long-term illnesses	1,833 (44.5)	184 (33.7)	1,649 (46.1)	<0.001
Corticosteroids before the fracture	297 (7.2)	35 (6.4)	262 (7.3)	0.439
Aromatase inhibitors before the fracture	79 (1.9)	21 (3.9)	58 (1.6)	<0.001
Anti-osteoporotic drug initiated or switched in the year after the fracture	399 (9.7)	168 (30.8)	231 (6.5)	<0.001

Data are n (%) unless indicated otherwise. Long-term illnesses are severe or chronic illnesses for which the French national health insurance system covers 100% of the medical expenses and can therefore be used as a surrogate marker of comorbidities

Supplemental material: percentage of bone mineral density assessment according to the presence or absence of comorbidities in women ≥ 50 years old in *Centre-Val de Loire* area in France

	With Long-term illnesses			Without Long-term illnesses		
	BMD-	BMD+	Sub total	BMD-	BMD+	Sub total
Diseases of the circulatory system	830 (92.5%)	67 (7.5%)	897 (100%)	2744 (85.1%)	479 (14.9%)	3223 (100%)
Neoplasms	476 (85.0%)	84 (15%)	560 (100%)	3098 (87.0%)	462 (13.0%)	3560 (100%)
Diabetes mellitus	336 (90.6%)	35 (9.4%)	371 (100%)	3238 (86.4%)	511 (13.6%)	3749 (100%)
Dementia	300 (97.1%)	9 (2.9%)	309 (100%)	3274 (85.9%)	537 (14.1%)	3811 (100%)
Depression	115 (86.5%)	18 (13.5%)	133 (100%)	3459 (86.8%)	528 (13.2%)	3987 (100%)
Visual impairment - Diseases of inner ear	75 (90.4%)	8 (9.6%)	83 (100%)	3499 (86.7%)	538 (13.3%)	4037 (100%)
Chronic lower respiratory diseases	50 (84.8%)	9 (15.2%)	59 (100%)	3524 (86.8%)	537 (13.2%)	4061 (100%)
Rheumatoid arthritis	50 (87.7%)	7 (12.3%)	57 (100%)	3524 (86.7%)	539 (13.3%)	4063 (100%)
Parkinson disease	49 (90.7%)	5 (9.3%)	54 (100%)	3525 (86.7%)	541 (13.3%)	4066 (100%)
Diseases of the nervous system	47 (88.7%)	6 (11.3%)	53 (100%)	3527 (86.7%)	540 (13.3%)	4067 (100%)
Osteoporosis with pathological fracture	23 (92%)	2 (8.0%)	25 (100%)	3551 (86.7%)	544 (13.3%)	4095 (100%)
Spondyloarthritis	10 (76.9%)	3 (23.1%)	13 (100%)	3564 (86.8%)	543 (13.2%)	4107 (100%)
Disorders due to use of alcohol	9 (81.8%)	2 (18.2%)	11 (100%)	3565 (86.8%)	544 (13.2%)	4109 (100%)
Fracture of femur	3 (75.0%)	1 (25.0%)	4 (100%)	3571 (86.8%)	545 (13.2%)	4116 (100%)
Care-provider dependency	2 (100%)	0 (0.0%)	2 (100%)	3572 (86.7%)	546 (13.3%)	4118 (100%)
Abnormalities of gait and mobility	1 (100%)	0 (0.0%)	1 (100%)	3573 (86.7%)	546 (13.3%)	4119 (100%)
Others	643 (84.3%)	120 (15.7%)	763 (100%)	2931 (87.3%)	426 (12.7%)	3357 (100%)