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Management of Hip Fractures at an Academic Center: Challenges and Opportunities

***Randa Saad,*[1] *Maya Beydoun,*[1] *and Ghada El-Hajj Fuleihan**[1,2]**

[1] *American University of Beirut-Medical Center, Beirut, Lebanon and* [2] *Calcium Metabolism and Osteoporosis Program, WHO Collaborating Center for Metabolic Bone Disorders at the American University of Beirut-Medical Center, Beirut, Lebanon*

Abstract

Objective: To assess characteristics of patients with hip fractures and investigate the extent of osteoporosis-related care they receive at a tertiary referral center in Lebanon. *Methods*: A retrospective review of charts of 400 patients admitted with a hip fracture to the American University of Beirut-Medical Center, between January 1, 2011 and December 31, 2015. We reviewed medical records of adults admitted with a nonpathologic/nontraumatic hip fracture, and evaluated basic demographics and relevant clinical information, associated risk factors, and the management received. *Results*: The mean age of the population was 78 ± 10 years and men constituted 37%. Women were more likely to be assessed and/or treated. On admission, 21% were taking calcium and 18% vitamin D supplementation. During hospitalization, vitamin D level was assessed in only 39% of patients; a dietary and an osteoporosis consult were requested on only 32% and 22% of the cases, respectively. One-fourth to a third of patients were discharged on calcium or vitamin D, and less than 5% on bisphosphonates. Bone mineral density was measured in a minority although 21% had a history of previous contralateral hip fracture. One year mortality rate in a subset where follow-up available was 12% in men and 7% in women. *Conclusion*: A large care gap in the management of patients admitted with hip fracture persists despite clear national osteoporosis guidelines. This study provides a strong impetus for establishing and monitoring a fracture liaison service to understand and address barriers to providing optimal care to patients with osteoporosis.

Key Words: Care gap; hip fracture; Lebanon; Middle East; osteoporosis.

Introduction

Osteoporotic fractures have a devastating effect on quality of life and carry substantial morbidity and mortality *(1–3)*. These are defined as fractures that occur after minimal trauma equivalent to a fall from standing height or less *(4)*. Hip fractures account for 20% only of osteoporotic fractures, but incur the greatest societal costs *(3)*, and are most readily identified *(2,3)*. Patients with prevalent fractures are at high risk for subsequent fragility fractures *(5,6)* and approx 30%–50% of patients who sustain a hip fracture lose functional independence *(2)*.

The International Osteoporosis Foundation Middle East and Africa Osteoporosis audit underscored the scarce data on hip fracture incidence in the region; it is mostly from nonpopulation-based studies and suboptimal osteoporosis awareness among primary healthcare professionals *(7)*.

Lebanese national osteoporosis guidelines have been developed and updated by the Lebanese Society for Osteoporosis and Metabolic Bone Disorders and the National

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*Address correspondence to: Ghada El-Hajj Fuleihan, MD, MPH, Calcium Metabolism and Osteoporosis Program WHO Collaborating Center for Metabolic Bone Disorders, American University of Beirut-Medical Center, Beirut, Lebanon. E-mail: gf01@aub.edu.lb

Task Force for Osteoporosis and the Ministry of Health and disseminated widely to concerned physician societies since their launch *(8–11)*.

In our previous retrospective study of 274 osteoporotic hip fracture patients, we reported a large care gap and a mortality rate of 47% in a subset of the cohort *(12)*. The purpose of this study is to reevaluate standards of care of patients admitted to our center with acute hip fracture.

Materials and Methods

Design and Subject Selection

This is a retrospective chart review of patients admitted with hip fracture to the American University of Beirut-Medical Center (AUB-MC), a university-based tertiary care center, between January 1, 2011 and December 31, 2015. The population studied included all patients 47 years of age or older admitted with any of the following International Classification of Diseases codes: (ICD)-9: 820.32 subtrochanteric open; 820.22 sub-trochanteric closed; 820.21 intertrochanteric closed; 820.31 intertrochanteric open; 820.09 femoral neck closed; and 820.19 femoral neck open. Cases resulting from major trauma, fall height exceeding standing height, or pathological disease were excluded.

The study was approved by the Institutional Review Board and granted informed consent waiver in view of its retrospective nature and since identifying information was not used.

Survey Demographic Data

We collected clinical and surgical information from patients' electronic hospital information system and hard copy of medical records. This included sex, age, smoking and alcohol usage, and number of comorbidities. We collected height and weight from clinic records or previous admission if available within 6 months of the index fracture. We reviewed prefracture home medications listed on admission, including anxiolytics and/or sleeping pills, thyroid hormone or antithyroid medications, corticosteroids, calcium (Ca) and vitamin D, and osteoporosis medications. We screened discharge prescriptions for inclusion of Ca/vitamin D supplementation and osteoporosis medications.

Index Hip Fracture and Other Fractures

We captured information regarding fall height, type of hip fracture sustained (cervical, intertrochanteric, or subtrochanteric), and type and date of surgery performed. These included total hip arthroplasty with acetabular and proximal femoral prosthetic replacement, Current Procedure Terminology (CPT) codes 27236/27130; hip hemiarthroplasty with proximal femoral prosthetic replacement, CPT 27236/27125; hip nailing with a femoral intramedullary nail and a screw fixing the femoral neck and head, CPT 27245; open reduction internal fixation using plate and screws, CPT 27244; hip pinning using screws fixing the femoral neck and head to the shaft, CPT 27235; or conservative treatment.

We collected information on the number and type of previous fractures including vertebral, ipsilateral hip, contralateral hip, and arm and leg fractures. We noted the date of presentation of the index fracture, and the date of any previous ipsilateral or contralateral hip fracture. We also noted length of hospital stay, in-hospital postoperative morbidities, and whether a physiotherapist, dietician, and/or an osteoporosis expert (rheumatologist or endocrinologist in our institute) were consulted.

Follow-Up, Morbidity, and Mortality

We reviewed the records up to 1-year postindex fracture including follow-up admissions and clinic visits. We were only able to capture complications if they occurred in-hospital, resulted in an emergency department visit or readmission to AUB-MC. Patient were considered alive 1 year postoperatively if they had any test documented during that time frame. For patients who died at AUB-MC within 1 year postoperatively, we calculated time-to-mortality postfracture.

FRAX and Bone Mineral Density

We captured the calculated 10-year FRAX for major osteoporotic fractures (MOF) and hip fractures from physician notes or AUB-MC bone mineral density (BMD) reports within 4 years of the index fracture. We noted the date of the last BMD done prior to the fracture and calculated the time-to-fracture post last BMD. Similarly, we documented the date of the first BMD done after the fracture, if performed at AUB-MC.

Statistical Analyses

Height and weight were missing in 79% and 74% of the patients, respectively, and were imputed using the sex-specific mean value for that variable. We analyzed all other variables according to results available without imputation.

We summarized baseline demographics using frequencies and percentages, n (%), for categorical variables, and mean ± standard deviation, n ± SD, for continuous variables. Normality was checked, and non-normal continuous variables were summarized as medians (minimum, maximum). We compared categorical variables between groups using chi-squared test or Fischer's Exact test, and continuous variables with *t* test, One-Way ANOVA or nonparametric Mann-Whitney test. We rounded numbers to the nearest integer unless otherwise specified. SPSS version 23 (IBM, Chicago, IL) was used for analyses and a 2-sided p value of <0.05 was considered significant.

Results

We reviewed 452 charts; 400 are included in the analyses. Patients were excluded as per Design and Subject Selection (Fig. 1).

Patient Demographics

The mean age was 78 ± 10 years, with the majority being women 63%. Most patients were nonsmokers and nonalcohol users. Twenty-six percent were on either anxiolytics, antidepressants, and/or sleeping pills at the time of fracture. For those patients in whom fall height was available (N = 230), standing height was the most common. Fall direction was unavailable. At the time of admission, 21% and 18% were already on Ca and vitamin D, respectively. Only 11% were on bisphosphonates (BPs) and 9% reported previous use of BPs (Table 1). BP use did not impact the type of hip fracture (Appendix). Four women reported prior use of raloxifene, 1 was still taking it at the time of fracture, and 2 reported prior hormone-replacement-therapy use. Two men and 3 women reported previous use of teriparatide, and 1 man and 1 woman were still taking it at the time of fracture. Calcitonin was previously used by 1 woman and none had ever used RANKL-antibody.

Previous Fractures

Previous fracture history was documented in 173 charts (43%). A previous fracture was present in almost half of these patients, with no sex differences. One-fifth had a contralateral hip fracture, with a median duration of 3 years prior to the index fracture. The next most common fractures, in order of decreasing frequency, were of the arm, vertebrae, and then leg (Table 2).

Hip Fracture Characteristics and Care

Seventy-seven percent of patients presented on the day of fracture. Surgery was performed at a median duration of 1 day (minimum same day, maximum 20 days) since admission, and 84% had surgery within 2 days of admission. Half of the fractures were intertrochanteric fractures, followed by cervical (42%) and subtrochanteric (8%) fractures, with no sex differences. Hip nailing was most commonly performed (54%), followed by hemiarthroplasty (30%). Only 4% were followed-up conservatively, because of high operative risk (Table 3).

Physiotherapy team was consulted on most cases. However, dieticians were only consulted on a third, and an osteoporosis expert on 22% of the cases.

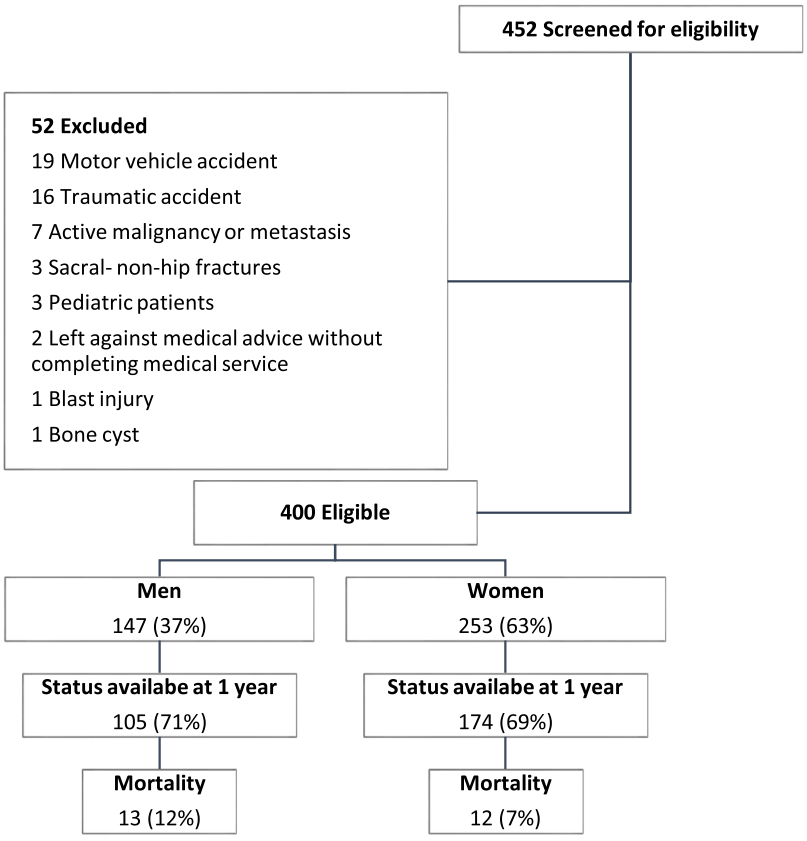

Fig. 1. Flow diagram detailing the selection of the patient population presenting with a hip fracture to AUB-MC between the years 2011 and 2015, and their status 1-year postoperatively, as available.

Table 1
Baseline Characteristics in the Overall Patient Population and by Sex

	Overall N 400	Men N 147 (37)	Women N 253 (63)	*p* Value*
Age (years)	78 ± 10	79 ± 11	78 ± 10	0.547
Age category (years)				0.667
47–55	10 (2)	2 (1)	8 (3)	
56–65	31 (8)	12 (8)	19 (8)	
66–75	79 (20)	25 (17)	54 (21)	
76–85	189(47)	69 (47)	120 (47)	
>85	91 (23)	39 (27)	52 (21)	
BMI[a] (Kg/m^2)	27.7 ± 3.0	26.6 ± 2.7	28.3 ± 2.9	<0.001
Smoking history				
Current smoker	48 (12)	19 (13)	29 (11)	0.001
Ex- smoker	76 (19)	41 (28)	35 (14)	0.664
Nonsmoker	276 (69)	87 (59)	189 (75)	0.001
Alcohol history				
Current daily alcohol intake	16 (4)	10 (7)	6 (2)	0.019
Ex- daily alcohol intake	2 (0.5)	2 (1)	0 (0)	0.134
No alcohol intake	382 (95.5)	135 (92)	247 (98)	0.007
Medications on admission				
Thyroid hormone	48 (12)	9 (6)	39 (15)	0.006
Anti-thyroid medication	6 (0.5)	3 (2)	3 (1)	0.673
Anxiolytic/antidepressant/sleeping pills	102 (26)	28 (19)	74 (29)	0.024
Calcium	84 (21)	15 (10)	69 (27)	<0.001
Vitamin D	73 (18)	15 (10)	58 (23)	<0.001
Bisphosphonate on admission				<0.001
Yes	43 (11)	8 (5)	35 (14)	
Ever used	34 (9)	2 (1)	32 (13)	
Fall height				0.009
Standing height	205 (51.3)	73 (49.7)	132 (52.2)	
1–2 steps	14 (3.5)	8 (5.4)	6 (2.4)	
1–1.5 m	8 (2)	7 (4.8)	1 (0.4)	
Down the stairs	3 (0.8)	1 (0.7)	2 (0.8)	
Not available	170 (42.5)	58 (39.5)	112 (44.3)	

Values presented as mean ± SD or frequency (%).
[a]BMI Body mass index, for both the height and the weight variables used to calculate BMI, 79% and 74% of the results were missing respectively, since these are not measured in patients admitted with hip fractures, so were imputed using the sex specific mean value for that variable.
*$p < 0.05$ indicates statistical difference between men and women.

In-hospital postoperative morbidities attributed to the surgery within the first year were mainly infectious in nature. The in-hospital and periprocedure complication rate was 26% in men and 19% in women. No deep vein thrombosis or pulmonary embolism were recorded.

Only a small proportion of patients were discharged on Ca, or Ca/vitamin D combination therapy, the majority being women (Table 3). Of those discharged on Ca, 56 patients (50%) were already taking it at the time of admission, and it was discontinued in 6 patients (7%). 25-hydroxy vitamin D (25OHD) level was assessed in less than half of patients (Table 3). More were discharged on vitamin D than on Ca. Of those discharged on vitamin D, 56 patients (45%) had been using this supplement at the time of admission, and it was discontinued upon discharge in 17 (14%) other patients. Only 20 patients (5%) were discharged on BPs.

The minimum length of in-hospital stay was 2 days, corresponding mainly to patients managed conservatively. For patients who had surgery, the average length of stay was 9 ± 6 days, and this was not affected by the type of surgical repair performed (data not shown).

Follow-Up

There was no documentation of out-patient clinic follow-up postdischarge at our institution in two-thirds of cases. Most patients had a follow-up visit with their caring

Table 2
History of Previous Fractures as Available for Overall Population and As Per Sex

	Overall N 173	Men N 46	Women N 127	*p* Value*
History of previous fracture, N(%)	83 (48)	19 (41.3)	64 (50.4)	0.290
Type of previous fracture, N(%)				
Ipsilateral hip	6 (3.5)	1 (2.2)	5 (3.9)	0.421
Contralateral hip	36 (20.8)	9 (19.6)	27 (21.3)	0.125
Vertebral	16 (9.2)	3 (6.5)	13 (10.2)	0.127
Arm	24 (13.9)	5 (10.9)	19 (15.0)	0.095
Leg	11 (6.4)	2 (4.3)	9 (7.0)	0.341
Months since previous hip fracture, median (min, max)				
Ipsilateral hip	39 (0, 298)	298	31 (0, 79)	0.143
Contralateral hip	32 (1, 422)	15 (1, 422)	66 (1, 323)	0.234
Either ipsi- or contra-lateral hip	32 (0, 422)	23 (1, 422)	40 (0, 323)	0.628

Values presented as frequency (%) or median (minimum, maximum).
*$p < 0.05$ indicates statistical difference between men and women. Data collected from physician notes and from previous admissions to AUB-MC.

orthopedic surgeon. Only a minority, 4 men (3%) and 15 women (6%), also followed up with an osteoporosis expert (Fig. 2).

Postoperative vital status at 1 year was available for 279 patients (70% of original cohort, 174 women, and 105 men, Fig. 1). Of these, 254 (91%) were still alive within 1 year postoperatively. There were 25 recorded deaths (13 men) within the 1 year postoperative period. The mortality rate was 12% in men and 7% in women, $p = 0.134$.

BMD and FRAX

Risk factors for osteoporotic fractures were documented in the records of a minority of patients. FRAX

Table 3
Characteristics of Hip Fracture in Hospital Care and Discharge Medications

	Overall N 400	Men N 147	Women N 253	*p* Value*
Type of surgery				0.094
Nailing	216 (54)	72 (49.0)	144 (56.9)	
Hemiarthroplasty	121 (30.3)	55 (37.4)	66 (26.1)	
Total hip replacement	25 (6.3)	6 (4.1)	19 (7.5)	
ORIF[a]	18 (4.5)	8 (5.4)	10 (4.0)	
Pinning	4 (1.0)	0 (0)	4 (1.6)	
None	16 (4.0)	6 (4.1)	10 (4.0)	
Consults				
Physiotherapy	342 (86)	130 (88)	212 (84)	0.204
Dietician	127 (32)	48 (33)	79 (31)	0.767
Endocrine or rheumatology	89 (22)	34 (23)	55 (22)	0.747
Vitamin D				
Assessed in	156 (39)	55 (37)	101 (40)	0.620
Level (ng/ml)	21.8 ± 15.4	19.2 ± 14.6	23.3 ± 15.6	0.04
Length of hospital stay (days)	9 ± 6	10 ± 7	9 ± 6	0.129
Medications on discharge				
Vitamin D	125 (31)	38 (26)	87 (34)	0.076
Calcium	111 (28)	29 (20)	82 (32)	0.079
Calcium/ Vitamin D combination	97 (24)	25 (17)	72 (28)	0.010
Bisphosphonates	20 (5)	4 (3)	16 (6)	0.111
Raloxifene	1 (0.3)	0	1 (0.4)	NA

[a]ORIF: open reduction internal fixation.
*$p < 0.05$ indicates statistical difference between men and women. Values presented as mean ± SD or frequency (%).

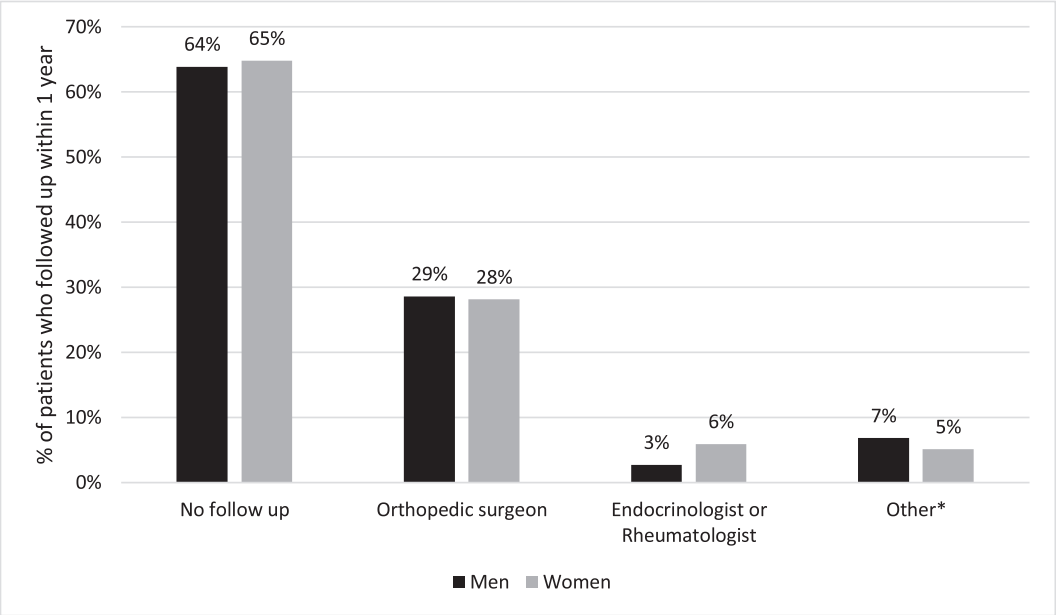

Fig. 2. Documentation of postoperative follow-up of all patients in AUB-MC clinics within 1-year postfracture as per sex. *Other includes family physicians, gynecologists, cardiologists, nephrologists, pulmonists, gastroenterologists, infectious disease specialists, neurologists, and urologists. Total in each group may exceed 100% as some patients followed up with more than 1 physician during the postoperative observation period.

was calculated based only on risk factors in 6% of patients (Table 4).

One-third of the women had BMD measurements prior to the index fracture (Table 4), and 12% of the total cohort had a BMD at AUB-MC post the index fracture, with no sex difference. T-scores did not differ significantly between men and women.

The 10-year FRAX for MOF was 18% and for hip fracture 11%, with a trend for a higher MOF risk in women. Of the 95 patients in whom FRAX was calculated, 39 (41%) had an MOF FRAX greater than the Lebanese age-adjusted threshold for intervention *(11)*. FRAX data were available prior to index fracture in 2 men and 24 women (Table 4). Of these 24 women, 10 had an MOF FRAX exceeding the Lebanese age-adjusted intervention threshold, 4 were on BPs at the time of fracture and another 4 had taken BPs in the past.

Discussion

Hip fracture management is still a challenge, even in a tertiary care center such as AUB-MC. The mean age of patients presenting with hip fractures was 78 ± 10 years, and women were more likely to be assessed and treated for osteoporosis. The proportion of second hip fractures was 21% and higher than reported previously *(12)*. Assessment for, and treatment of, osteoporosis was alarmingly low despite the solid data for high mortality, morbidity *(1)*, risk of subsequent fractures *(6)*, efficacy of current drugs *(13,14)*, and national osteoporosis guidelines, with repeated awareness initiatives *(8–10)*.

The mean age of hip fracture patients admitted to AUB-MC between 1992 and 2002, was 72 ± 9 years *(12)*. The older age seen in our current study is consistent with increased life expectancy, and with other publications *(15)*. Three quarters of hip fractures occur in women *(15)*, and although there was a women predominance (63%) in our study, the proportion noted in men (37%) exceeded the range reported in the literature of 19%–27% *(16,17)*. This is in concordance with findings of our previous study *(12)*, and possibly explained by the lack of osteoporosis assessment in men, the high frequency of osteoporosis risk factors, such as smoking (41%), and low rates of Ca/vitamin D supplementation (<11%), despite a high prevalence of vitamin D deficiency in our population *(18–20)*.

Femoral neck T-scores were comparable between sexes, consistent with growing evidence that men and women fracture at similar BMD, and again confirms the International Osteoporosis Foundation and the International Society for Clinical Densitometry recommendations of deriving T-scores using the National Health and Nutrition Examination Survey III women database *(21)*.

In Lebanon, osteoporosis awareness increased when the densitometry became available in 1995 *(12)*. The period after 1995 witnessed an increase in Ca supplementation in hip fracture patients *(12)*. The Lebanese osteoporosis assessment and treatment guidelines were first published in 2002 and later updated in 2007 *(8,9)*. The online FRAX calculator was established by the Ministry of Health in Lebanon in 2009 *(7,11)*, and the FRAX-based Lebanese Osteoporosis Guidelines were launched in 2013 *(10)*. However, despite these major national

Table 4
BMD and FRAX-Based 10-Year Risk of Major Osteoporotic and Hip Fracture

	Overall N 400	Men N 147	Women N 253	*p* value*
BMD done ± 4 years of fracture[a,b]	118 (30)	26 (18)	92 (36)	<0.001
Prior to fracture	92 (23)	13 (9)	79 (31)	<0.001
Months prefracture	30 ± 27	33 ± 26	30 ± 27	0.731
Postfracture	48 (12)	14 (10)	34 (13)	0.245
Months postfracture	9 ± 8	5 ± 5	10 ± 9	0.058
T-score measured by DXA[a,c]				
AP spine T-score (N 74)	−2.07 ± 1.40	−1.73 ± 1.79	−2.17 ± 1.26	0.359
Total femur T-score (N 100)	−2.37 ± 1.00	−2.09 ± 0.75	−2.45 ± 1.05	0.075
Femur Neck T-score (N 99)	−2.55 ± 0.92	−2.59 ± 0.62	−2.54 ± 1.00	0.790
Forearm T-score (N 81)	−2.90 ± 1.51	−2.82 ± 1.30	−2.93 ± 1.57	0.786
FRAX %				
Available pre- or postfracture[d]	95 (24)	26 (18)	69 (27)	0.030
Available prefracture	26 (7)	2 (1)	24[e] (9)	0.001
10-yr risk of major fracture	18 ± 13	14 ± 10	19 ± 13	0.105
10-yr risk of hip fracture	11 ± 11	10 ± 10	11 ± 11	0.848

Values presented as mean ± SD or frequency (%).
[a]Bone mineral density (BMD) reports were available for a total of 104 patients who did their BMD in AUB-MC.
[b]Some patients did a BMD pre and post the hip fracture.
[c]At AUB-MC, BMD is measured using a Hologic dual-energy X-ray absorptiometry (DXA) scanning machine and T-scores are based on the NHANES III women reference data for ages 20–29 years. The same absolute values are used in men.
[d]FRAX was available in BMD reports (N = 73), or as calculated without femoral neck BMD on admission by admitting or consulting physicians (N = 22).
[e]10 women had a 10-yr FRAX risk of major fracture greater than the Lebanese threshold of intervention.
*$p < 0.05$ indicates statistical difference between men and women.

initiatives, BMD was only measured in 12% of patients, comparable to rates seen in the United States *(22)*, and formal fracture risk assessment through FRAX implemented in only a fifth of the population.

Our study emphasizes the large on-going care gap posthip fractures and is consistent with results of other audits *(5,23)*. Dieticians were only consulted on a third, and osteoporosis experts on less than a fifth of the patients. Despite an unexpected high prevalence of previous contralateral hip fractures (21%), BMD measurement and FRAX calculation were low. Furthermore, less than a fourth of patients were taking Ca and/or vitamin D on admission, and 25OHD level was measured in less than half of the patients. This is worrisome in view of high prevalence of vitamin D deficiency in our populations *(18–20)*, and in this study almost half of our subjects had a mean 25OHD level below 20 ng/ml. The definition of normality for 25OHD levels is a matter of debate, but our group proposed a desirable range of 20–40 ng/ml in a recent review (24). A low proportion of patients were discharged on Ca/vitamin D, despite their proven efficacy when combined in reducing hip fractures in elderly deficient populations *(13)*, such as ours, and our national recommendations *(9,10)*. Only 11% were on BPs at the time of the fracture and 5% received BPs on discharge. This persistent alarming low rate *(12)* is even lower than what is reported in other countries worldwide *(25,26)*. Underutilization of bone agents has been well-documented postfragility fractures *(25)*, and specifically posthip fractures *(26)*. In the United Kingdom, it improved from 7% in 2000 to 46% in 2010 *(26)*. Stagnation in drug prescription in recent years coincided with the modified labeling for BPs for risk of osteonecrosis and the 2007 and 2010 FDA announcements of atrial fibrillation and atypical femur fractures concerns *(26,27)*. In a study of 22,598 hip fracture patients between 2004 and 2013 from the US United HealthCare plan, only 14.5% of patients received BPs in the 6 months postindex fracture *(27)*. The proportion filling at least one BP prescription or receiving at least 1 intravenous BP dose decreased from 15% in 2004 to 3% in 2013 *(27)*. There was a 4% increase in the odds of BP use after hip fracture every quarter until 2007, when the FDA announced an association with atrial fibrillation, and a 4% decrease thereafter *(27)*.

Other factors possibly associated with therapy underutilization in our study are the large proportion of men *(23,26)*, the lack of patient awareness and self-perception of osteoporosis *(28)*, and the lack of communication between various concerned physicians for follow-up *(29)*. Orthopedic surgeons focus on in-hospital acute management of fracture and usually trust osteoporosis management to primary care physicians and experts, who, however, do not usually evaluate hip fracture patients during their hospitalization *(29)*.

Indeed, in our study an osteoporosis expert was consulted on less than a fourth of the cases, and only 5% were prescribed BPs. This possibly reflects the reluctance of orthopedic surgeons to start antiresorptives immediately postfractures due to concerns of possible nonunion *(28)*.

Fracture liaison service is an evidence-based multidisciplinary model created to evaluate and treat fracture patients and close the care gap *(30,31)*. Its established success worldwide provided an impetus for our institution to implement it as part of a medical center driven quality assurance program with a dedicated nurse. The program was launched in 2018 and aims to ensure hip fracture patients get the essential studies and a dual-energy X-ray absorptiometry scan done, along with consultations to the physiotherapist, dietician, and osteoporosis experts, and outpatient follow up with them.

Osteoporosis in men may be overlooked except in severe cases *(32)*. Women are more likely to be diagnosed/treated for osteoporosis after fractures *(22,32)*, although the mortality rate posthip fracture is higher in men *(12,16)*. Mortality posthip fracture reaches 12%–32% within the first year *(1)*. In our study, postoperative vital status was available for 70% at 1 year, with an overall mortality rate of 9%. Possible explanations for improved survival may be related to stronger social/family support *(33)*, routine thromboembolism prophylaxis use *(34)*, early operative intervention *(35)*, and increased utilization of regional instead of general anesthesia *(36)*. However, these numbers are limited by the relatively low patient number (N = 279), and the fact that mortality data are not systematically collected, thus reporting bias is a possibility (more of those who were lost to follow-up may have died).

Patients who sustain a fragility fracture are at increased risk of subsequent fragility fractures *(5,6,29)*. Documentation of previous fractures was available in only 43% of charts, and 21% have had a previous contralateral hip fracture. This is higher than the reported 10%–17% *(2,37)*, again possibly underscoring the large care gap.

This study holds the limitations of a retrospective chart review. However, most information selected is routinely available in our medical records, and inconsistencies were minimized through the use of standardized data abstraction sheets by physicians trained on using AUB-MC electronic interface. Not all osteoporosis risk factors were assessed properly in the charts, follow-up information was only available on a subset, and patients may have had studies and follow-up outside of AUB-MC. Finally, the population studied is limited to patients admitted to AUB-MC. However, being a tertiary care center, AUB-MC witnesses an influx of patients from all Lebanese regions.

The strengths of this study lie in the relatively large sample size and the valuable information provided on a topic where data in the region are scarce, providing an important call for action for public health officials and policy makers.

This study highlights the persistent and alarming care gap in hip fracture management at a tertiary care center in Lebanon, and a call for immediate action. The newly istituted fracture liaison service at our institution will hopefully allow insights into the barriers to providing optimal care to osteoporotic patients.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jocd.2019.01.002.

Appendix: Baseline Characteristics by Type of Fracture

	Cervical N 169	Intertrochanteric N 200	Subtrochanteric N 31	*p Value
Age (years)	77 ± 12	80 ± 9	78 ± 9	0.037
Sex				0.715
Man	66 (39.1)	70 (35.0)	11 (35.5)	
Woman	103 (60.9)	130 (65.0)	20 (64.5)	
BMI[a] (Kg/m^2)	27.4 ± 2.8	28.0 ± 3.2	27.8 ± 2.5	0.170

(*continued*)

(*Continued*)

	Cervical N 169	Intertrochanteric N 200	Subtrochanteric N 31	*p Value
Diabetes	49 (29)	60 (30)	13 (42)	0.347
Current smoker	32 (19)	38 (19)	6 (19)	0.999
Current alcohol	6 (4)	10 (5)	0 (0)	0.534
Current corticosteroids	7 (4)	11 (6)	2 (7)	0.539
Vitamin D level (ng/ml)	23.4 ± 17.2	20.7 ± 14.3	21.2 ±12	0.572
Medications on admission				
Thyroid hormone	21 (12)	18 (9)	9 (29)	0.011
Antithyroid medication	2 (1.2)	3 (1.5)	1 (3.2)	0.524
Anxiolytic/antidepressant/sleeping pill	40 (24)	56 (28)	6 (19)	0.456
Calcium	39 (23)	41 (21)	4 (13)	0.210
Vitamin D	26 (15)	45 (23)	2 (7)	0.111
Bisphosphonates on admission				0.650
Yes	16 (10)	24 (12)	3 (10)	
Ever used	11 (7)	20 (10)	3 (10)	
Fall height				0.180
Standing height	85 (50.3)	102 (51.0)	18 (58.0)	
1–2 steps	4 (2.4)	8 (4.0)	2 (6.5)	
1–1.5 m	3 (1.8)	3 (1.5)	2 (6.5)	
Down the stairs	1 (0.6)	2 (1)	0	
Not available	76 (45.0)	85 (42.5)	9 (29)	

Values presented as mean ± SD or frequency (%).

[a]BMI Body mass index, for both the height and the weight variables used to calculate BMI, 79% and 74% of the results were missing respectively, since these are not measured in patients admitted with hip fractures, so were imputed using the sex specific mean value for that variable.

*$p < 0.05$ indicates statistical difference between fracture types.

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