such as low BMI and higher age. The knowledge of these disease-specific factors helps to identify patients with SLE at particular high risk for OP and fragility fractures.

REFERENCES:

[1] Wang X, Yan S, Liu C, Xu Y, Wan L, Wang Y, et al. Fracture risk and bone mineral density levels in patients with systemic lupus erythematosus: a systematic review and meta-analysis. Osteoporos Int. 2016;27(4):1413-23.
[2] Bultink IE, Lems WF. Systemic lupus erythematosus and fractures. RMD Open. 2015;1(Suppl 1):e000069.

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POS0397 SHORT-TERM (2 YEARS) FRACTURE RISK PREDICTION: A MACHINE LEARNING APPROACH

Keywords: Real-world evidence, Osteoporosis, Bone diseases

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Background: Osteoporotic fractures continue to be a major cause of global health concerns around the world. The most common risk scores (FRAX, DeFRA) are evaluating this risk within a 10-yearstime window, which might not be suitable for evaluating shorter term risk, or quickly progressing patients.

Objectives: The objective of the present analysis is to develop 2-year fracture risk scoring models using Machine Learning (ML) techniques and compare their performance with the DeFRA tool.

Methods: Data were obtained from web-based fracture risk assessment tool (DeFRA) used in Italy. This tool is a derived version of the FRAX and can be accessed through a website (https://defra-osteoporosi.it/). 33 clinical and densitometric variables were used to compute the DeFRA risk score, with variable degree of completeness for each patient. After eliminating the attributes with a large number of missing values, and eliminating the patient with large outlier values for any of the attributes, the dataset was reduced to 2516 patients (with follow-up visits) and 15 attributes (Age, Weight, Height, BMI, Smoking, Alcohol, Familial Fractures/Osteoporosis, Previous femur or vertebra fractures, Previous other fractures, Comorbidities, Prednisone mg equivalent per day, T-score femoral-neck, T-score spine, Serum CTX levels, Anti-osteoporotic therapy prescribed). For the development of the machine-learning prediction, the dataset has been randomly divided into a train-set and a test-set, and the train-set has been synthetically balanced using Synthetic Minority Oversampling Technique (SMOTE). A Logistic Regression (LR) model and a Random Forest (RF) model have been optimized on the train-set for predicting the patients who incurred either a hip fracture, or any major osteoporotic fracture, or both in the 2 years following the baseline visit. DeFRA risk score is used as a benchmark for the prediction of either hip fracture or of any major fracture within 2-years.

Results: The DeFRA score, when used to predict the patients incurring a hip fracture within 2 years, has an Area Under the Receiver-Operating Curve(AUROC) of 0.52, compared to 0.76 for Random Forest and 0.81 for Logistic Regression. When looking at other major osteoporotic fractures, the AUROC is 0.59 for DeFRA, 0.77 for LR and 0.80 for RF, and when looking at any fracture the values are 0.58, 0.78, 0.80 for DeFRA, LR and RF respectively. Performance metrics including accuracy, sensitivity, and specificity are summarized in Table 1.

Table 1.

Table I: Performance of DeFRA and machine learning classifier in predicting patients incurring an osteoporotic fracture within 2 years

	Hip fracture			Major osteoporotic fracture			Any fracture		
	DeFRA	LR	RF	DeFRA	LR	RF	DeFRA	LR	RF
AUROC	0.52	0.81	0.76	0.59	0.77	0.80	0.58	0.78	0.80
Accuracy	0.62	0.63	0.92	0.68	0.69	0.89	0.61	0.71	0.90
Sensitivity	0.40	0.76	0.29	0.49	0.76	0.34	0.54	0.79	0.34
Specificity	0.63	0.62	0.95	0.69	0.69	0.93	0.61	0.70	0.95

Conclusion: Currently usedrisk scores for osteoporotic fractures are developed within a 10-years time window, which might be toolong to stratify the most at risk-patients or those that are showing a fast-progressing disease. This isreflected by the poor predictive performance of DeFRA when looking at a 2-years time window. Machine-learning (either logistic regression or random forest) could greatly improve the predictive performance ofa scoring system to identify the patients most likely to incur an osteoporotic fracture in the short term,thus requiring shorter follow-ups.

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POS0398 DETERMINANTS OF MORTALITY AND IMMINENT RE-FRACTURE IN PATIENTS HOSPITALIZED FOR SEVERE OSTEOPOROTIC FRACTURES

Keywords: Osteoporosis

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Background: Patients hospitalized for severe osteoporotic fractures are at increased risk of morbidity and mortality. It is recommended to improve their medical management by Fracture Liaisons Services (FLS) organization.

Objectives: Our aim was to assess the determinants of mortality and imminent refracture in those patients followed in FLS.

Methods: The CROSS study is a national, prospective, observational, multicenter study conducted in 12 centers with Fracture Liaison Services (FLS). Patients included were men and women above 60 years, hospitalized for a recent (less than 3 months) severe fragility fracture (hip, pelvis, humerus or vertebrae) that occurred after a low-energy trauma. Patients with either a non-severe fracture, a pathological fracture, a high trauma fracture or a per-prosthetic fracture were not included. At baseline and 2 years we have collected sociodemographic data, fracture event, bone risk factors, factors of falling, FRAX items, history of treatments, comorbidities, Charlson score and DXA measurement. To assess the risk factors for new severe fracture or death, a multivariate Cox proportional hazard multivariate analysis was performed.

Results: 895 patients were included in the cohort with the following fracture location distribution: clinical vertebrae 43.3%, hip 37.5%, pelvis 10.3%, and humerus 11.1%. Most patients were women (79%) with a median age of 81 years (71-85). 40% had a previous history of fragility fracture after 40 years. Only 17.7% received an anti-osteoporotic treatment in the 5 years prior baseline whereas 21.4% received a calcium supplementation and 43.6% received a vitamin D supplementation. At baseline 48% of patients had densitometric osteoporosis. Over the 2 years of follow-up (data completed for 95% of population), 116 severe fractures in 110 patients (12.9%) and 80 deaths (8.9%) occurred. 49.1% of patients were prescribed an antiosteoporotic treatment after the fracture (75% of bisphosphonates), that was initiated within the 3 months following fracture event in 63 % of the cases. Multivariate analysis showed that reduced spinal BMD (OR=24.6 CI 95% 2.84-247, p=0.027), recurrent falls (OR= 2.80 (1.11-6.65), p=0.023), antiosteoporotic treatment initiation (OR= 2.17, CI 95% 1.19-4.08, p=0.013) and increased age (OR=1,04 CI 95% 1,01-1.08, p=0.027) were significantly associated with the risk of a new severe fracture. Use of walking aids (RR=2.71 (CI 95% 1.15-6.39), p=0.02), diabetes (RR=3.70 (CI 95% 1.04 to 13.2), p=0.044), metastatic cancer (RR=15,5 (CI 95% 1.08 to 221), p=0.043) were positively associated with risk of death whereas antiosteoporotic initiation was negatively associated with this risk (OR=0.19 (CI 95% 0.07 to 0.49), p<0.001).

Conclusion: In patients hospitalized for severe osteoporotic fractures and managed in a FLS setting, initiation of an anti-osteoporotic treatment is associated with a decreased risk of mortality. In this population, a low BMD was a strong determinant of an imminent fracture risk.

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