Clinical prediction guide

An algorithm had moderate sensitivity for identifying older women in nursing homes at risk of fracture


QUESTION: Does an algorithm composed of routinely collected baseline data identify older women in nursing homes at increased risk of fracture?

Design
18 month follow up of a cohort of nursing home residents divided into derivation and validation samples.

Setting
A stratified random sample of 47 long term nursing facilities in Maryland, USA.

Patients
1427 white women living in nursing homes who were ≥ 65 years of age (mean age 85 y), had no terminal cancer or bone metastases, were not comatose, had ≥ 1 wrist or forearm free of prosthetic implants and open skin lesions, were not admitted for rehabilitation only, and were able to have bone mineral density (BMD) measurements.

Description of prediction guide
The women’s most recent minimum data set (MDS) (collected on all nursing home residents in the US) was the primary source of information for the algorithm (total 75 variables). The data pertained to physical functioning and activities of daily living, ambulatory status, vision status, mood and behaviour patterns, incontinence, dementia, other health conditions, and use of restraints. Classification and regression tree (CART) methodology and logistic regression were used to identify variables that would predict fractures. An additive scoring algorithm was derived in a random 67% of the cohort using cut points suggested by the CART methodology and validated in the remainder of the cohort.

Main outcome measures
Sensitivity and specificity of the algorithm for predicting osteoporotic fractures ascertained by physician note or x-ray.

Main results
180 women (12.6%) had osteoporotic fractures during follow up. Variables that contributed to the algorithm were body size (weight and height), mobility and transfer status, and activities of daily living. Age ≥ 75 years, weight < 170 pounds (77 kg), height ≤ 63 inches (160 cm), independent or supervised locomotion, fall in the past 180 days, dependence in ≤ 4 selected activities of daily living, MDS cognition score ≤ 3, and occasional incontinence contributed ≥ 1 point to the score. The score was calculated by summing of the points. Using a cut point of ≥ 4, the algorithm had moderate sensitivity but low specificity for predicting fracture in both the derivation and validation samples. In the derivation sample, the sensitivity was 79.7% and the specificity was 38.4% in the validation sample, the sensitivity was 70.2% and the specificity was 38.0%. Fracture rates increased with increasing algorithm score and the c statistic (area under the receiver operating characteristic curve) was 0.63.

Conclusion
An algorithm composed of routinely collected minimum data set baseline data had moderate sensitivity, but low specificity in predicting fractures in older white women in nursing homes.