External Validation Of An Artificial Intelligence Model To Predict Bone Mineral Density From Chest Radiographs.

Takamune Asamoto[1], Yoichi Satol[1], Yasuhiko Takegami[1], Shiro Imagama[1]
[1] Nagoya University Graduate School of Medicine, Nagoya, Japan.

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INTRODUCTION: We performed external validation (EV) of a Artificial Intelligence (AI) model to predict bone mineral density (BMD) from chest radiographs to verify the usefulness of this model in clinical practice.

METHODS: This study included patients who visited any of the collaborating facilities from 2010 to 2020 and underwent chest radiography and dual-energy X-ray absorptiometry (DXA) at the proximal femur in the year before and after their visit. A total of 48,371 chest radiographs were obtained, and BMD was measured using DXA. We developed the model with 47,150 images from 17 facilities and performed EV with 1,221 images from 2 other facilities (EV dataset). We trained the AI model via ensemble learning based on chest radiographs, age, and sex to predict BMD using regression. The outcomes were the correlation of the predicted BMD and measured BMD with diagnoses of osteoporosis and osteopenia using the T-score estimated from the predicted BMD.

RESULTS SECTION: The mean BMD was 0.64±0.14 g/cm2 in the EV dataset. The BMD predicted by the model averaged 0.61±0.08 g/cm2, with a correlation coefficient of 0.68 ($p<0.01$) when compared with the BMD measured using DXA. The accuracy, sensitivity, and specificity of the model were 77.6%, 96.9%, and 25.0% for T-score < -1 and 78.0%, 69.5%, and 82.2% for T-score ≤ -2.5, respectively.
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DISCUSSION:
The study developed a deep learning model for predicting proximal femur BMD using chest radiographs, age, and sex. The model achieved good prediction accuracy and sensitivity, suggesting its potential in osteoporosis screening. The model's performance was comparable to previous studies, demonstrating its generalizability.Discussion, including limitations and conclusions within the framework of stated question, hypothesis, or objective.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): Our model, which was externally validated using data obtained at facilities other than the development environment, predicted BMD on chest radiographs. The model performed well and showed potential for clinical use.

Fig.