Practical and Versatile Artificial Intelligence to Detect Osteoporosis from Chest radiographs

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INTRODUCTION: Our aim was to evaluate the performance of internal and external data for an artificial intelligence model used to screen for osteoporosis using chest radiographs (CRs). An estimated 500 million people worldwide have osteoporosis, and the increased mortality risk and shortened healthy life expectancy owing to fragility fractures are becoming major issues in aging populations. Although therapeutic intervention in patients with potential osteoporosis could address this problem, it is difficult to identify potential osteoporosis using conventional examinations. Recently, deep-learning techniques have been applied for osteoporosis screening using CRs, which are frequently used in daily medical practice. These models have shown good screening performance. However, the performance of the external data from different facilities has not yet been clarified.

METHODS: Data were retrospectively collected from 9725 cases. After image preprocessing, we trained a deep learning model, EfficientNetV2(B4), on these data for image recognition. Diagnostic performance was evaluated by calculating the accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve.

RESULTS: The performance of internal data was good in all models (area under the curve 80.6-92.8), and that of external data outperformed the performance of calcaneal quantitative ultrasound, which is widely used as a screening tool for osteoporosis.

DISCUSSION AND CONCLUSION:
Our results demonstrate that the model can easily perform osteoporosis screening from CR, the most performed imaging test worldwide, without additional invasiveness or cost.