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Editorial

Clinical Applicability of Machine Learning in Family Medicine

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Recently, artificial intelligence and machine-learning algorithms have gained significant attention in the field of osteoporosis.[1] They are recognized for their potential in exploring new research fields, including the investigation of novel risk factors and the prediction of osteoporosis, falls, and fractures by leveraging biological testing, imaging, and clinical data.[2] This new approach might improve the performance of current fracture prediction models by including all possible variables such as the bone mineral density (BMD) of all sites as well as trabecular bone score (TBS) data.[3] Also, the new model could suggest novel factors that could influence the fracture by calculating all variables through a deep learning network. Although there are a few studies in osteoporosis and fracture prediction using machine learning,[4-6] a fracture-prediction machine-learning model with a longitudinal, large-sized cohort study including BMD and TBS has not been developed.[3]

In this issue, Kang et al.[1] aimed to construct a prediction model for osteoporotic fractures among female participants of the Korean Genome Epidemiology Study, a large-scale cohort study, by employing machine learning techniques and utilizing selected Fracture Risk Assessment Tool (FRAX) parameters, and to compare the performance of this model with conventional risk assessment tools. The implemented machine-learning algorithms included gradient boosting, random forest, decision tree, and logistic regression. Machine-learning models were trained to predict osteoporotic fractures using the selected the FRAX parameters as input features.

The area under the receiver operating characteristic curve (AUROC) was calculated to compare the performance of each model. Among the four machine-learning models, gradient boosting showed the highest AUROC of 0.662. When considering the AUROC for predicting osteoporotic fractures, the machine-learning models outperformed the FRAX and Osteoporosis Self-Assessment Tool for Asians. They concluded that when obtaining complete FRAX information is challenging, machine-learning algorithms show promise for predicting osteoporotic fractures, particularly in women.

In this study, the machine-learning model showed a similar or better performance than the FRAX method for fracture prediction. When predicting hip fractures without BMD information and relying solely on clinical risk factors, as analyzed in this study, machine-learning algorithms can demonstrate better performance than that of the FRAX model. Therefore, the application of machine-learning algorithms in clinical practice is a meaningful endeavor.[3]

But the outputs of machine learning analyses are limited by the accuracy of available data. Big data can be associated with indeterminate quality, lack of confounding variables, and suboptimal outcomes.[7] And machine learning require complex models to fit data and the optimal algorithm may overfit the data.[7] Nevertheless, there is no doubt that predictive modelling, artificial intelligence, machine learning, and data mining will become a major component of the physician's practice.

In my knowledge, this is the first study to use machine learning to predict clinical outcome in the *Korean Journal of Family Medicine*. Understanding artificial intelligence and machine learning will help us with understanding early warning sign of disease, and predict clinical outcome.[8] Family physician and researchers should become familiar with these techniques.

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CONFLICT OF INTEREST

Jungun Lee has been an associate editor of the Korean Journal of Family Medicine but had no role in the decision to publish this review. Except for that, no other potential conflict of interest relevant to this article was reported.

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