Korean Circ J. 2019 Jul;49(7):640-641
https://doi.org/10.4070/kcj.2019.0110
pISSN 1738-5520·eISSN 1738-5555

kcj
Korean Circulation Journal

Editorial

Can artificial Intelligence Prediction Algorithms Exceed Statistical Predictions?

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▸ See the article "Development and Validation of Deep-Learning Algorithm for Electrocardiography-Based Heart Failure Identification" in volume 49 on page 629.

Received: Apr 4, 2019
Accepted: Apr 10, 2019

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Funding
Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (NRF-2017R1E1A1A01078382).

Conflict of Interest
The author has no financial conflicts of interest.

The contents of the report are the author's own views and do not necessarily reflect the views of the *Korean Circulation Journal*.

Traditionally, statistical analysis models using logistic regression and multivariate analyses have contributed to revealing the relationship between risk factors and the incidence of diseases. To date, most studies have analyzed various data to find the risk factors corresponding to a "p value <0.05." However, statistical methods contain errors. Statistical analyses may include the researcher's bias whether we include or exclude certain risk factors, and this kind of bias has been pointed out by other reviewers. However, as the recent medical data has become more massive and complicated, these analyzes have become limited. In a situation where too much unstructured data is produced, it has become a difficult situation to find regularities and determine hypotheses. Along with the emergence of big data, prediction models using artificial intelligence are slightly replacing the existing statistical prediction models. Beyond verifying a hypothesis by using a conventional statistical analysis, it has been possible to minimize the prediction errors by a deep learning algorithm using accumulated big data and digitalized clinical information. Among that, the electrogram (ECG) is a simple and easily transferred diagnostic tool. So many kinds of arrhythmias and cardiovascular diseases including heart failure can be diagnosed by digitalized ECG data.[1)]

Of course, there are limitations to the artificial intelligence model. Unlike the previous statistical analysis methods, the artificial intelligence model cannot estimate the process that led to the conclusion. Artificial intelligence models do not show a process that can infer the relationship between the risk factors and incidence of the disease. It is a simple "black box," which just shows the results according to the input data. Therefore, although there is the advantage that the prediction error is less and the accuracy is higher than that of previous statistical models, when new diseases occur, the predictive power is reduced to a great extent. Further, because it is impossible to infer the process occurring in the black box, it is therefore difficult to modify or translate the analysis process.

Kwon et al.[2)] created a deep learning algorithm, using 55,163 ECGs from 22,765 patients who underwent echocardiography. Further, the deep learning algorithm was finally confirmed after an internal validation and external validation (with data of other hospital). This trial has very important clinical implication. As mentioned above, although a deep learning algorithm has the limitation of being a "black box," which does not show the association between the features and HF incidence, this topic is very meaningful for finding the comparable accuracy

of the deep learning algorithm, compared with the previous logistic regression model. Because heart failure has an increasing prevalence along with the aging process,[3] it has a very important implication to predict the incidence of heart failure using simple ECG parameters.

Several trials to develop a predictive model for heart failure using machine-learning have been known.[4-6] Kwon et al.[2] used a deep learning algorithm to achieve a greater accuracy with limited information. Further, an external validation in data of other hospital showed a comparably high accuracy as compared to the logistic regression model.

Although this is a new attempt to create a prediction model, this article has a limitation of concerning a deep learning algorithm. Deep learning has difficulty in finding what features are associated with the presence of heart failure (black box). It is a very difficult point to show the clinical implications without finding the association between the risk factors and incidence of heart failure. However, deep-learning can use various types of data including images[7][8] and wave signals including ECGs.[1] Moreover, the important features of deep-learning can be estimated by an automatic algorithm, and an explainable deep-learning algorithm has recently been studied. Therefore, it is likely that deep learning will overcome the limitations of the "black box."

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