An Electrocardiography Deep Learning Model to Detect Atrial Fibrillation on Clinical Application

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Abstract: Background:12-lead electrocardiography(ECG) is one of frequently-used tools to detect atrial fibrillation (AF), which might degenerate into life-threaten stroke, in clinical Practice. Based on this study, the AF detection by the clinically-used 12-lead ECG device has only 0.73~0.77 positive predictive value (ppv). Objective: It is on great demand to develop a new algorithm to improve the precision of AF detection using 12-lead ECG. Due to the progress on artificial intelligence (AI), we develop an ECG deep model that has the ability to recognize AF patterns and reduce false-positive errors. Methods: In this study, (1) 570-sample 12-lead ECG reports whose computer interpretation by the ECG device was AF were collected as the training dataset. The ECG reports were interpreted by 2 senior cardiologists, and confirmed that the precision of AF detection by the ECG device is 0.73.; (2) 88 12-lead ECG reports whose computer interpretation generated by the ECG device was AF were used as test dataset. Cardiologist confirmed that 68 cases of 88 reports were AF, and others were not AF. The precision of AF detection that the to identify AF based on limb-lead ECGs and chest-lead ECGs. Results: The results indicated that this model has better performance on AF detection than traditional computer interpretation of the ECG device in 88 test samples with 0.94 ppv, 0.98 sensitivity, 0.80 specificity. Conclusions: As compared to the clinical ECG device, this AI ECG model promotes the precision of AF detection from 0.77 to 0.94, and can generate impacts on clinical applications.

Keywords : 12-lead ECG, atrial fibrillation, deep learning, convolutional neural network

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