An Artificial Intelligence-Electrocardiogram Model for Prediction of Dementia: The Atherosclerosis Risk in Communities (ARIC) Study

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The purpose of this study was to develop an artificial intelligence electrocardiogram (AI-ECG) model to predict dementia in older adults. It has been previously reported that by using derived ECG variables from the Atherosclerosis Risk in Communities (ARIC) study, an ECG-based model (C-statistic, 0.70) is superior to existing dementia models. It was hypothesized that an AI-ECG model would have better model discrimination to predict dementia compared to the previously published model that was based on derived ECG parameters. In the current project, the ECG waveforms from 5673 participants (mean age, 75 years) in ARIC in 2011-13 who were followed through 2020 were analyzed. After a mean follow-up of 6.7 years, 1106 participants developed dementia. The convolutional neural network (CNN) architecture incorporated weights from a pretrained model and had four convolutional blocks, a global averaging pooling layer, and one dense output layer. Additionally, the model was fine-tuned by adding two hidden layers with activation function. The ECG sample was partitioned into training (80%), validation (10%), and test (10%) sets. The area under the receiver operating characteristic curve (AUC) and 95% confidence interval of the final model for the training, validation, and test sets were 0.65 (0.63–0.67), 0.59 (0.53–0.65), and 0.58 (0.52–0.64), respectively. In conclusion, the AI-ECG model was not superior to the previously published ECG model based on a priori defined ECG parameters, likely due to a relatively small sample size. Further research to develop an AI-ECG model for dementia using larger datasets and different age groups is warranted.

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