AI beats doctors at predicting heart disease deaths

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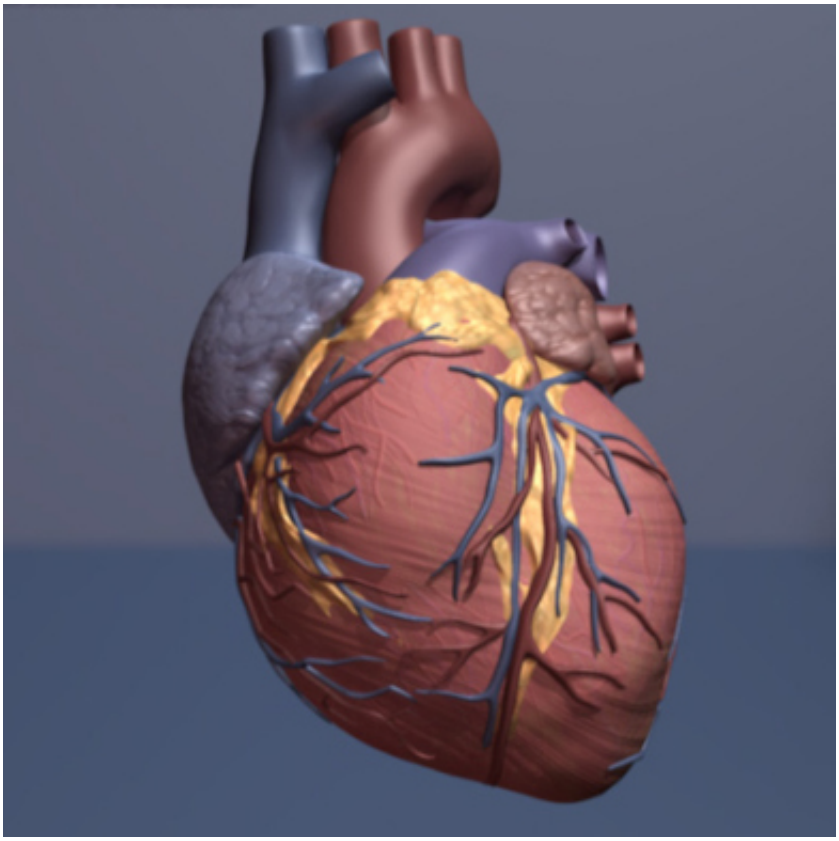

Human heart. Credit: copyright American Heart Association

A model developed using artificial intelligence (AI) is better at predicting risk of death in patients with heart disease than models designed by medical experts, a new study from the Francis Crick Institute shows.

The study, published in *PLOS One*, adds to the growing evidence that AI could revolutionise healthcare in the UK and beyond. So far, the emphasis has been on the potential of AI to help diagnose and treat various diseases, but these new findings suggest it could also help predict the likelihood of patients dying too.

"It won't be long before doctors are routinely using these sorts of tools in the clinic to make better diagnoses and prognoses, which can help them decide the best ways to care for their patients," says Crick scientist Andrew Steele, first author of the paper.

"Doctors already use computer-based tools to work out whether a patient is at risk of heart disease, and machine-learning will allow more accurate models to be developed for a wider range of conditions."

Data-driven model

The model was designed using the electronic health data of over 80,000 patients, collected as part of routine care, and available for researchers on the CALIBER platform.

Scientists at the Crick, working collaboratively with colleagues at the Farr Institute of Health Informatics Research and University College London Hospitals NHS Foundation Trust, wanted to see if they could create a model for coronary artery disease—the leading cause of death in the UK—that outperforms experts using self-taught machine learning techniques.

Coronary artery disease develops when the major blood vessels that supply the heart with blood, oxygen and nutrients become damaged, or narrowed by fatty deposits. Eventually restricted blood flow to the heart can lead to chest pain and shortness of breath, while a complete blockage can cause a heart attack.

An expert-constructed prognostic model for coronary artery disease which this work was compared against made predictions based on 27 variables chosen by medical experts, such as age, gender and chest pains. By contrast, the Crick team got their AI algorithms to train themselves, searching for patterns and picking the most relevant variables from a set of 600.

Outperforming experts

Not only did the new data-driven model beat expert-designed models at predicting patient mortality, but it also identified new variables that doctors hadn't thought of.

"Along with factors like age and whether or not a patient smoked, our models pulled out a home visit from their GP as a good predictor of patient mortality," says Andrew. "Home visits are not something a cardiologist might say is important in the biology of heart disease, but perhaps a good indication that the patient is too unwell to make it to the doctor themselves, and a useful variable to help the model make accurate predictions."

This study was a proof-of-principle to compare expert-designed models to machine learning approaches, but a similar model could be implemented in the clinic in the not too distant future.

"Machine learning is hugely powerful tool in medicine and has the ability to revolutionise how we deliver care to patients over the next few years," says Andrew.

More information: Andrew J. Steele et al, Machine learning models in electronic health records can outperform conventional survival models for predicting patient mortality in coronary artery disease, *PLOS ONE* (2018). DOI: 10.1371/journal.pone.0202344

Provided by The Francis Crick Institute

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