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EDITORIAL

Role of artificial intelligence in cardiology

Rafael Vidal-Perez, Jose Manuel Vazquez-Rodriguez

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Abstract

Artificial intelligence (AI) is the process of having a computational program that can perform tasks of human intelligence by mimicking human thought processes. AI is a rapidly evolving transdisciplinary field which integrates many elements to develop algorithms that aim to simulate human intuition, decision-making, and object recognition. The overarching aims of AI in cardiovascular medicine are threefold: To optimize patient care, improve efficiency, and improve clinical outcomes. In cardiology, there has been a growth in the potential sources of new patient data, as well as advances in investigations and therapies, which position the field well to uniquely benefit from AI. In this editorial, we highlight some of the main research priorities currently and where the next steps are heading us.

Key Words: Artificial intelligence; Machine learning; Deep learning; Electrocardiography; Cardiac imaging

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Core Tip: The main aims of artificial intelligence (AI) in cardiovascular medicine are triple: To improve patient care, increase efficiency, and enhance clinical outcomes. In cardiology, there has been a progress in the potential sources of new patient data, along with advances in diagnostic tests and therapies, which position this specialty well to uniquely gain from AI. For the prediction of the future probably, we must focus on the potential gaps and limitations of AI, knowing that elements will guide us on the new advances that we must expect in the years to come.

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INTRODUCTION

Artificial intelligence (AI) is the process of having a computational program that can execute tasks of human intelligence (*e.g.*, pattern recognition) by mirroring human thought processes[1]. AI is a transdisciplinary fast evolving field which puts together statistics, computer science, material science, neuroscience, psychology, computer hardware design, and mechanical engineering to create algorithms that aim to simulate human intuition, object recognition, and decision-making[2].

AI IN CARDIOLOGY

The main aims of AI in cardiovascular medicine are triple: To improve patient care, increase efficiency, and enhance clinical outcomes. In cardiology, there has been a progress in the potential sources of new data from patients, along with innovations in diagnostic tests and therapies, which position this specialty well to distinctively gain from AI[3].

The AI applications in cardiology are showing for instance that uncomplicated instruments like electrocardiography (ECG) might provide us a plenty of useful data, and AI converts the ECG data in a robust tool for prediction[4]. On the same side with more complexity, the use of AI tools in cardiovascular imaging into daily decision-making will improve care provision. AI has influenced every area of cardiovascular imaging in all stages from acquisition to reporting[5-7].

In cardiovascular medicine, the pioneer uses of AI were the creation of self-learning neural networks applied to ECG[8,9]. The next step on research has been the use of enormous sets of digital ECGs connected to detailed clinical data to create AI algorithms for the detection of silent (previously asymptomatic and undocumented) atrial fibrillation, left ventricular dysfunction, and hypertrophic cardiomyopathy, in addition to the ability to determinate a person's age, race, and sex, amongst other phenotypes. The population-level and daily clinical implications of AI-based ECG phenotyping keep up to arise, especially with the fast rise in the disposal of wearable and mobile ECG technologies[4]. These deep learning algorithms, once created, could be used in low-end machines like smartphones or wearables like smartwatches, providing great access to population. The first example has been recently published[10], applying an algorithm that detects the potential presence of left ventricular dysfunction through the ECG signal. This approach for sure is the future to spread this technology.

In the field of imaging, the progress of AI has been enormous in the last years, affecting all the phases of the diagnostic process. The advances have been bigger in the field of computed tomography imaging or magnetic resonance imaging[11], but the next step is echocardiography to generalize the value of AI in imaging[12], as shown in the review of Barry *et al*[11].

For the prediction of the future probably, we must focus on the potential gaps and limitations of AI, knowing that elements will guide us on the new advances that we must expect in the years to come. Currently, nearly all studies of AI in echocardiography for example are constructed with retrospective data and concentrated largely on the performance of AI in concrete diagnostic tasks, and these studies range from small and simple exploratory studies[13] to larger studies[14,15]. There is a need on prospective studies to show the feasibility of the AI algorithms in the cardiovascular field[15]. One more preoccupation is what to make when machine and man differ. The value of outstanding validation of the algorithms must, consequently, be emphasised. Clinical judgment by the physician will be crucial, with a dose of humbleness additionally, to guarantee that AI will be employed to assist and not substitute clinical decision-making.

CONCLUSION

A possible future lies in having this AI software implemented in low-end machines, and it would certainly help in the early detection and prevention of some cardiovascular diseases. We could affirm that for sure it will be essential that cardiovascular medicine specialists should keep the final step in the handling of the system, take care for the decisions, and have the power to modify algorithms in the situations that get mistaken.

FOOTNOTES

Author contributions: Vidal-Perez R designed the study, performed the collection of the data, and wrote and edited the paper; Vazquez-Rodriguez JM contributed to the critical revision and editing of the paper.

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