Feasibility of artificial intelligence-enhanced electrocardiogram (AI-ECG) analysis in the current clinical environment

Citation for published version:

Digital Object Identifier (DOI):
10.1093/europace/euad122.533

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Publisher's PDF, also known as Version of record

Published In:
EP Europace

General rights
Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.
Feasibility of artificial intelligence-enhanced electrocardiogram (AI-ECG) analysis in the current clinical environment: An online survey

Doctor Bodagh N; Doctor Ali O; Doctor Kotadia I; Doctor Sim I; Doctor Gharaviri A; Unknown Mozaffar H; Doctor Cresswell K; Unknown Solis-Lemus J; Unknown Baptiste T; Unknown Corrado C; Professor Niederer S; Professor O’neill M; Doctor Williams SE.

King’s College London, London, United Kingdom of Great Britain & Northern Ireland
Royal Preston Hospital, Preston, United Kingdom of Great Britain & Northern Ireland
University of Edinburgh, Edinburgh, United Kingdom of Great Britain & Northern Ireland

Funding Acknowledgements: Type of funding sources: Foundation. Main funding source(s): The study was funded by a University of Edinburgh Wellcome Trust iTPA award. The authors acknowledge the support of the British Heart Foundation Centre for Research Excellence Award III (RE/18/5/34216). SEW is supported by the British Heart Foundation (FS/20/26/34952).

Background: Artificial intelligence-enhanced electrocardiogram (AI-ECG) analysis offers the potential to identify patterns unrecognisable to human interpreters and broaden the ECG’s utility. However, current algorithms rely on waveform signals derived from digital ECGs for input data, and these cannot be readily obtained from paper-based ECGs. This potentially presents a barrier to adoption as numerous workplaces continue to use paper-based ECGs. The views of stakeholders on the current use of paper-based ECGs and the potential future application of AI-ECG analysis are unknown.

Purpose: To explore stakeholders’ views about current and future ECG use.
To determine the perceived utility of AI-analysis of paper-based ECGs.

Methods: A web-based survey was designed using Qualtrics and distributed to a variety of healthcare professionals from numerous locations across the United Kingdom (UK). The survey consisted of 12 questions about participants’ perceptions relating to current and future paper-based ECG use and the perceived advantages and disadvantages of AI-ECG.

Results: In total, 43 healthcare professionals from 15 health provider organisations in the National Health Service (NHS) completed the survey. Paper-based ECGs were in use in 86% (37/43) of the respondents’ workplaces and 61% (26/43) felt that it would be useful if AI-based algorithms could analyse paper-based ECGs in addition to digital ECGs (Figure 1). Views on future prevalence of paper-based ECGs were split with 47% (20/43) responding that it is likely or extremely likely paper-based ECGs will still be in use in the next 5 years in the NHS. Perceived advantages of AI-based analysis included the potential to improve clinical decision making (51%, (22/43)) and optimisation of healthcare professionals’ work (leaving more time for clinical patient management) (47%, (20/43)) (Figure 2A). The inability to explain how algorithms determine results (56%, (24/43)), a lack of clarity over the accountability for the results (44%, (19/43)), and a reduction in learning opportunities (44%, (19/43)) were identified as potential issues associated with use of AI-ECG (Figure 2B).

Conclusions: Whilst AI-ECG offers potential to improve clinical care, there is currently a gap between research and the integration of AI-ECG into real-world practice. Paper-based ECGs remain prevalent within the NHS, and the current requirement for algorithms to receive signal data presents a barrier to current and future AI-ECG implementation. There is currently an unmet clinical need to develop algorithms capable of interpreting paper-based ECGs. AI-ECG analysis of paper-based ECGs could enable a wider range of healthcare professionals to capitalise on any benefits offered by AI-ECG.
Figure 1. Survey responses regarding (A) ECG format type available in respondents’ workplaces and (B) stakeholders’ views on the utility of AI-based algorithms capable of analysing paper-based ECGs. ECG = electrocardiogram; EPR = electronic patient record; AI = artificial intelligence.
Figure 2. Responses to questions (A) "Which of the following do you think could be potential advantages of the application of AI algorithms to ECG analysis? Please select all that apply." and (B) "Which potential issues could the application of AI-ECG analysis pose? Please select all that apply." AI = artificial intelligence; ECG = electrocardiogram; ILR = implantable loop recorder.