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LETTER TO THE EDITOR

Putting AI at the centre of heart failure care

Heart failure (HF) is a global pandemic affecting over 40 million people worldwide and imposing a considerable human and economic burden.[1–3] At least 1–2% of the global healthcare budget is spent on HF, costs driven primarily by hospitalizations, many of which are regarded as preventable.[3–5] Worryingly, the prevalence of HF is increasing substantially alongside increases in predisposing diseases and co-morbidities (i.e. diabetes, hypertension, and obesity), a growing 'Western lifestyle' in developing countries, and an ageing population worldwide,[1,6,7] together imposing unsustainable demands on our healthcare systems. A new vision of care is required, one that embraces digital technologies to drive fundamental change in HF healthcare.

Artificial intelligence (AI), a rapidly evolving field in medicine, especially cardiology, is revolutionizing risk prediction and stratification, diagnostics, precision medicine, workflows, and efficiency.[8–10] In a strategic paper, we [PAtient Self-care uSing eHealth In chrONic Heart Failure (PASSION-HF) consortium] propose using digital therapeutics powered by AI as a personalized approach to HF self-care.[11] PASSION-HF aims to develop a virtual 'doctor at home' system. Being able to pool datasets smartly and extrapolating relevance at an individual level, our AI approach offers huge potential for reducing clinician burden, improving clinical efficacy, and enhancing patient experience and outcomes.[11]

AI techniques are transforming cardiovascular diagnosis through interpreting and finding meaning in vast sets of data, faster and more effectively than the human brain.[8] Machine learning, the most common application of AI, is characterized by the ability to learn from data without being explicitly programmed. Through the development of reinforcement learning algorithms, machine learning recognizes patterns in new data to create its own logic to continuously improve cardiovascular disease prediction and diagnosis.[9] Accordingly, AI is able to deal with enormous combinations of multi-markers, essential in the prediction and prevention of deterioration of complex diseases like HF. Even so, such predictive models are largely dependent on high-quality large-scale datasets that are not easily accessible, and datasets of poorer quality may lead to biases with subsequent decrease in the predictive accuracy of models.[12] However, through strategic selection of underlying data and use of sensitivity checks, algorithm developers can mitigate AI bias.[12] This in itself accentuates the need for transparency, reproducibility, and standard reporting guidelines, which have recently been proposed and implemented in AI and machine learning.[13,14]

The ability of AI to mimic the human brain and even overcome bias is fast contributing to the conceptualization of personalized precision medicine. However, overwhelmingly, the focus has been on diagnosis and risk prediction.[15] Evidence demonstrating applications of AI in clinical decision-making are not only lacking but also essential if we are to advance into an era of precision medicine. Only then is AI likely to take over the routine part of a physician's workload, allowing them to spend more quality time with their patients and improve patient engagement.

The future application of AI in HF care offers immense possibilities. For healthcare providers, AI has the potential to decrease risk of adverse events, patient waiting times, and per capita costs whilst increasing accessibility, productivity, and overall patient experience.[10] For clinicians, AI has the capability to reduce workloads and margin of error and improve needs-led patient–doctor interactions and therapeutic decision-making.[9,11] For patients, AI can empower them through increased knowledge, shared decision-making, and self-efficacy in disease management, ultimately improving their health and well-being.[11]

Although AI has the ability to overcome many of the key challenges posed by the prevailing HF pandemic, some caution is warranted as it is a rapidly evolving science. Transparency regarding the quality of data, population representativeness, and performance assessment will be imperative.[14] Discussions regarding legal, technical, and regulatory challenges should involve clinicians, informatics and IT experts, regulators, and patients and carers and prioritize ethics and equity. The diversity of AI development teams will mandate interdisciplinary integration to achieve adoption, utility, safety, and inclusion all under the auspices of a new philosophy of care—*AI-enabled care*.[11] Although the landscape of HF care may be changing, the patient–doctor relationship will not be entirely replaced by AI. However, those who do not use AI will, in all probability, be replaced by those who do.

AI is the new tool in the toolbox that is already transforming cardiology. The PASSION-HF consortium see AI as an enabler to personalize medicine and to optimize

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effective HF self-care in consideration of disease complexity. By adding value and precision to the management of HF, providing equitable and affordable care access, and improving patient expectation and outcomes, AI is transforming HF care.

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Conflict of interest

None declared.

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