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Citation for published version (APA):

Hendriks, J. M., Spreeuwenberg, M. D., & Linz, D. (2021). Mobile health and cardiac arrhythmias: patient self-management in digital care pathways. *European Journal of Cardiovascular Nursing*, 20(7), 631-632. <https://doi.org/10.1093/eurjcn/zvab075>

Document status and date:

Published: 01/10/2021

DOI:

[10.1093/eurjcn/zvab075](https://doi.org/10.1093/eurjcn/zvab075)

Document Version:

Publisher's PDF, also known as Version of record

Document license:

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Mobile health and cardiac arrhythmias: patient self-management in digital care pathways

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Received 5 August 2021; accepted 17 August 2021; online publish-ahead-of-print 2 September 2021

The use of technology in cardiovascular care has emerged significantly over the last decade. This includes telemedicine and cardiac monitoring devices to remotely monitor and manage cardiac conditions, as well as the use of activity trackers and educational applications to support a healthy lifestyle and to activate and support patients in self-management of their condition. The COVID-19 global pandemic accelerated the uptake of these technologies, given that numerous interventions and models of care delivery were converted from face-to-face into virtual and remote models of care using digital healthcare solutions. Patient roles have changed from passively receiving treatment, to actively being involved in their care process, treatment decisions and being an active member of the treatment team.¹ Co-design methodologies are required to develop novel approaches incorporating the aims and requirements from the perspective of healthcare professionals but equally important, the needs, values, and preferences of the patients involved in this. In clinical practice, such co-design methodologies are referred to as shared decision-making, which plays an important role in the management of patients with chronic conditions such as atrial fibrillation (AF).²

AF is the most prevalent cardiac arrhythmia, associated with multiple underlying cardiovascular co-morbidities and risk factors. To support treatment and care delivery for patients with AF, numerous technologies to screen individuals aiming to detect and diagnose AF and consequently provide comprehensive treatment have been introduced.³ Also, guideline-based patient applications have been developed aiming to enhance patient education and empowerment to actively involve patients in their treatment, as well as healthcare professional applications to support best practice and evidence-based decision-making in the treatment team.⁴ The 2020 European Society of Cardiology Guidelines for the management of AF state that an integrated management approach should be applied in all patients with AF. This patient-centred, multidisciplinary model of care aims to provide comprehensive AF treatment and includes the use of technology to support the integrated approach.⁵ An example is the TeleCheck-AF approach, which incorporates these

fundamentals. This mobile health (mHealth) approach was developed as a response to the COVID-19 pandemic restrictions, to maintain the remote management of patients with AF. TeleCheck-AF applies an on-demand mHealth infrastructure by using a smartphone application, which allows patients to measure their heart rate and rhythm themselves and to receive treatment through teleconsultation.⁶ The app-based on-demand infrastructure requires active patient involvement since patients were instructed to record their heart rate and rhythm, their symptoms, and associated risk factors, during 7 days prior to scheduled teleconsultations.⁷ When completing a recording, patients immediately received the result of the recording, which resulted in feelings of safety and involvement in most patients in this integrated mHealth approach.⁸

A recent study by Carnlof *et al.*,⁹ published in the *European Journal of Cardiovascular Nursing*, stated that patients with symptomatic AF may experience severe symptoms such as palpitations, shortness of breath, and chest pain, which can be scary, and the emotional stress may even worsen or trigger episodes of AF. This study included 821 women who had symptomatic palpitations were provided a handheld electrocardiogram (ECG), which was connected to their smartphone for a 60-day period. Participants were instructed to record an ECG twice a day and in case of symptoms and received immediate responses based on an automated algorithm interpretation. Most recordings demonstrated sinus rhythm or premature atrial/ventricular contractions, and only 6% demonstrated AF. Using validated questionnaires, it was demonstrated that anxiety and depression levels decreased significantly. Interestingly and contrastingly, the frequency and severity of symptoms improved, which resulted in the improved quality of life.⁹ This demonstrates the huge potential of technology on the wellbeing of patients by providing direct feedback on heart rate and rhythm as an integrated part of a comprehensive care approach.

Moreover, technology may serve as the self-management guide for patients in terms of education, symptom assessment, medication adherence, general wellbeing, and quality of life. Therefore,

The opinions expressed in this article are not necessarily those of the Editors of the *European Journal of Cardiovascular Nursing* or of the European Society of Cardiology.

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development of healthcare-related technology should be co-designed with patients and healthcare professionals and should underpin theoretical behaviour change. Pearsons *et al.*¹⁰ performed a scoping review which was recently published in the *European Journal of Cardiovascular Nursing*, to identify these important characteristics in commercially available AF self-management applications. Five applications that met their inclusion criteria were included in the analysis demonstrating the scarcity of applications with a focus on AF self-management, compared to other chronic conditions such as hypertension and diabetes mellitus. Most of these applications include educational content, symptom assessment, and possibility to communicate with health care professionals. However, alignment with personalized behavioural change theory embedding the individual self-management approach and to appropriately affect lifestyle modifying behaviour was lacking.¹⁰

Novel emerging mHealth technologies allow for a more personalized and dynamic transmural care approach, where the right care for the right patient at the right time can be provided and organized within a digital care pathway. Based on the results of mHealth technologies and related risk calculations, patients can be referred to dedicated specialized centres for complex treatments, while others can be referred to primary care services. Transmural care solutions in the interface between primary and secondary care have been developed. For example, in a Primary Care Plus setting, cardiologists provide consultations with patients in collaboration with the primary care physician to prevent unnecessary referrals to the hospital.¹¹ Dedicated use of technology may further improve transmural collaboration, care delivery, and above all involvement and self-management of our patients with the overall aim to improve the wellbeing and outcomes of patients with chronic conditions, such as AF.

In summary, the use of mHealth technology may be able to support and amplify models of care focusing on actively involving, empowering, and preparing patients to be able to self-manage their AF and associated lifestyle risk factors. In addition, mHealth implemented within an integrated care approach may reassure and potentially reduce anxiety in patients and provide the right care for the patient at the right place at the right time. Importantly, the use of technology does not imply replacement of the human interaction in health care but provides an additional tool to support patients and healthcare providers. To align the use and design of technologies with the needs and values of the patient, it is crucial to co-design novel approaches and devices in collaboration with patients, who will

have a much more active role in collecting and interpreting data to manage their AF than in the past.

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