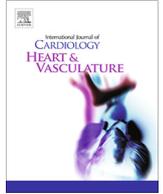




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On-demand app-based rate and rhythm monitoring to manage atrial fibrillation through teleconsultations during COVID-19



During the coronavirus 2019 (COVID-19) pandemic, traditional face-to-face outpatient consultations in atrial fibrillation (AF) clinics were transformed into teleconsultations. Herein, we describe how we implemented a remote on-demand mobile health (mHealth) infrastructure, which was based on a mobile phone app using photoplethysmography (PPG) technology allowing rate and rhythm monitoring through teleconsultations (summarized in the figure) (see Fig. 1).

We asked our secretaries to call all patients 5–7 days before scheduled teleconsultations. The patients were instructed to download the FibrCheck mobile phone app (www.fibrcheck.com). This app is CE marked, connected to a secured and certified cloud and validated to detect AF via PPG signals and to provides rate measures during sinus rhythm and AF [1,2]. A manual outlining the download and registration process of the app was sent to the patient via email. After download and registration, patients activated a 7-day on-demand prescription by scanning a QR code which linked the app to a cloud accessible by the treating physician. The patients were instructed to use the app three times per day and in the case of symptoms.

Between March 25 and April 1, 2020, 38 patients with a planned teleconsultation for AF management in the Maastricht University Medical Centre+ were contacted (age 66 years (range 40–78), 57% female). Thirty (79%) patients agreed to use the app, six (16%) patients did not have access to a mobile phone or tablet and were therefore excluded, two (1%) patients refused to use the app. During the teleconsultation at 5–7 days after the initial patient contact, the patients' feedback was overwhelmingly positive. In total, 651 measurements were recorded and the quality of just 64 (10%) measurements was too low for automatic analysis. The FibrCheck algorithm defined 398 (61%) measurements as normal sinus rhythm, 143 (22%) as AF and 46 (7%) as sinus rhythm with extrasystoles. The average number of measurements per participant was 22. After each measurement, symptoms were assessed by the app: 77% of measurements were asymptomatic, dyspnea was present in 5%, palpitations in 2%, chest pain in 1% and in 15% other symptoms were reported. FibrCheck information was used for management of rate and rhythm control medication in patients planned for AF outpatient clinic or follow-up after AF ablation.

During COVID-19, we implemented an on-demand app-based rate and rhythm monitoring to manage AF patients through teleconsultations in our AF-clinic, with fundamental key elements included. A case coordinator, in our team the secretary, is the main contact person for the patients explaining the app or in case of

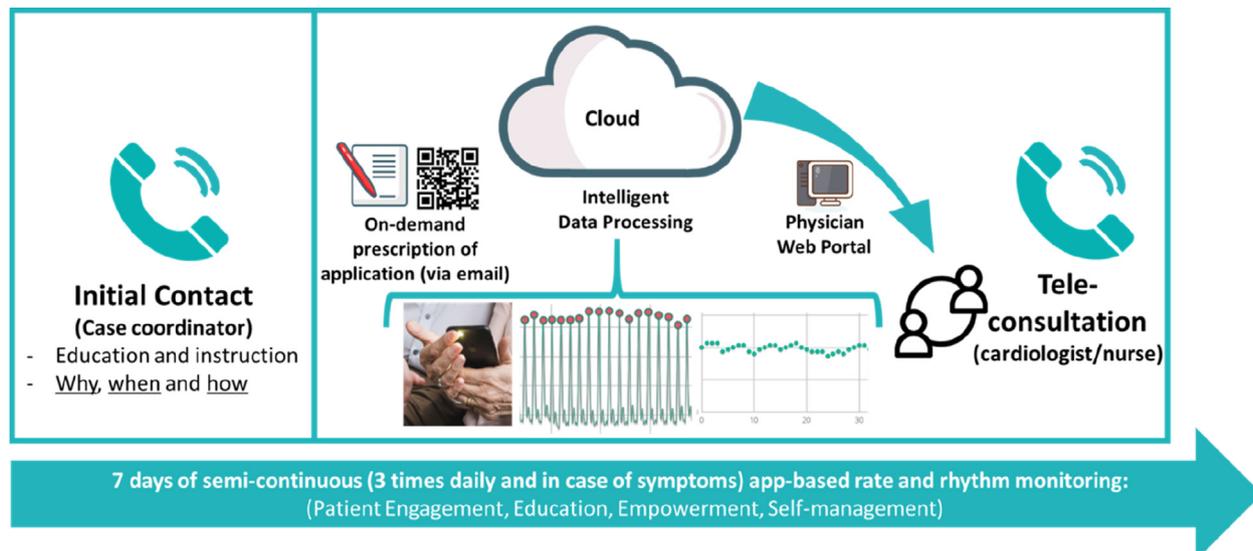


Fig. 1. On-demand app-based rate and rhythm monitoring to manage atrial fibrillation patients through teleconsultation.

issues [3]. Patient engagement and education are important aspects of this intervention [4]. Clear instructions are required concerning why, how, and when to use the app. Patients were made aware of their critical role in this process and the importance of the measurements for treatment decisions. Active engagement and empowerment to undertake this self-management intervention contributed to regular use of the app.

This application of mHealth is new compared to previous settings. The goal was to monitor rate and rhythm remotely just around teleconsultations to allow a better assessment of the disease state of the patient and to support in treatment decisions. This on-demand approach was regulated by a prescription to use the app for a limited predefined time period, which avoids unnecessary data-load and additional follow-up patients-contacts.

The relatively low cost, convenience, and broad accessibility of the mobile phone app used in this approach allows a fast and broad implementation of the herein described mHealth infrastructure during the COVID-19 pandemic. No hardware is required which has several hygienic and logistical advantages. A potential disadvantage is that no electrocardiogram is provided.

In conclusion, it is feasible to implement a novel app-based on-demand rhythm and rate monitoring infrastructure to efficiently provide teleconsultations in an AF population. Currently, we make this infrastructure widely available in numerous European centers within the TeleCheck-AF project to manage and improve AF patient care during the COVID-19 pandemic.

Declaration of Competing Interest

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