

Wat is voor jou de grootste waarde van digitale zorg?



VS



Hart- en vaatzorg van de toekomst: Digitaal waar het kan

Dominik Linz, MD, PhD

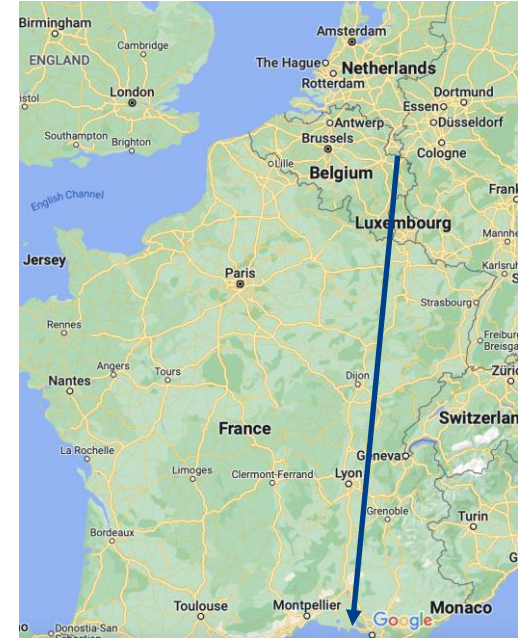
Twitter: @Dominik_Linz



The case



- pAF patient (74a)
- No ICM/PPM etc.
- NOACs, 2.5 Bisoprolol
- Holidays in Southern France (>1000 km away from Maastricht)
- Develops palpitations
- Calls ED in Maastricht





ESC

European Society
of Cardiology

Europace

<https://doi.org/10.1093/europace/euac038>

POSITION PAPER

EHRA practical guide

How to use digital devices to detect and manage arrhythmias: an EHRA practical guide

Emma Svennberg¹, Fleur Tjong², Andreas Goette^{3,4}, Nazem Akoum⁵, Luigi Di Biase⁶, Pierre Bordachar⁷, Giuseppe Boriani⁸, Haran Burri⁹, Giulio Conte¹⁰, Jean-Claude Deharo^{11,12}, Thomas Deneke¹³, Inga Drossart^{14,15}, David Duncker¹⁶, Janet K. Han¹⁷, Hein Heidbuchel^{18,19}, Pierre Jais²⁰, Marcio Jansen de Oliviera Figueiredo²¹, Dominik Linz²², Gregory Y.H. Lip^{23,24}, Katarzyna Malaczynska-Rajpold²⁵, Manlio Márquez²⁶, Corrette Ploem²⁷, Kyoko Soejima²⁸, Martin K. Stiles²⁹, Eric Wierda³⁰, Kevin Vernooy³¹, Christophe Leclercq³²

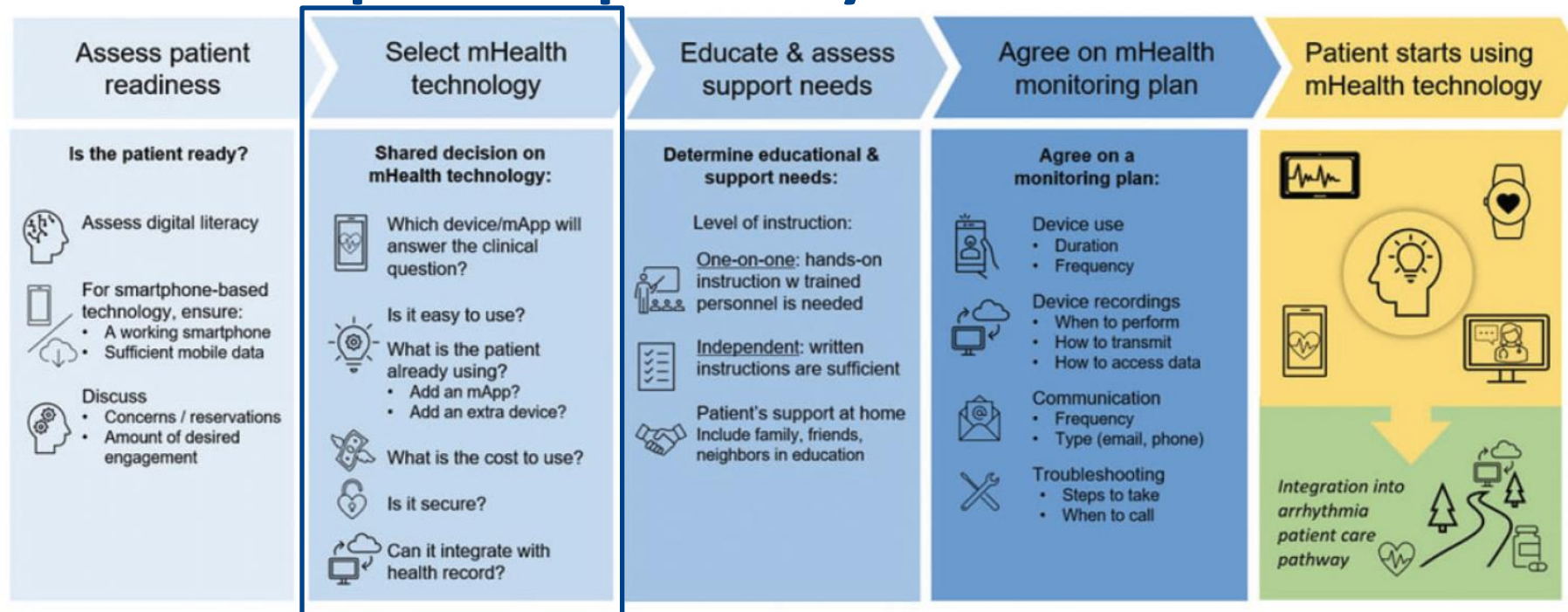
Christian Meyer (EHRA review coordinator)³³, Cristiano Pisani³⁴, Hui-Nam Pak³⁵, Dhiraj Gupta³⁶, Helmut Pürerfellner³⁷, H.J.G.M. Crijns³⁸, Edgar Antezana Chavez^{39,40}, Stephan Willems⁴¹, Victor Waldmann^{42,43}, Lukas Dekker⁴⁴, Elaine Wan⁴⁵, Pramesh Kavour⁴⁶, Mohit K. Turagam⁴⁷, and Moritz Sinner⁴⁸

Consensus statement

Following a structured patient pathway is beneficial when engaging patients in the use of digital health technology



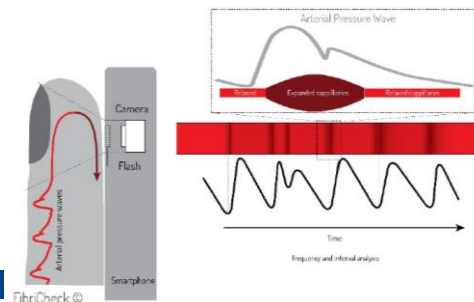
Structured patient pathway



Photoplethysmography (PPG)

The photoplethysmography dictionary: practical guidance on signal interpretation and clinical scenarios from TeleCheck-AF

Rachel M.J. van der Velden¹, Dominique V.M. Verhaert^{1,2}, Astrid N.L. Hermans¹, David Duncker³, Martin Manninger⁴, Konstanze Betz¹, Monika Gawalko^{1,5}, Lien Desteghe^{6,7}, Ron Pisters⁸, Martin Hemels⁸, Laurent Pison⁹, Afzal Sohaib^{10,11}, Arian Sultan¹², Daniel Steven¹², Petra Wijtvliet^{1,13}, Dhiraj Gupta¹⁴, Emma Svennberg¹⁵, Justin C.L.M. Luermans^{1,2}, Marisevi Chaldoupi¹, Kevin Vernooij^{1,2}, Dennis den Uijl¹, Piotr Lodzinski⁵, Ward P.J. Jansen¹⁶, Jens Eckstein¹⁷, Andreas Bollmann¹⁸, Pieter Vandervoort¹⁹, Harry J.G.M. Crijns¹, Robert Tieleman¹³, Hein Heidbuchel⁷, Nikki A.H.A. Pluymaekers¹, Jeroen M. Hendriks^{20,21}, Dominik Linz^{1,2,20,22*}, TeleCheck-AF Investigators



Recommendations for diagnosis of AF

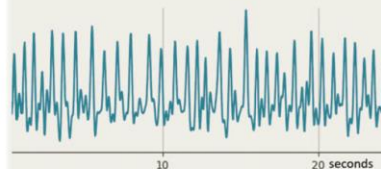
Recommendations	Class ^a	Level ^b
ECG documentation is required to establish the diagnosis of AF.		
<ul style="list-style-type: none"> A standard 12-lead ECG recording or a single-lead ECG tracing of ≥ 30 s showing heart rhythm with no discernible repeating P waves and irregular RR intervals (when atrioventricular conduction is not impaired) is diagnostic of clinical AF.⁶ 	I	B

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PPG



- Sensor-based light source & photodetector
- Measures changes in tissue blood volume based on reflected light
- Generates pulse waveform
- Heart rate is derived
- Abnormal heart rhythm can be detected by embedded algorithms



ECG



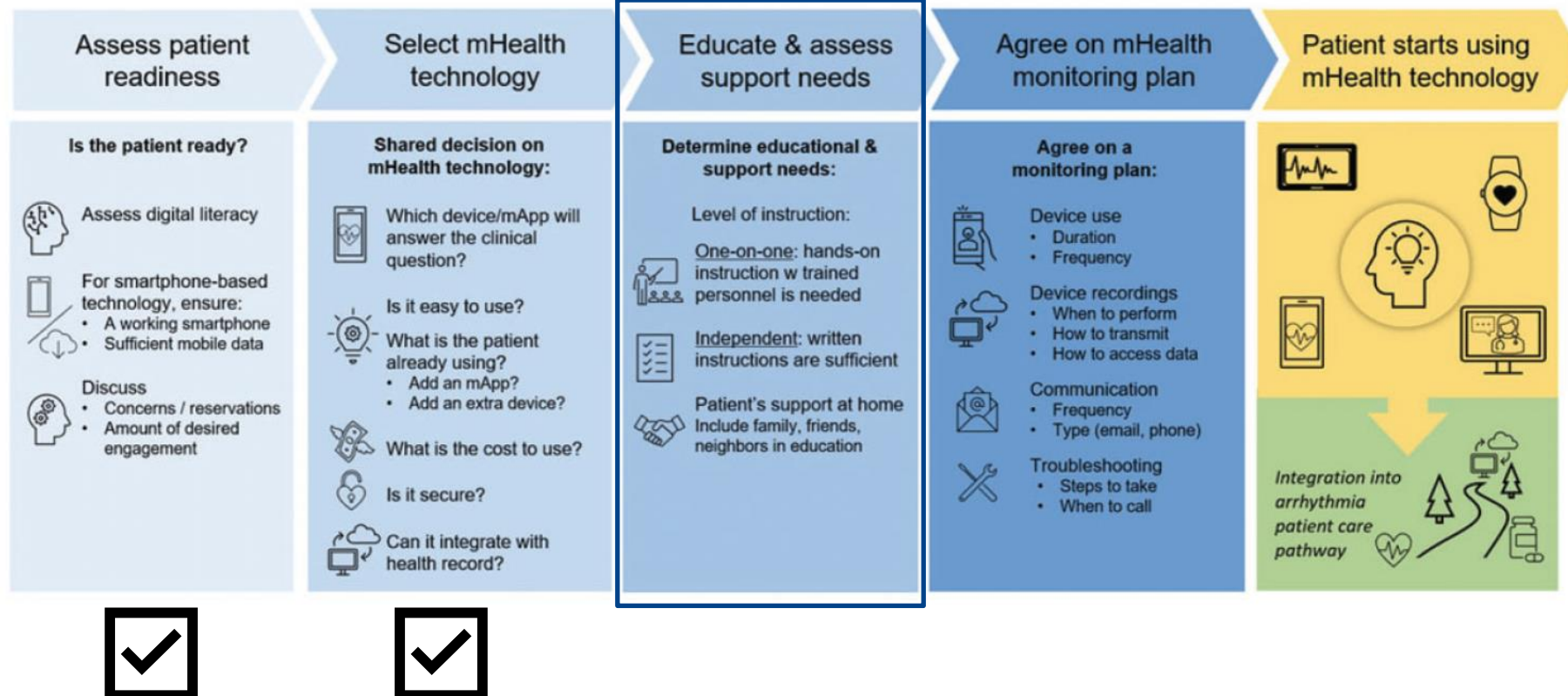
- Electrode-based
- Generates an electrocardiographic (ECG) tracing
- Allows direct analysis/diagnosis of heart rhythm

Can be diagnostic

- Clinician oversight is required for rhythm confirmation



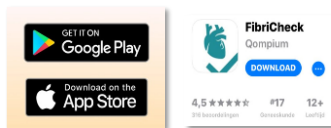
Structured patient pathway



Patient education

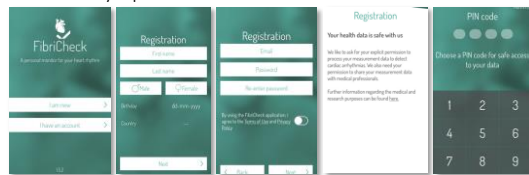
Step 1.

- Go to the "play store" or the "Apple App Store" on your smartphone.
- Search the app 'FibriCheck' and download the application.



Step 2.

After the first-login you'll need to create an account, fill in your own personal data and the email address you provided to us.



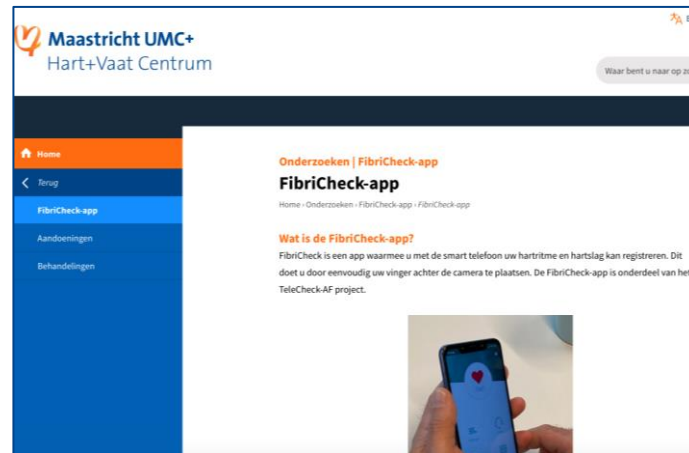
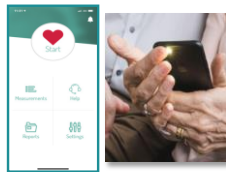
Step 3.

- Do you have a FibriCheck invitation code? -> Answer this question with "YES"
- Click on "I have a QR code", point the camera towards the QR code shown here.

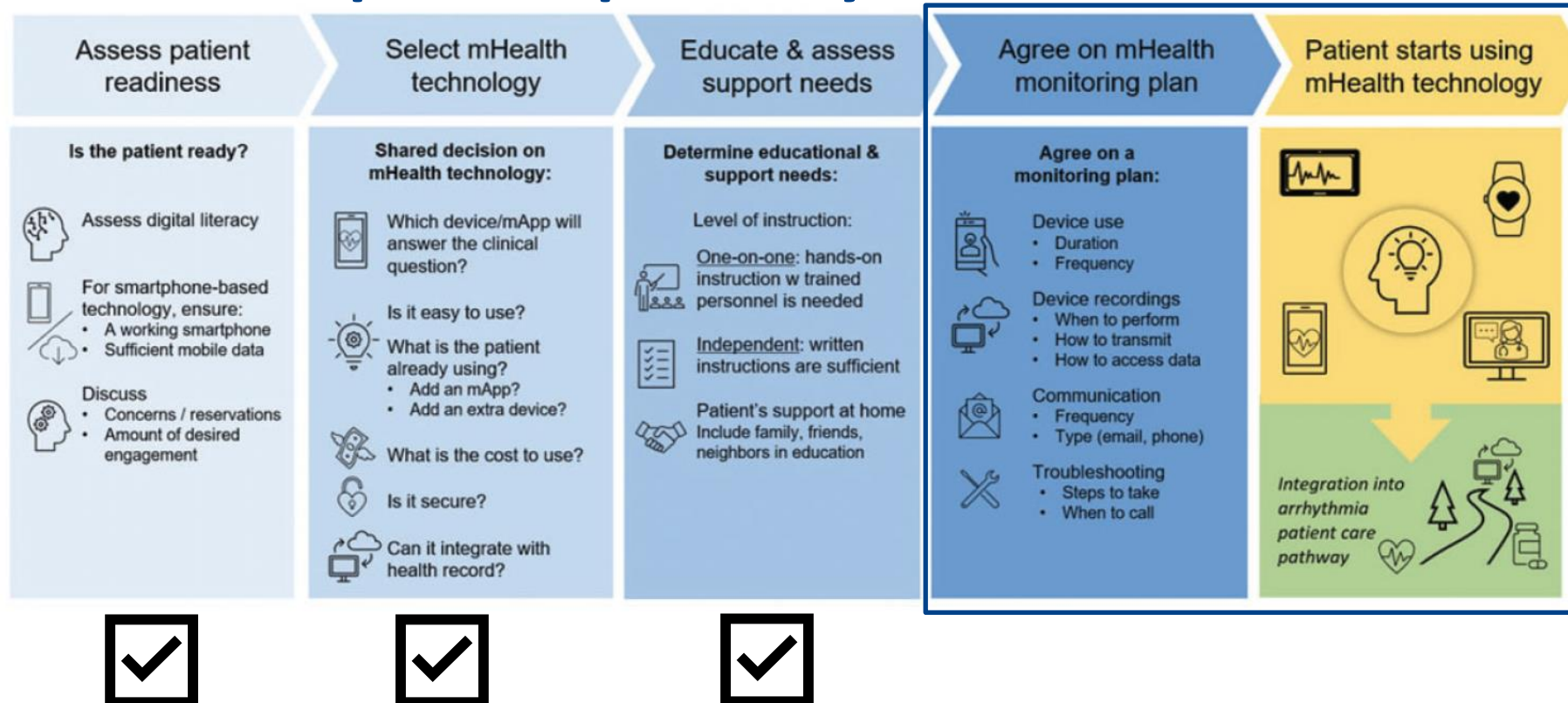


Step 4.

- To perform a registration of the heart rhythm, click "start"
- Place your index finger "gently" on the camera of your smartphone (you do not need to cover the flashlight, this can become hot!). The registrations will start automatically and will take 60 seconds. Afterwards the data is automatically sent to your caregiver.



Structured patient pathway





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of Cardiology

EP Europace (2020) 0, 1–8
doi:10.1093/europace/euaa201

REVIEW

Tele
fac



Implementation of an on-demand app-based heart rate and rhythm monitoring infrastructure for the management of atrial fibrillation through teleconsultation: TeleCheck-AF

Nikki A.H.A. Pluymaekers¹, Astrid N.L. Hermans¹, Rachel M.J. van der Velden¹, Monika Gawatko¹, Dennis W. den Uijl¹, Saskia Buskes¹, Kevin Vernooij^{1,2}, Harry J.G.M. Crijns¹, Jeroen M. Hendriks^{3,4†}, and Dominik Linz^{1,2,4*,†}

¹Department of Cardiology, Maastricht University Medical Centre and Cardiovascular Research Institute Maastricht, Maastricht, The Netherlands;

²Department of Cardiology, Radboud University Medical Centre, Nijmegen, The Netherlands; ³College of Nursing and Health Sciences, Flinders University, Adelaide, Australia; and ⁴Centre for Heart Rhythm Disorders, University of Adelaide and Royal Adelaide Hospital, Adelaide, Australia

Received 24 April 2020; editorial decision 18 June 2020; accepted after revision 19 June 2020



stroke
prevention

education and
lifestyle advice

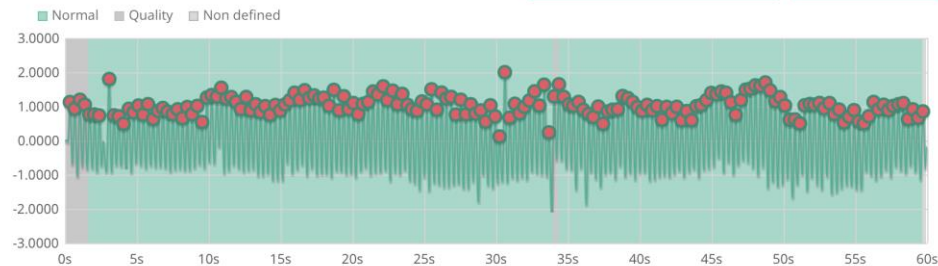
10 minutes after last contact



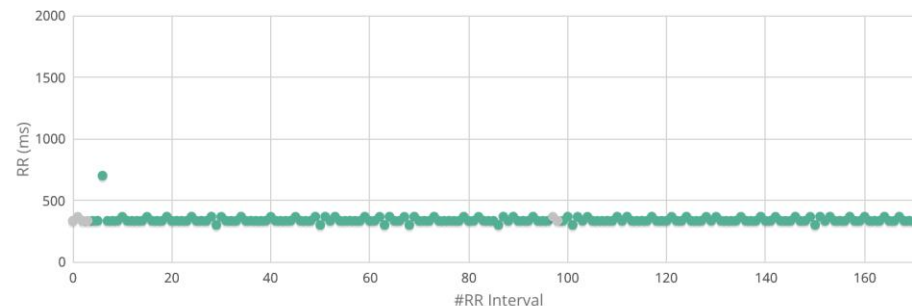
Measurement Detail

Groups: AZM - AF Poli
Heartbeat: ❤️ 175
Heart rhythm: Warning
Time:
Status: Reviewed
Review: Tachycardia
Symptoms: Lightheaded Fatigue
Short Breath
Activity: Sitting
FibriCheck:
Device:

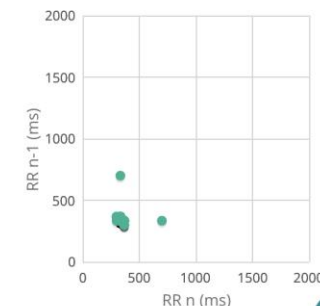
PPG signal

[Download measurement](#)[Edit Review](#)

RR tachogram



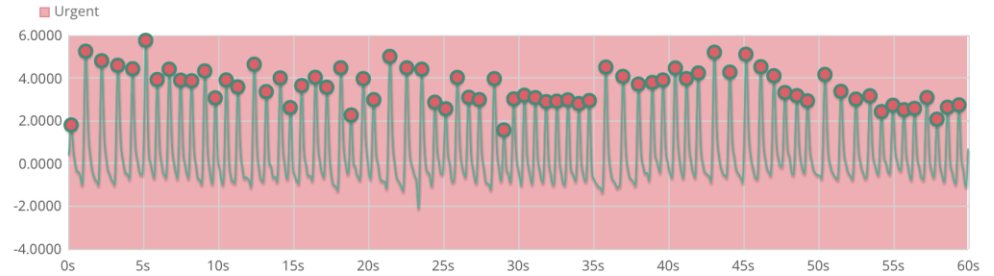
Poincaré



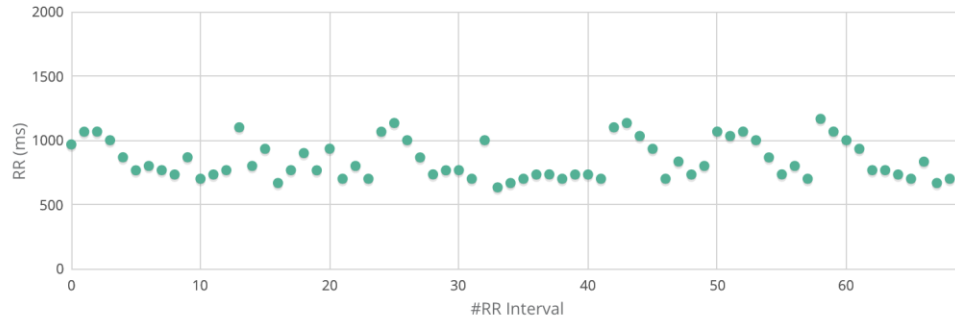
1h after 10 bisoprolol



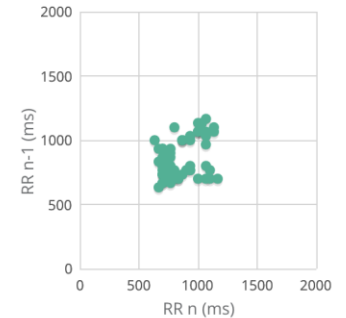
Groups: AZM - AF Poli
Heartbeat: ❤️ 72
Heart rhythm: Urgent
Time:
Status: Reviewed
Review: Atrial Fibrillation
Symptoms: Fatigue
Activity: Sitting
FibriCheck:
Device:



RR tachogram



Poincaré



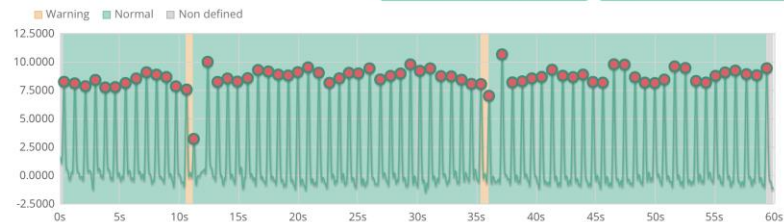
- The next morning...



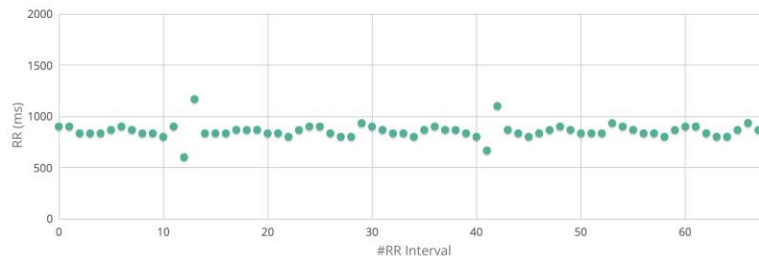
Measurement Detail

Groups: AZM - AF Poll
Heartbeat: 70
Heart rhythm: Normal
Time:
Status: Analysed
Symptoms: No Symptoms
Activity: Sitting
FibriCheck:
Device:

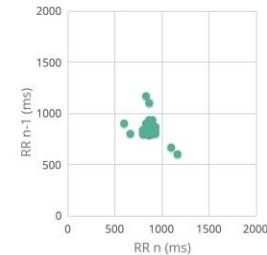
PPG signal



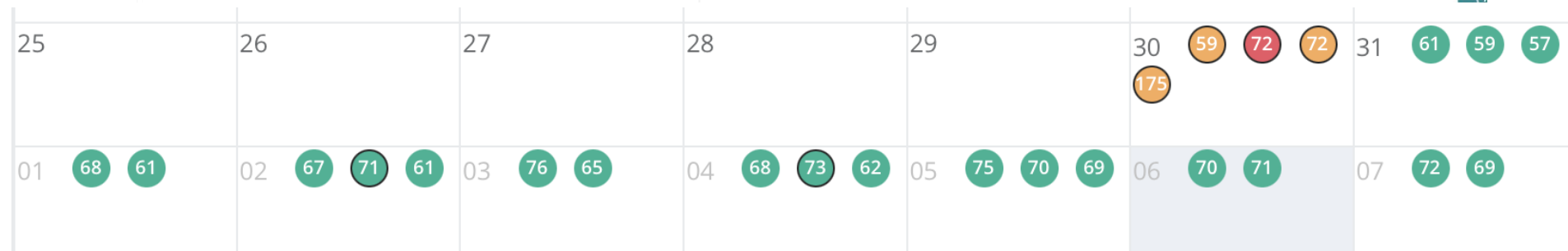
RR tachogram



Poincaré



Comments



TELECHECK-AF

17 May - 11 July 2022 (Week 96 - 103)

41

Clinical centers onboarded in the TeleCheck-AF programme

229

Caregivers involved in the program providing help to patients

5897

Patients enrolled that are now receiving continuity of care through teleconsultation

99070

Heart rate and heart rhythm recordings received in a 100% remote setting



EUROPE

THE NETHERLANDS

Maastricht University Medical Center
Rijnstate Hospital, Arnhem
Radboud University, Nijmegen
Martini Hospital, Groningen
Tergooi, Blaricum
Stichting Cardiologie, Amsterdam
Medisch centrum West, Maastricht

BELGIUM

Antwerp University Hospital, Antwerp
Jessa Hospital, Hasselt
Ziekenhuis Oost-Limburg, Genk
UZ Leuven, Leuven
Heilig Hart, Lier
OLV Aalst, Aalst

AUSTRIA

University Hospital of Graz, Graz

GERMANY

Klinik für Kardiologie, Hannover
University Hospital Münster, Münster
CCB, Frankfurt
University Hospital of Düsseldorf, Düsseldorf
University Hospital Cologne, Cologne
Essen University Hospital, Essen
University Hospital Schleswig-Holstein
Marienhospital, Aachen
University medical center, Hamburg

THE UNITED KINGDOM

Liverpool Heart and Chest Hospital, Liverpool
Barts Health NHS Trust, London
University Hospitals Plymouth NHS, Plymouth
St George's University Hospital, Wandsworth
Royal Infirmary Edinburgh Clinic, Edinburgh
Northern Ireland Chest & Stroke - Belfast
Royal Brompton Hospital, London

IRELAND

The Mater Misericordiae University Hospital, Dublin

ITALY

Fate bene fratelli Hospital, Rome

FRANCE

Parly II, Paris

POLAND

Medical University of Warsaw
John Paul II Hospital, Cracow
Poznan university of medical sciences, Poznan
Regional Hospital Silkeborg, Silkeborg

DENMARK

PORTUGAL

Hospital da Luz, Lisbon and Setubal

SWEDEN

Karolinska Institute, Solna

LATVIA

Stradini Institute, Riga

SPAIN

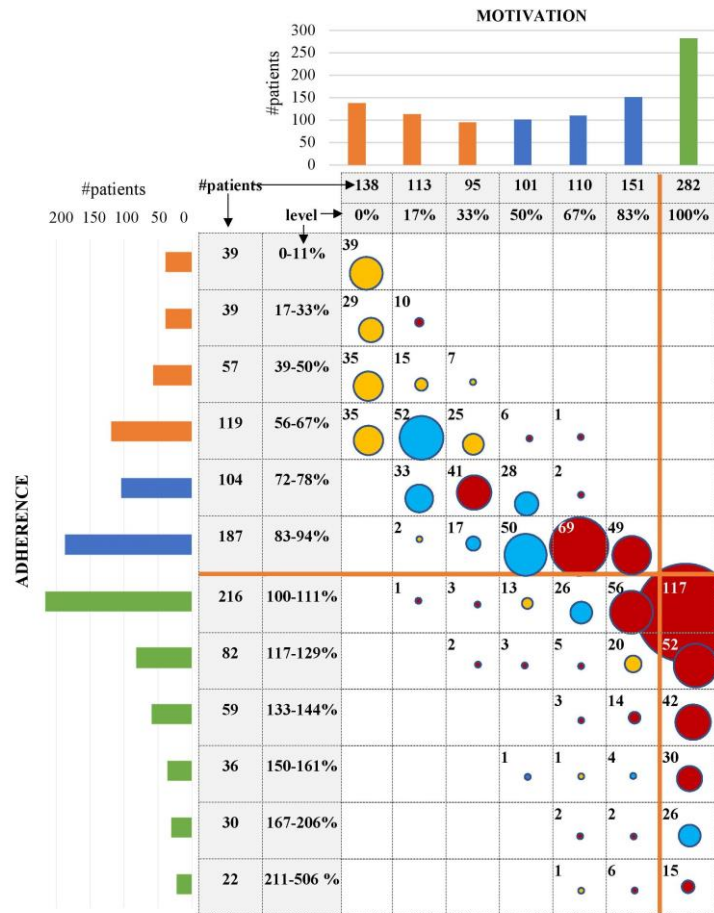
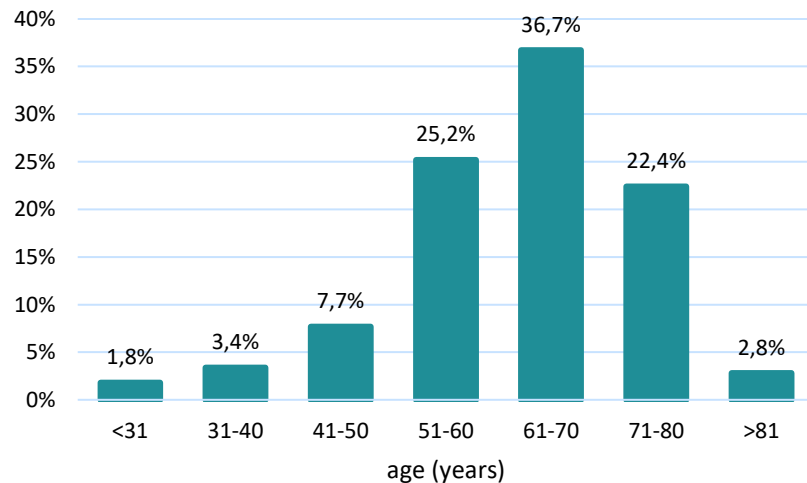
Hospital Clinic, Barcelona

OCEANIA

ADELAIDE

Royal Adelaide Hospital, Adelaide

Age distribution (n=990)



Patient experience in TeleCheck-AF (n=826)

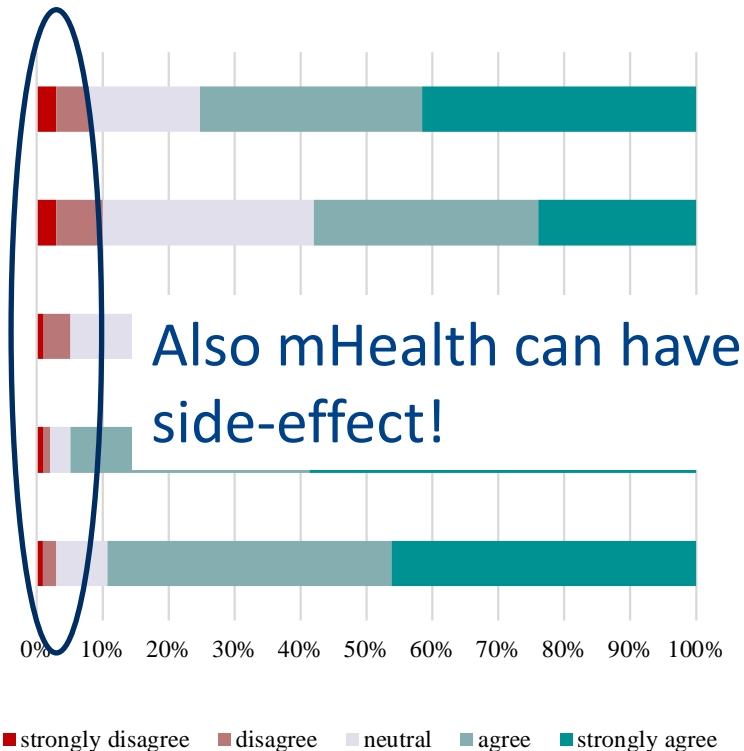
I liked using FibriCheck so that my doctor has information on my heart rate and rhythm and it gave me a safe feeling

I would like to use FibriCheck in the future

I found the daily notification to remind me to make registrations useful

I found the use of the FibriCheck app easy

I found the manual and installation of the FibriCheck app easy



Reimbursement

TELE

Tele-consultation
instead of face-to-
-face consultation



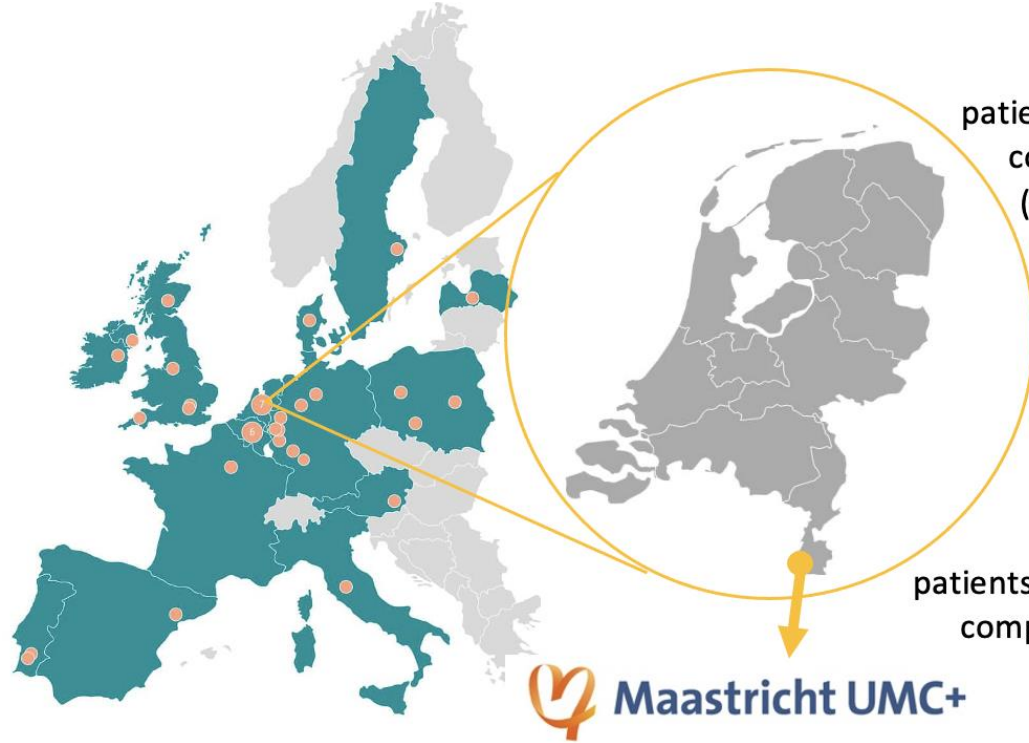
CHECK

On-demand app-
based heart rate/
rhythm monitoring



AF

Comprehensive
AF management



676

patients enrolled with
completed records
(The Netherlands)

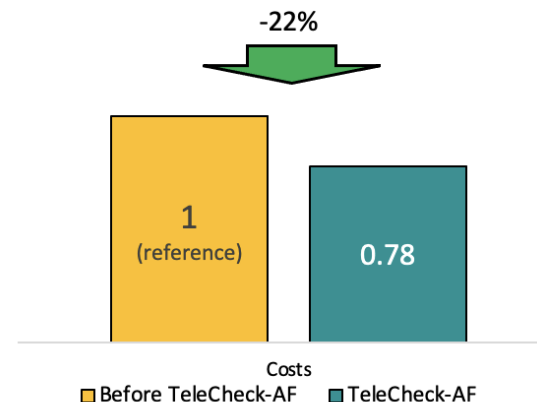
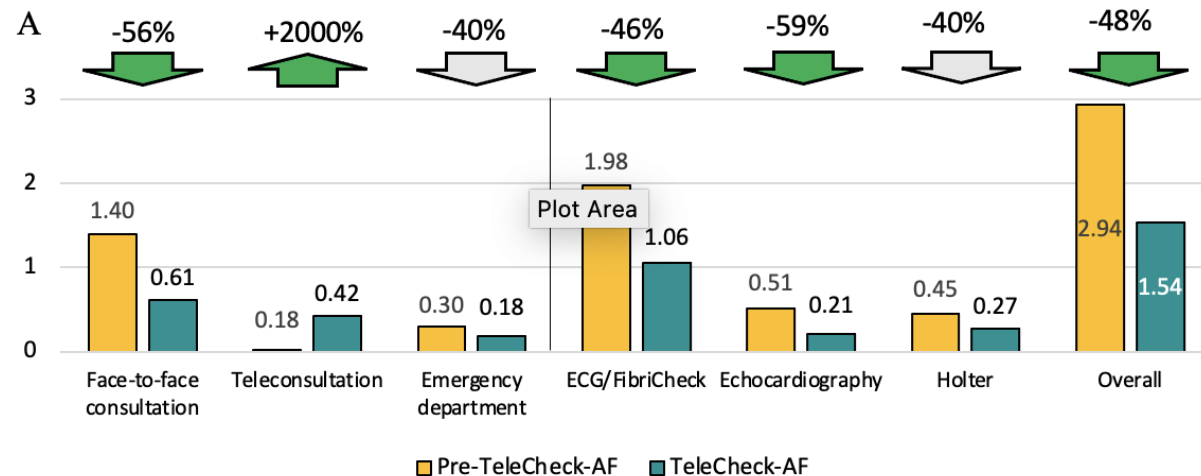
562

patients enrolled with
completed records
(Maastricht)



Maastricht UMC+

Effect on treatment profile (MUMC+)



1-2
medium
procedures
per patient
in pre-
TeleCheck-
AF period
(n=70)

37 medium

1-2
medium
procedures
per patient
in
TeleCheck-

- Holter/ ECG
- Echo

1-2 short
procedures
per patient
in pre-
TeleCheck-
AF period
(n=13)

Aant pat ambulant
middel - landelijk 2018
(DIS Open Data)

Percentage
verschuiving
MUMC

Aant pat
verschuiving
landelijk 2018

Diagn 401 - ZP 099899063

79.233

46%

36.447

Diagn 402 - ZP 099899063

22.042

45%

9.919

Diagn 802 - ZP 219699008

41.572

52%

21.617

Totaal

142.847

67.984

20 light

(n=52)

holter/
ECG

Nederlandse Zorgautoriteit

Vul 1 of 2 woorden in

[Home](#)
[Zoeken](#)
[Zorgsectoren](#)
[Collecties](#)
[Werken met dbc's](#)

Home > Zoekresultaten

Prestatiebeschrijvingbeschikking Facultatieve prestatie “Telecheck atriumfibrilleren” - TB/REG-21679-01

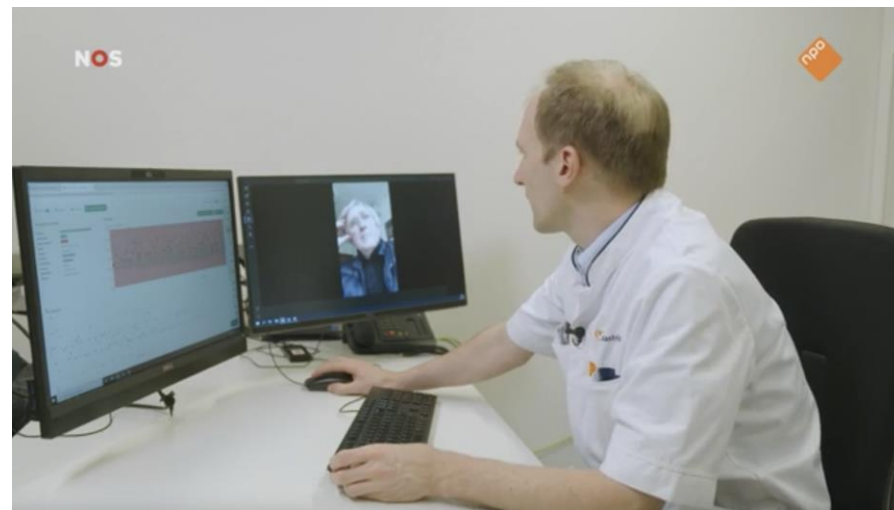
Vaststeldingsdatum: 20-12-2021
Geldigheid: 06-01-2022 t/m
Status: Geldig vandaag

Document
Documentgegevens
Versies
Uitgaande relaties 2

Za-code	Omschrijving
198704	Facultatieve prestatie – telecheck atriumfibrilleren (AF) met meten hartritme op afstand en beoordeling door cardioloog.

Aanvulling op de omschrijving van de prestatie

Door telecheck atriumfibrilleren (AF) kunnen hartpatiënten zelf eenvoudig via een gevalideerde app op hun eigen smartphone een meting van het hartritme uitvoeren. Deze metingen kunnen vervolgens door de eigen cardioloog op afstand worden beoordeeld om zo tot een behandeladvies te komen. Deze facultatieve prestatie is daarmee bedoeld als gevalideerd alternatief voor de meting die in het ziekenhuis wordt gedaan bij deze indicatie.



L
NIEUWS
REGIO
SPORT
MEDIA & CULTUUR
ZINE
ECO
OPINIE
PUZZLES

Afspraak MUMC+ en VGZ: hartpatiënt kan voortaan thuis zelf hartritme meten

09-02-2022 om 18:00 door Hennie Jeuken



Next Steps...

NL Roadmap how to implement mHealth in Cardiology



Juiste Hartzorg Op de Juiste Plek

nvvcconnect

