

Telemedicine and Digital Health

Gerhard Hindricks

ESC Digital Health Committee

Presenter Disclosure Information

Gerhard Hindricks/Department of Electrophysiology has received scientific grants and research & development grants through the University Leipzig / Heart Center from the German Innovation Fund, and the European Commission.

No personal relations to disclose.



Support European Values

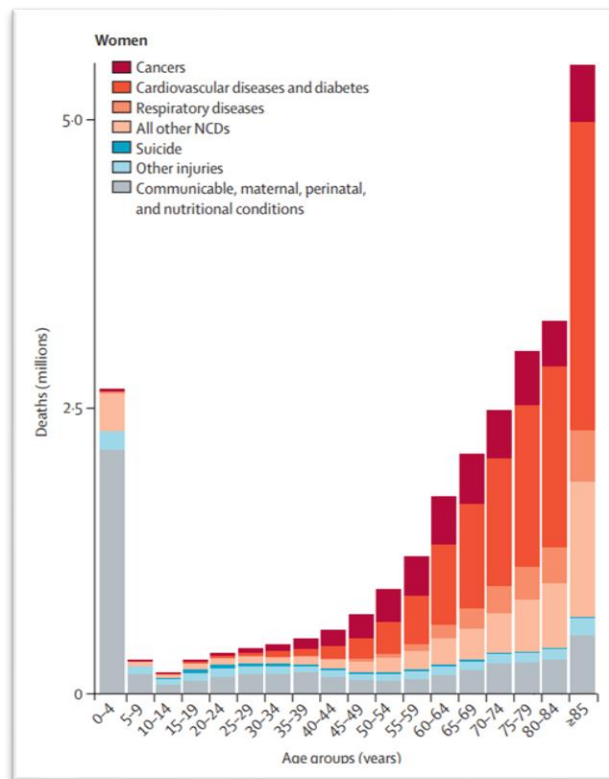
The European Society of Cardiology



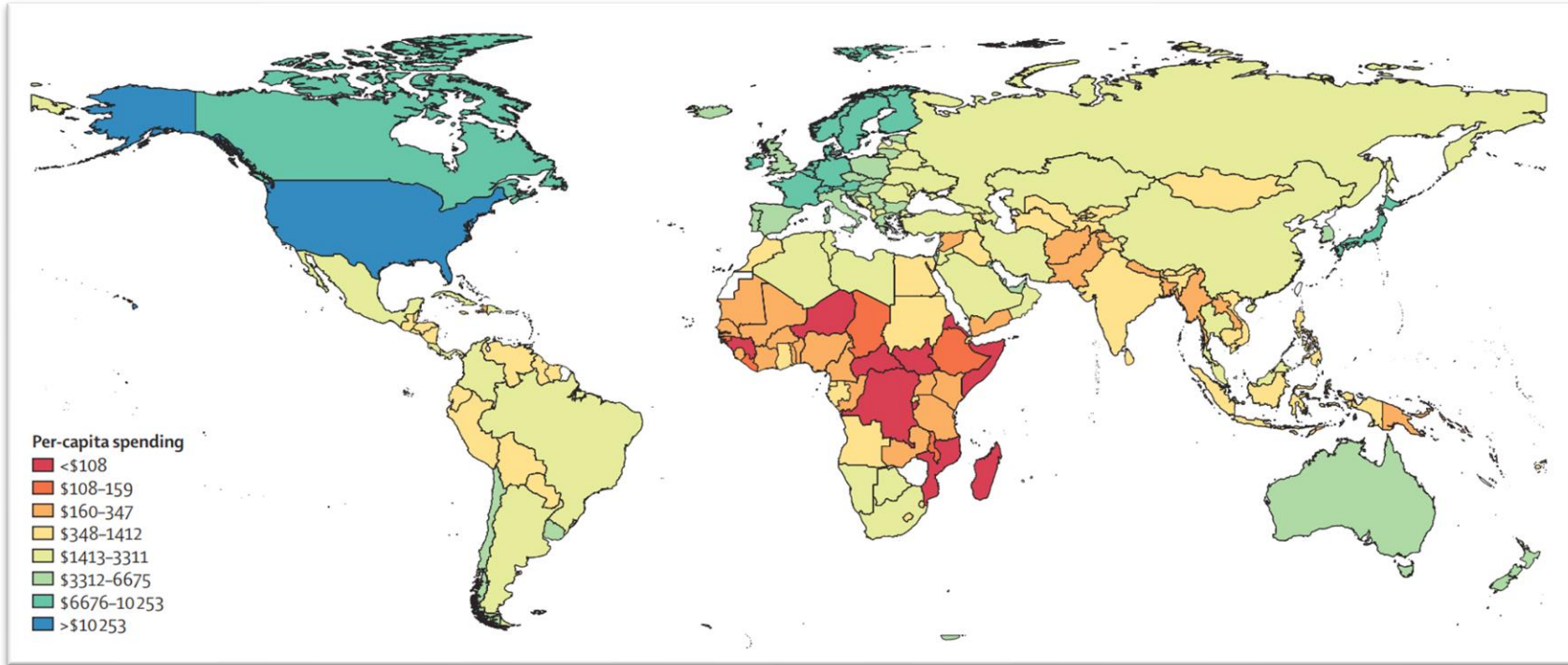
- Unites more than 110.000 cardiologists
- from 58 National Societies
- Promotes science and education
- Innovations and technologies
- Promotes patient values and patient engagement
- Hosts the largest annual cardiovascular congress – globally
- Journal family around the European Heart Journal
- Develops the globally leading guidelines for CV disease
- ... is proud to be guest here at ESA
- Our Mission: **Reduce the Burden of Cardiovascular Disease**

The burden of cardiovascular disease

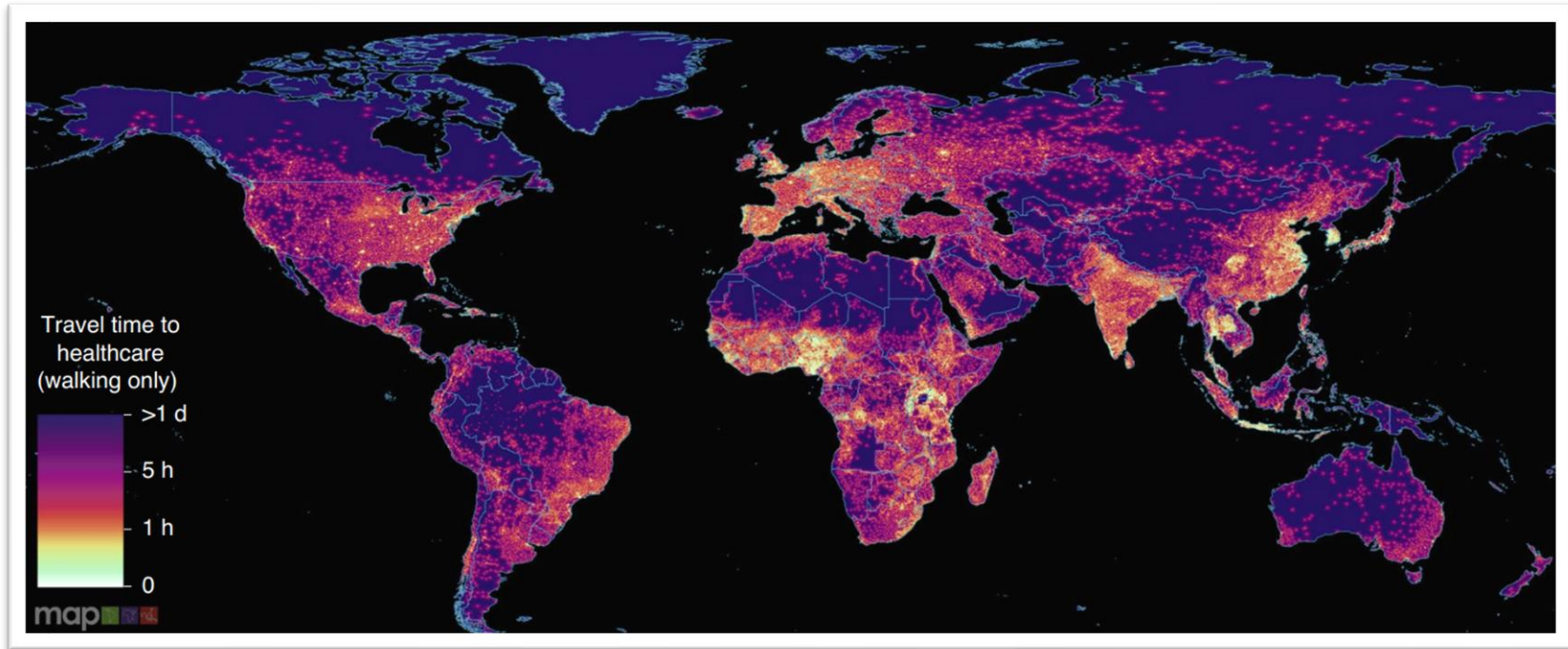
DALYs	by 2010	by 2020	by 2030
CVD DALYs			
Annual number of DALYs	153 million	169 million	187 million
Burden of CVD			
Percentage of all DALYs	10.4%	11.0%	11.6%
CVD rankings globally	3rd: coronary heart disease 5th: stroke	3rd: coronary heart disease 4th: stroke	3rd: coronary heart disease 4th: stroke
CVD rankings in developing countries	4th: coronary heart disease 8th: stroke	3rd: coronary heart disease 6th: stroke	3rd: coronary heart disease 5th: stroke



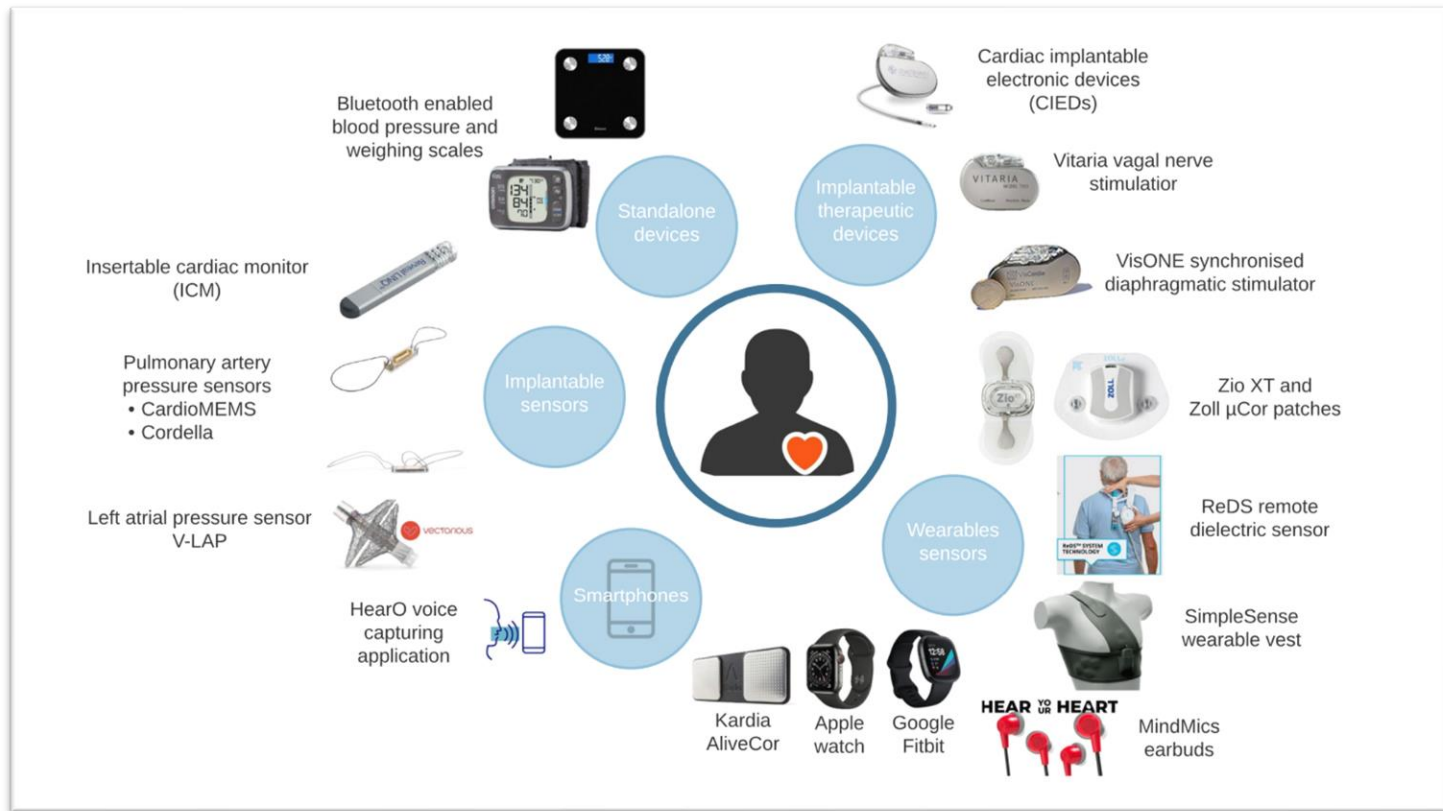
Global health care budget projections



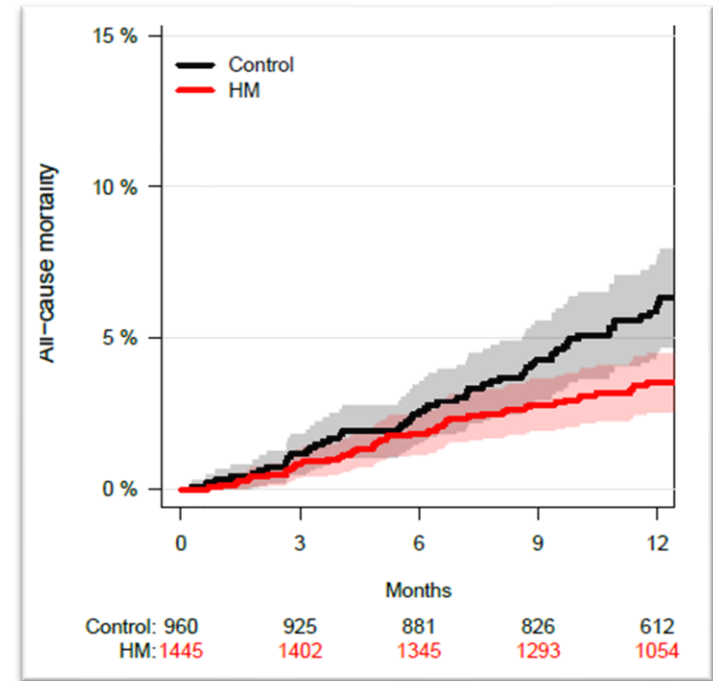
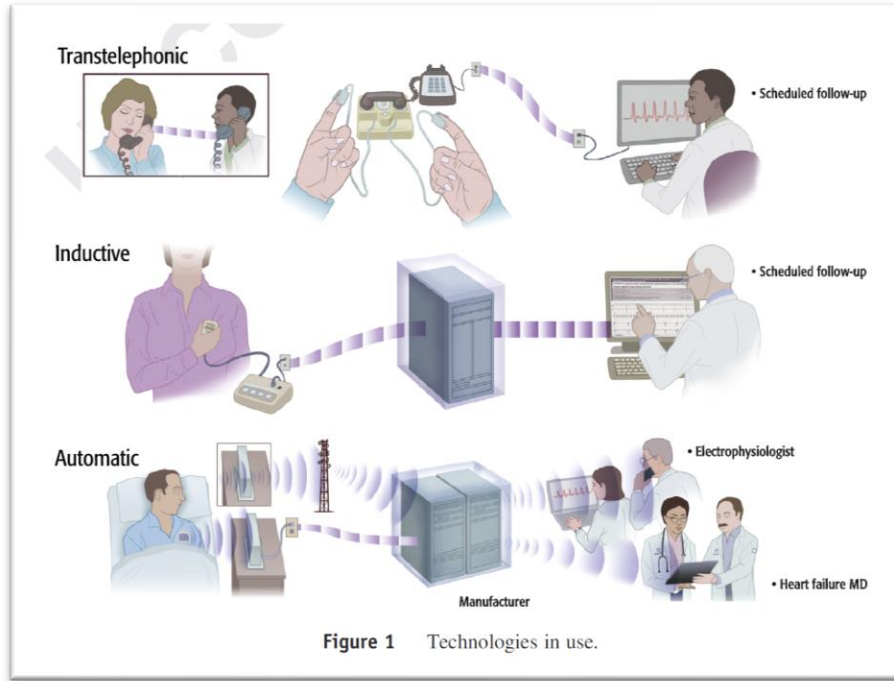
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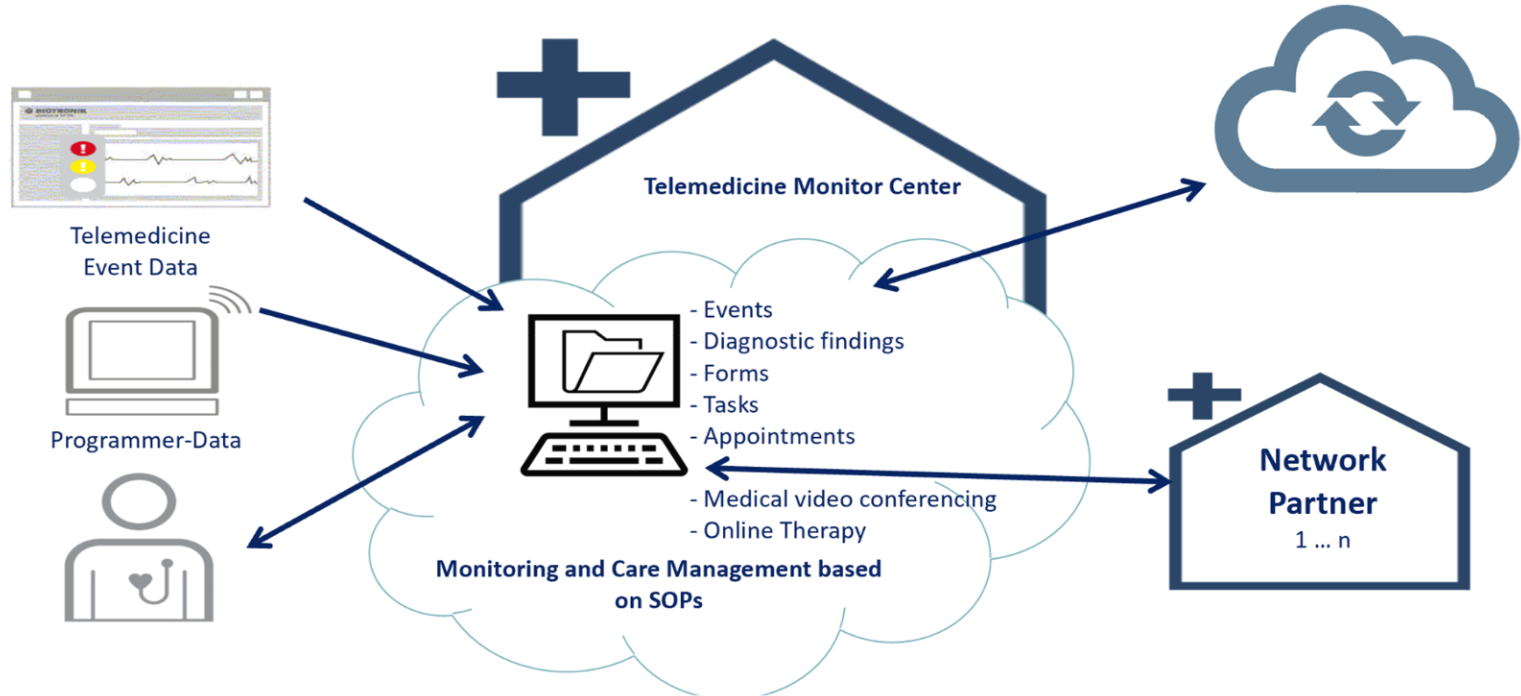
Digital technologies to support CV diagnostics and therapies



Remote communication cardiac implants



Wearables and remote communication tools



Wearables and remote communication tools

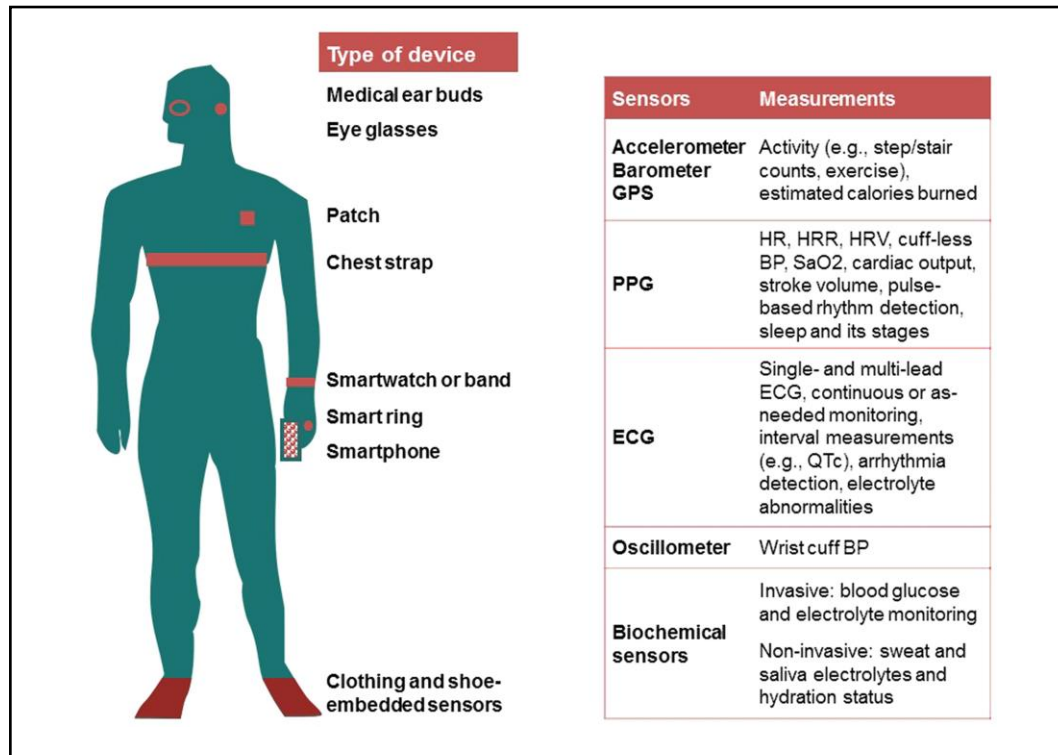
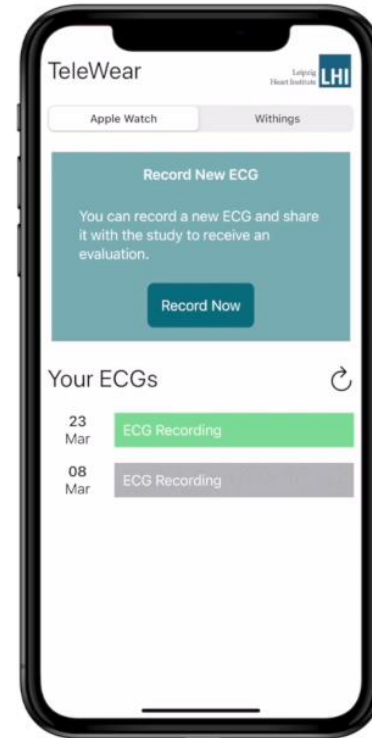


Table 4 Key factors for implementation

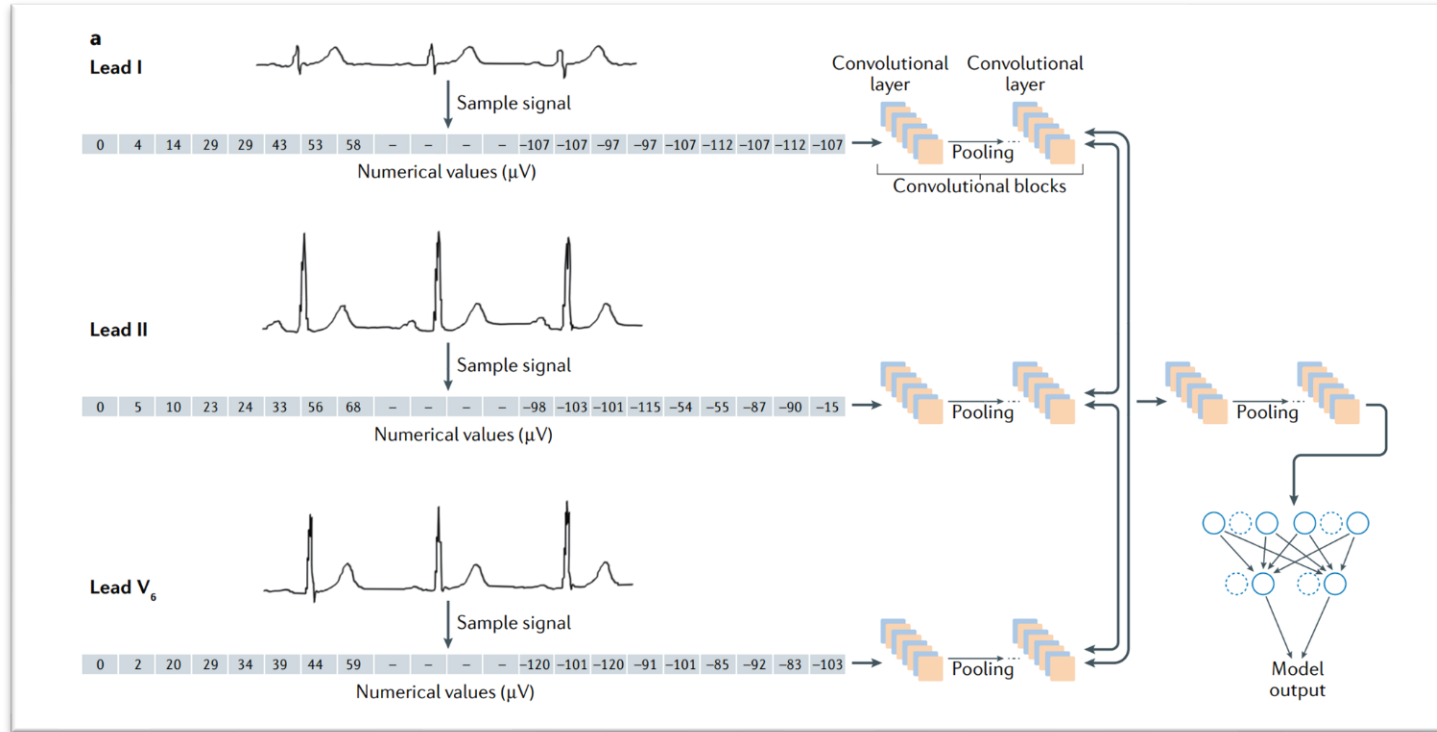
- Use regulatory-approved devices and algorithms (updated database of approved systems. The EUDAMED database is under construction, <https://ec.europa.eu/tools/eudamed/#/screen/home>)
- Well documented, easily navigated, standardized process for reimbursement
- Standardized hospital policies
- Reliable data privacy
- Process for regular updates
- Common platform with systems for integration of multiple devices
- Include regular training and education on digital technology for all personnel
- Provide training for patients with devices who are enrolled in monitoring programmes
- Dedicated in house or contracted digital health personnel
- Ensure medico-legal standards are in place



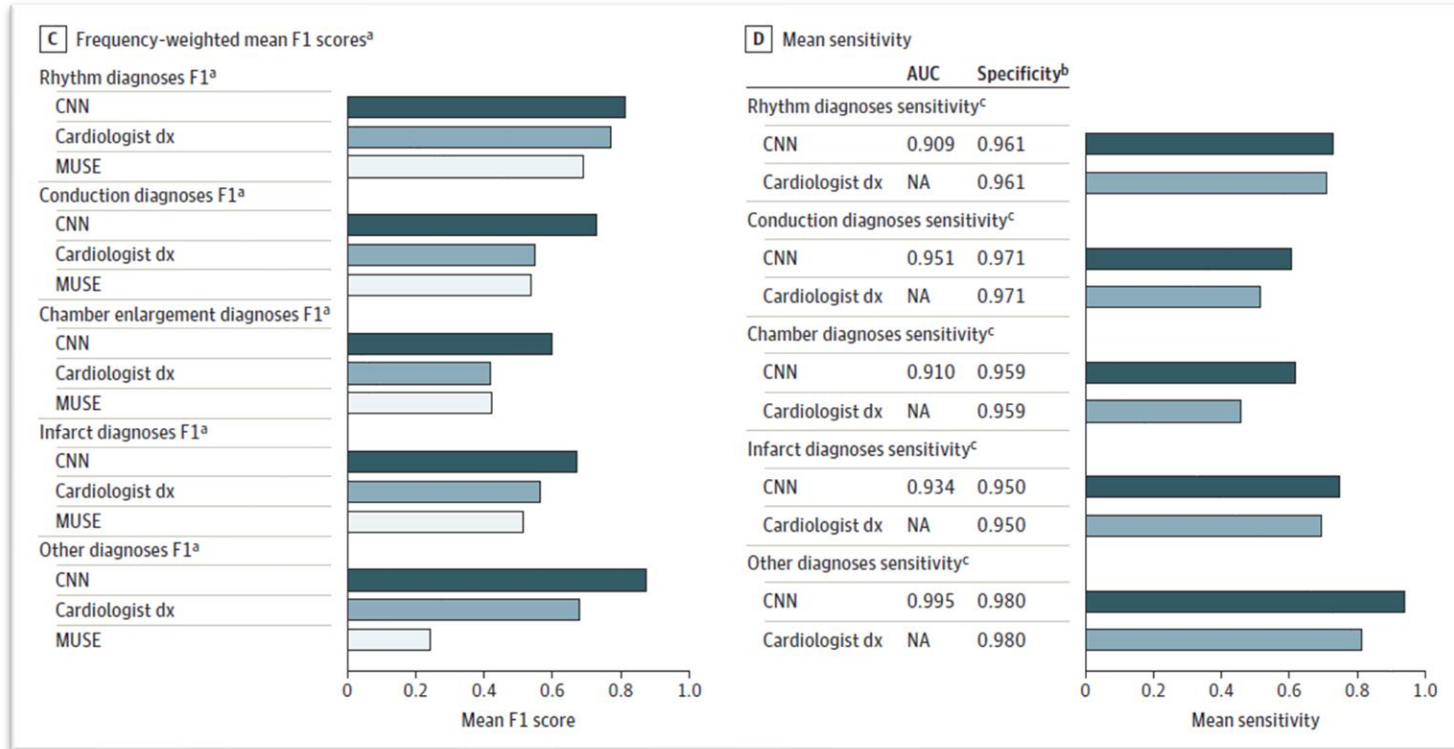
Diese Maßnahme wird mitfinanziert
mit Steuermitteln auf Grundlage des vom Sächsischen
Landtag beschlossenen Haushaltes



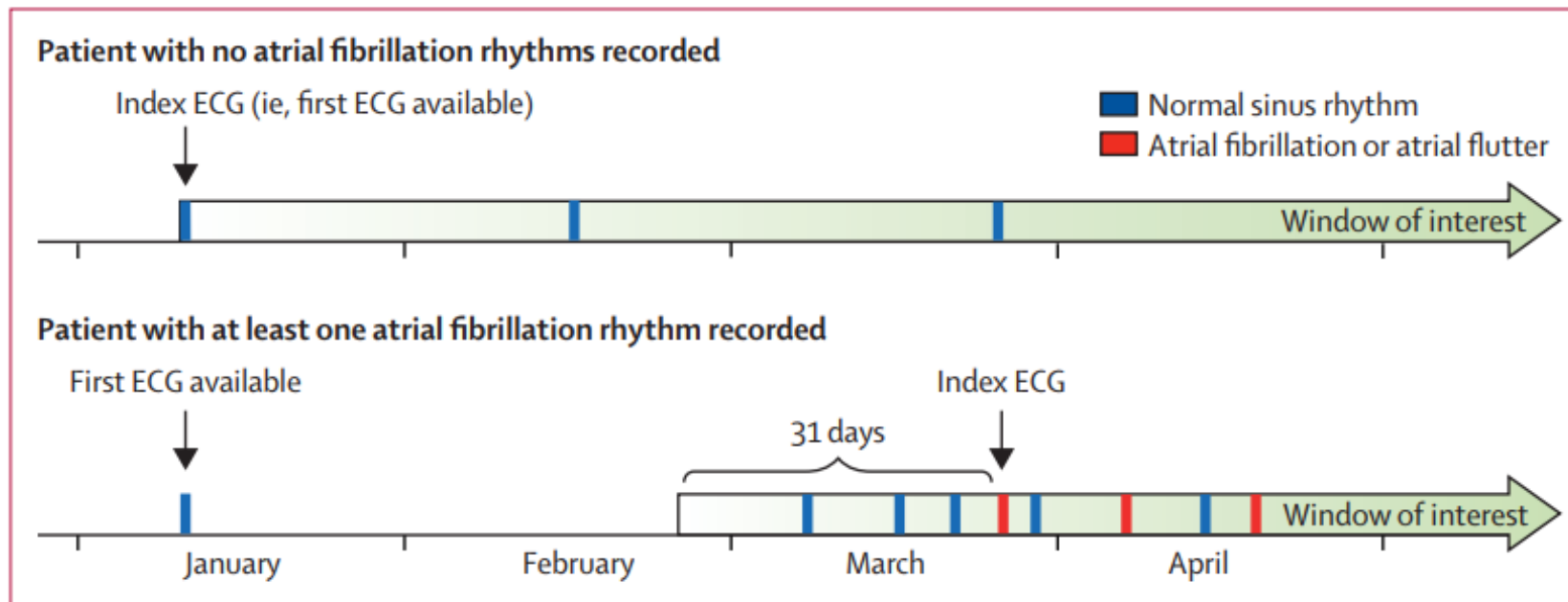
Convolutional neural network for detection of atrial fibrillation



Performance of a neural network for ECG diagnosis



Convolutional neural network for detection of atrial fibrillation



Self-diagnostic Medical Devices Market: Heart Diseases Segment is Likely to Expand at a High Growth Rate During the Forecast Period

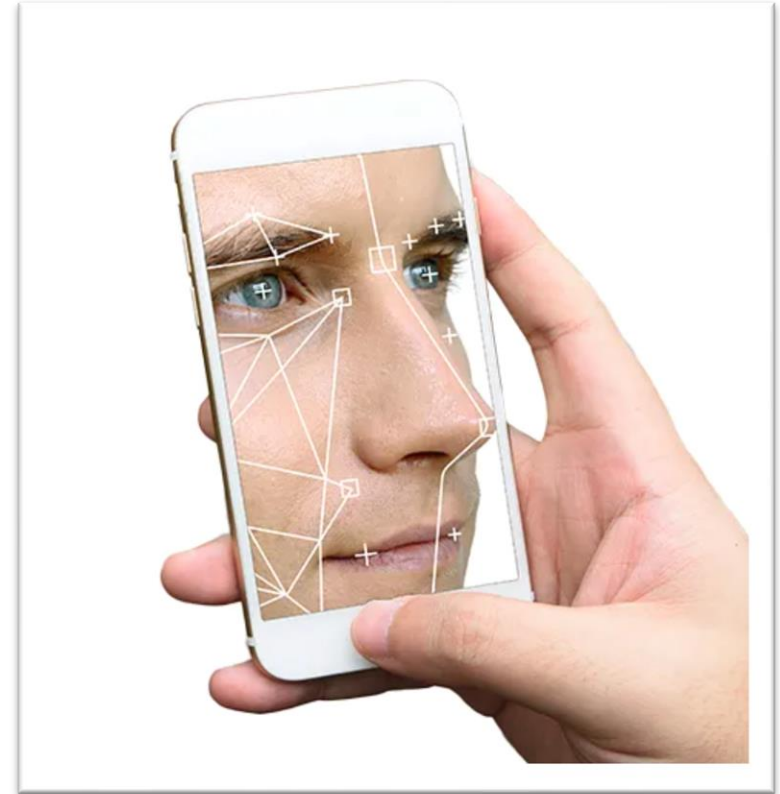
<https://www.biospace.com/article/self-diagnostic-medical-devices-market-heart-diseases-segment-is-likely-to-expand-at-a-high-growth-rate-during-the-forecast-period/>





Digital visual applications: facial viewing

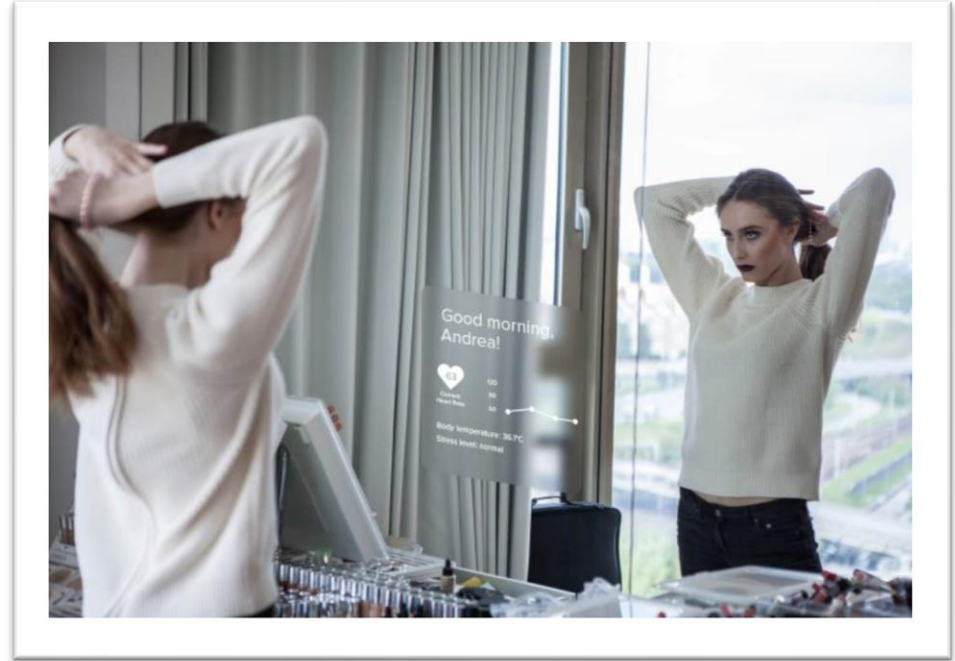
- Precise patient identification
- Non-contact assessment of rhythm and rate
- Insights into mental health
 - real time emotion recognition
- Pain perception
- Continuous facial monitoring
 - during interventions
 - ICU / CCU
- Connection of facial data with
 - hemodynamics
 - medical therapy
 - robotics
- Support of medical staff (e.g. ADDW)
(Advanced Driver Distraction Warning)



(source Visage Technologies)

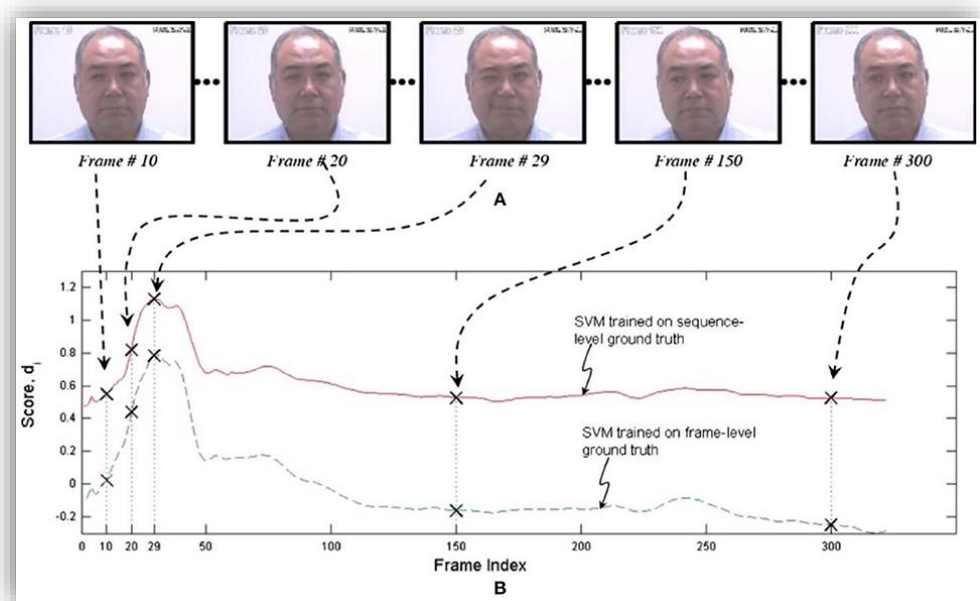
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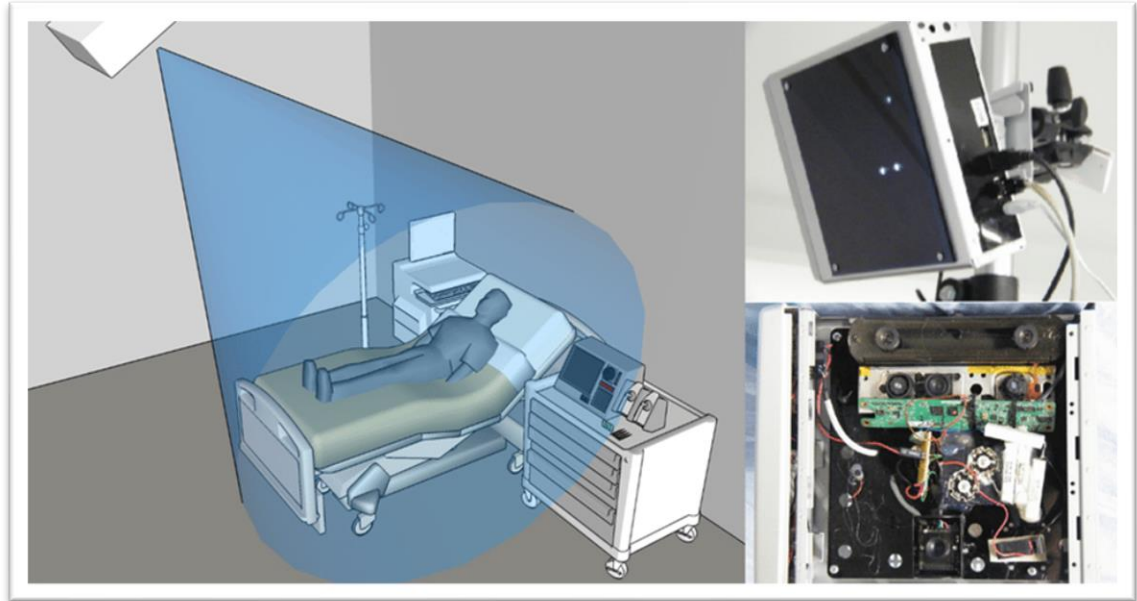
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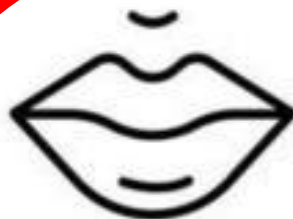
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Detection of heart failure using speech signals

The automatic detection of heart failure using speech signals



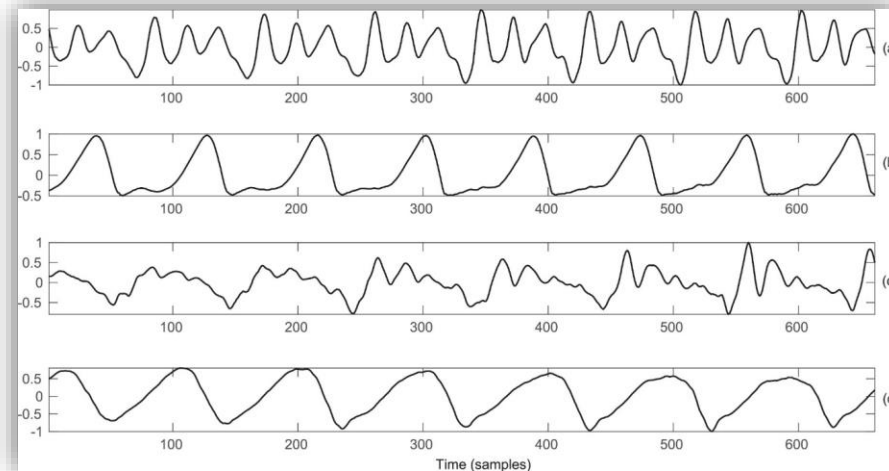
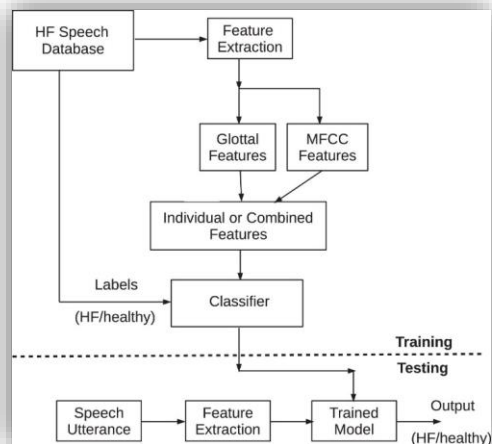
M. Kiran Reddy^{a,*}, Pyry Helkkula^b, Y. Madhu Keerthana^c, Kasimir Kaitue^a,
Mikko Minkkinen^d, Heli Tolppanen^d, Tuomo Nieminen^d, Paavo Alku^a

^a Department of Signal Processing and Acoustics, Aalto University, Aalto 00076, Finland

^b Institute of Molecular Medicine, University of Helsinki, Helsinki 00290, Finland

^c Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal 721302, India

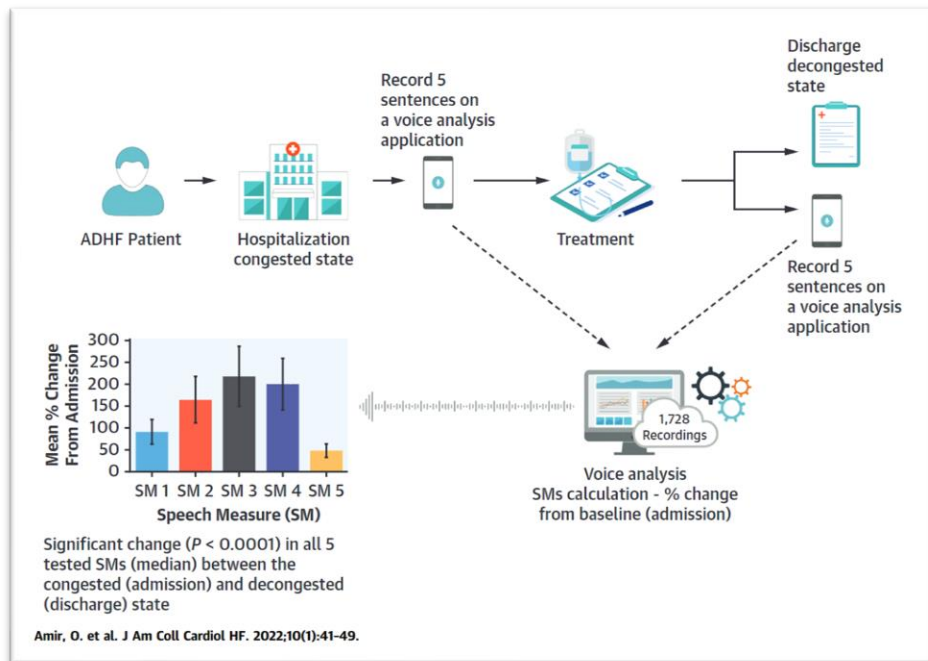
^d Heart and Lung Center, Helsinki University Hospital, Helsinki 00290, Finland



acoustic speech signal and corresponding glottal flow waveform, healthy (a/b) HF (c/d)

Digital technologies to support CV diagnostics and therapies

- 40 pts. With decompensated HF
- 5 sentences
- 1-3 languages
- HearO speech processing application
- 5 distinct speech measures,
 - each a distinct time,
 - frequency resolution,
 - linear versus perceptual (ear) model



Digital technologies to support CV diagnostics and therapies

- Goal: AI-driven patient information platform to improve patient engagement in AF
- Setting: AF ablation
- 1. Find/create medium
- 2. Define message (chatGPT)
- 3. Fuse medium and text



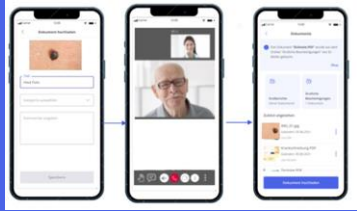


Better access to medical care: potential solutions

- A medical system with three components
- Digital products (apps) for self-assessment
- Digital centers / hospitals for consultation
- Compact health care diagnostics and treatment centers



Digital health solutions: 3 steps



Apps:
Digital healthcare services
from lifestyle, prevention,
smart routing, treatment to
chronic disease management

Step 1: self assessment
using pre-defined apps
For common disease



Digital Hospital:
Our best quality
**telemedical
consultation** services
across all medical areas

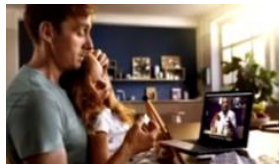
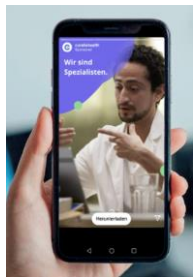
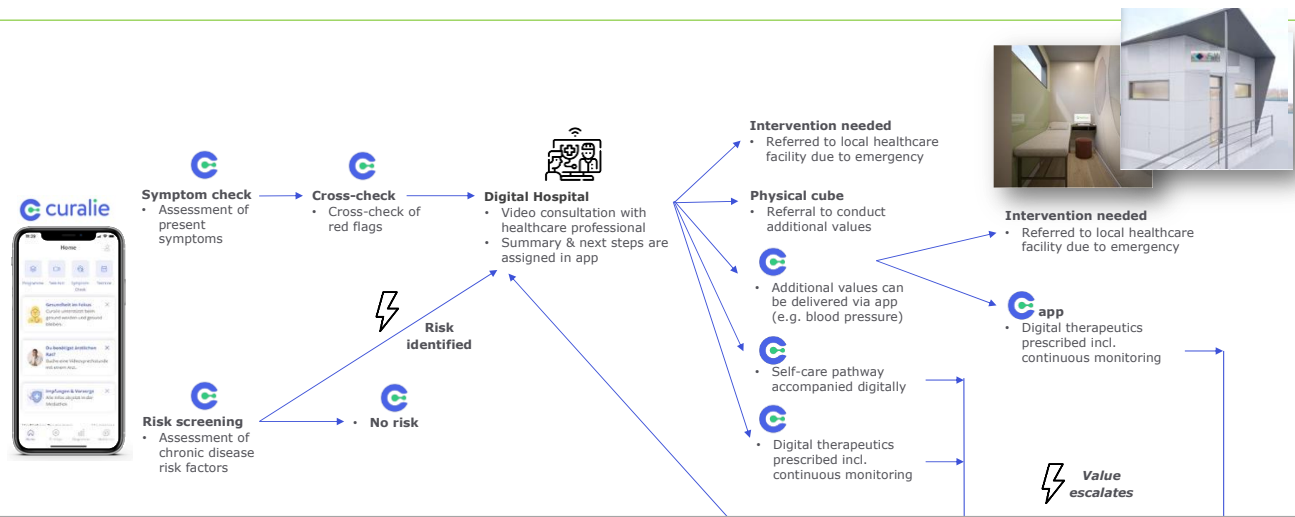
Step 2: contact the
digital hospital,
present symptoms and
consult physician



Physical Cube:
Access to healthcare by
standardized medical pathways
& medical equipment tailored to
the specific needs of the market

Step 3: if necessary
the app will guide
patients to Cubes for
further diagnostics and
treatment

Digital health solutions



Digital Hospital



Physical Cube



3

Digital transformation – opportunities and challenges

- Digital technologies will be **disruptive in health care**
- All elements of traditional health care will be substantially affected by DT
- **New spaces for health care** will develop and substantially reset the health care sector
- This development will happen soon and **substantially affect the ESC**
- Cardiovascular medicine will be a **leading catalyser** for implementation of DT
- ESC will have a specific role with huge opportunities in this emerging field
 - cardiovascular medicine - **prevention, diagnostics, treatment**
 - **science** *and* **education**
 - **regulation** *and* **advocacy**