@ProfMartinCowie

Creating a realistic digital roadmap:

Lessons learned from Cardiology

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Declaration of Interests

- Research grants administered by Imperial College London from Bayer, Boston Scientific, Abbott, and ResMed
- Consultancy and speaker fees from AstraZeneca, Servier, Novartis, Pfizer, Bayer, Medtronic, Boston Scientific, Abbott, Bristol Myers Squibb, Amgen, MSD.
- Non-Executive Director of NICE (2016-2020)
- Chair, Digital Health Committee of the European Society of Cardiology
- Chief Physician-Scientist (Heart Failure) for AstraZeneca

What is the European Society of Cardiology?

- An independent, non-profit organisation of healthcare professionals who volunteer their time and expertise

- Represents >95,000 men and women in the field of cardiology from Europe, the Mediterranean Basin and beyond.

www.escardio.org

The ESC Community

The ESC is a global organisation that caters for all cardiovascular specialists.

Our diversity is our strength

The ESC's role in fighting cardiovascular disease

The ESC acts in the interests of patients by providing cardiologists with the support and tools they need to deliver the best possible care. This not only means saving lives, but ensuring a good quality of life for the growing number of people living with cardiovascular disease.

The ESC does this by:

- Disseminating evidence-based, scientific knowledge through **15 scientific journals, numerous books** and the world's leading cardiovascular congress.
- Harmonising standards of care through their internationally respected **ESC Clinical Practice Guidelines.**
- Shaping heart health policy and regulation by fostering partnerships and providing scientific expertise and independent data.
- Providing a wealth of ESC scientific content, easily accessible on the ESC website, used by some 400,000 visitors each month.

Supporting our members

Improving members' access to the latest science, best practices and networking

The ESC is a member organisation. Cardiologists and other healthcare professionals join the ESC and its subspecialty communities, to be part of a society that **represents their interests** within the health sector and gives them opportunities to **network**, access the **latest science** and use a broad array of services that support their ongoing **professional development**.

Healthcare professionals can choose 'ESC Professional Membership', ESC subspecialty memberships, or a combination of any memberships of their choice.

What we do
Leading congresses

Broad global reach and cutting-edge scientific programmes that change the way clinicians practice medicine

The ESC organises and co-organises **14 cardiology congresses**.

Its award-winning flagship event, ESC Congress, is the **largest and most influential cardiovascular assembly in the world**, attracting more than 32,000 participants from some 150 countries each year. It is the pivotal event in the cardiology calendar, allowing healthcare professionals to keep up to date on the latest science while networking with their peers from different countries.

What we do
Robust research

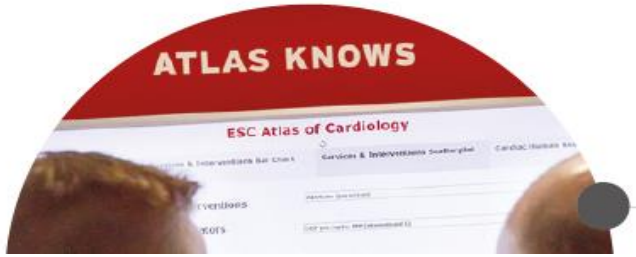
Unbiased, real-life data that illustrate what is happening in cardiology today

The ESC's key aims in this area include incubation, innovation, and management of world-class cardiovascular-related research programmes. It conducts research, drawing on expertise from ESC institutional members and international networks, including **21 Registries**, involving **150,000 patients** across **89 countries**.*

The 'ESC Atlas of Cardiology' collates data from more than 40 healthcare realities. It highlights the gaps and inequalities in cardiovascular medicine today and is an invaluable tool in the ESC's Advocacy programme.

The ESC is also a consortium partner in numerous EU funded research projects and provides grants to individuals to support excellence in research.

*As of July 2019



What we do
Advocating for heart health

Beyond science: Shaping an environment favourable to cardiovascular health

ESC Advocacy leverages the knowledge, network and influence of the cardiology profession to promote policy, regulation and research funding that advance cardiovascular science, support high quality healthcare, and encourage evidence-based decision making.

For all other information please contact:

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The European Heart House

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06903 Sophia Antipolis - France

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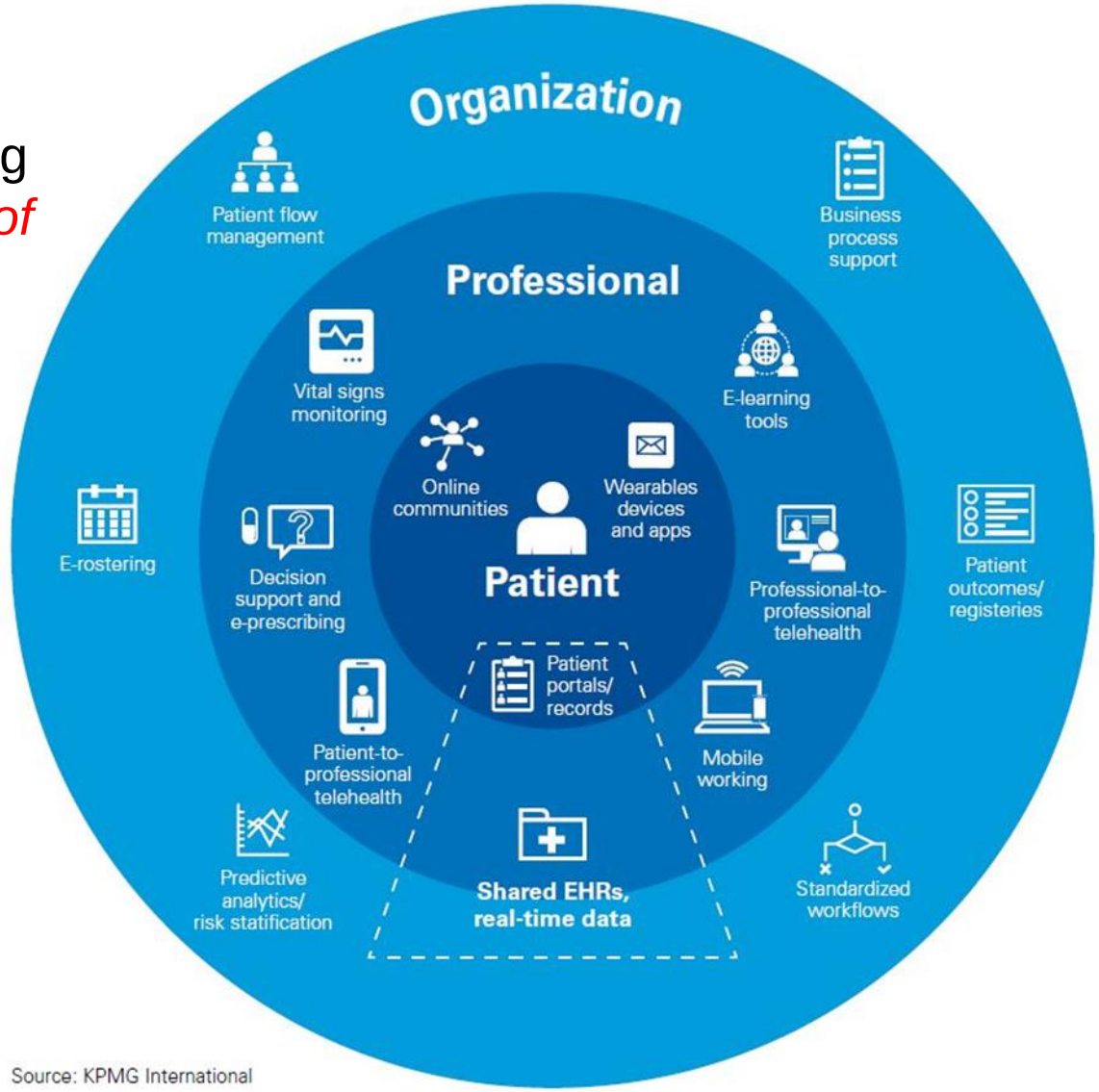
Fax: +33 (0)4 92 94 76 01

“There is a new and rapidly changing healthcare landscape, where digital technologies are becoming increasingly *normalized into the everyday delivery of healthcare*.”



Digital health: heaven or hell? KPMG
Available at: https://assets.kpmg.com/content/dam/kpmg/pdf/2016/03/digital-health-heaven-hell.pdf

2016

European Heart Journal
doi:10.1093/eurheartj/ehv416

EHJ POSITION STATEMENT
Eur Heart J 2016; 37: 63 – 6

e-Health: a position statement of the European Society of Cardiology

Martin R. Cowie[1]*, Jeroen Bax[2], Nico Bruining[3], John G. F. Cleland[4], Friedrich Koehler[5], Marek Malik[6], Fausto Pinto[7], Enno van der Velde[8], and Panos Vardas[9]

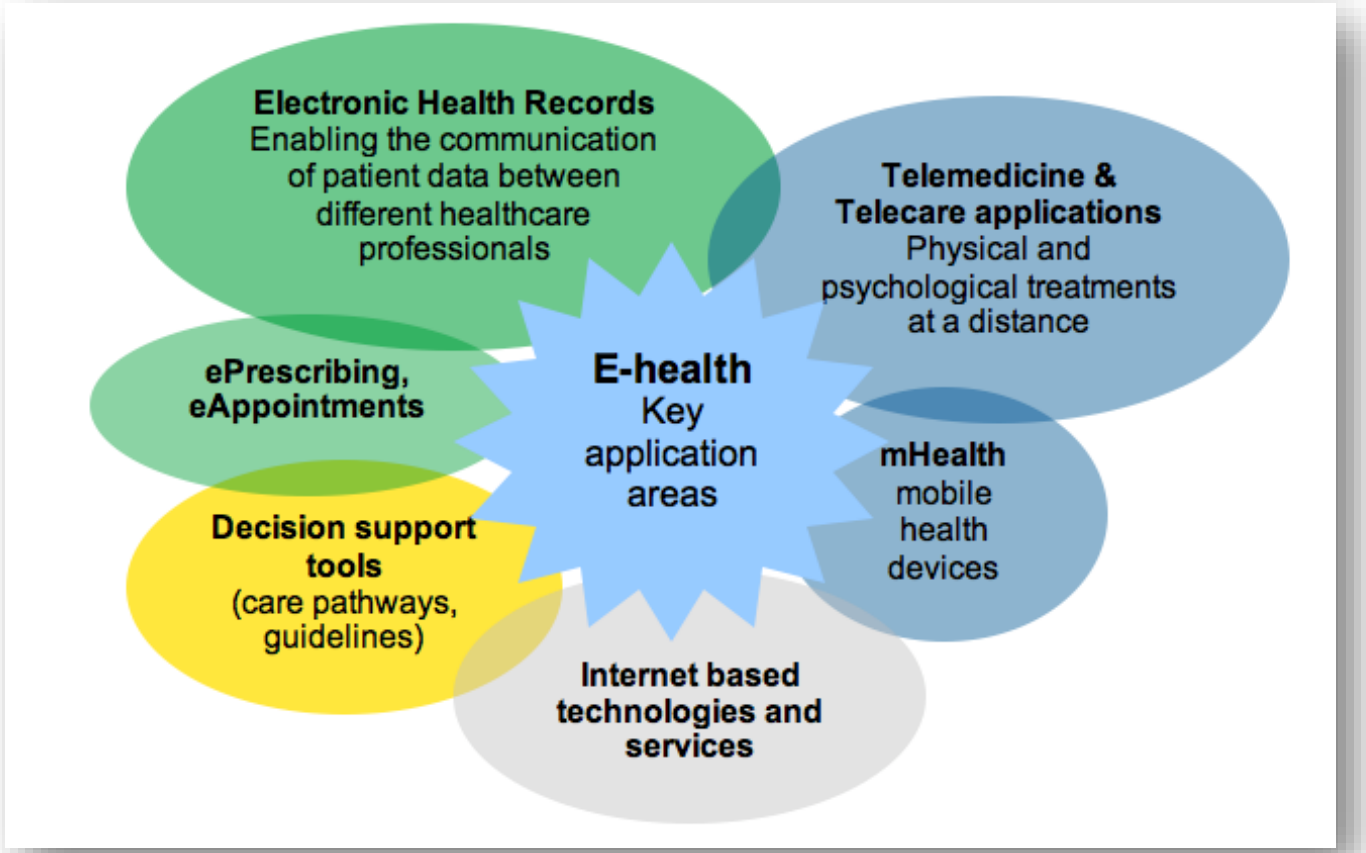
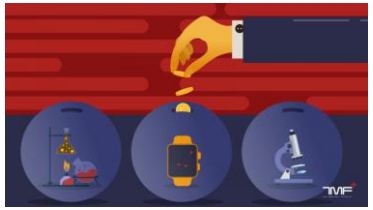


Table 1 **The domains of e-health, involving healthcare administration and support, education, healthcare delivery, and research**

(1) Telemedicine and telecare (including disease management services, remote patient monitoring, teleconsultations, and homecare)[3]
(2) Clinical information systems (electronic medical records, decision support and monitoring of clinical and institutional practice)
(3) Integrated regional and national information networks and associated e-referrals and e-prescribing
(4) Disease registries and other non-clinical systems used for education, public health, patient/disease-related behaviour, and healthcare management
(5) 'Mobile' health (m-health) including mobile applications ('Apps'): medical and public health practice supported by mobile technologies delivering health information, screening patients, monitoring physiological signs, providing direct care and patient education (sometimes considered part of telemedicine,[3] but increasingly less medicalized)
(6) 'Personalized' health (p-health): wearable or implantable micro- and nano-technologies with sensors and/or therapy delivery devices to help facilitate health and social care decision making and delivery (including fall detectors, implantable insulin pumps, defibrillator vests, etc.).
(7) 'Big Data'—large-scale integration and analysis of heterogenous data sources, usually of high volume (amount of data), velocity (speed of data in and out), and variety (range of data types and source)[4], ideally linked at the individual person level to provide a more holistic view of a patient/individual and shed light on social and environmental factors that may influence health.[5]

The covid19 pandemic has accelerated DH adoption

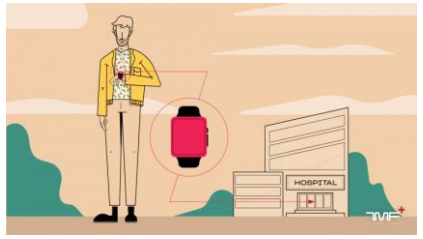


- 2020 was the year of the “tech-celleration”
- Investment in digital health boomed, particularly for on-demand healthcare services and remote care

- Telemedicine went mainstream
- Digital health became truly global
- Apps and wearables challenged interaction with HCPs

- Regulators increasingly approved AI for medical uses

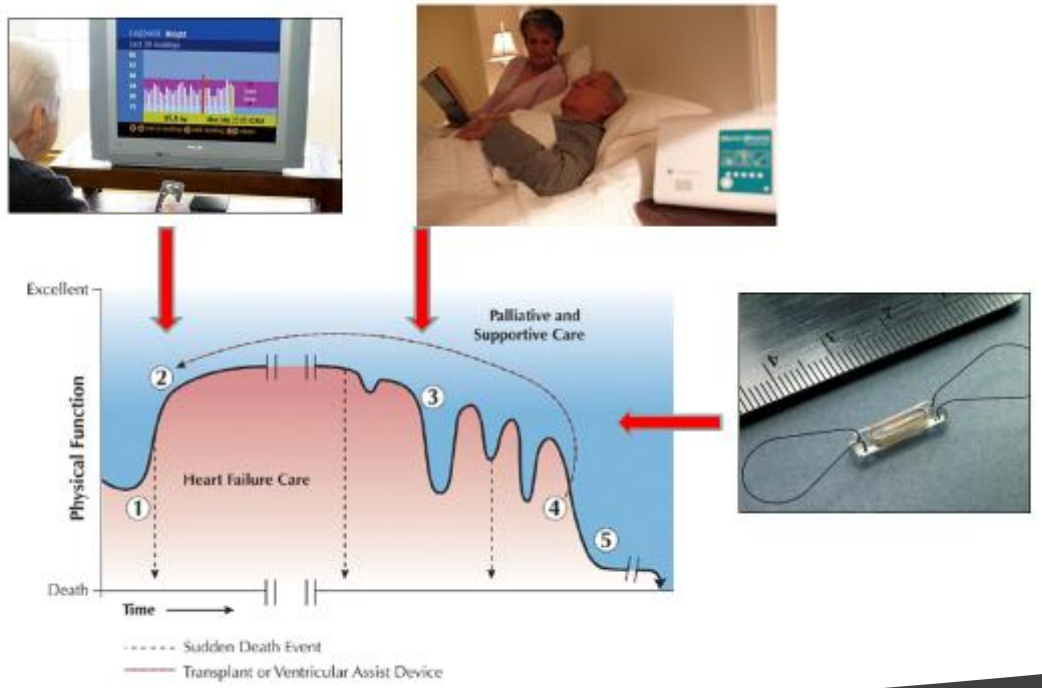
- Virtual events replaced in-person events



Bertalan Mesko, Medical Futurist Institute, 21 Jan 2021

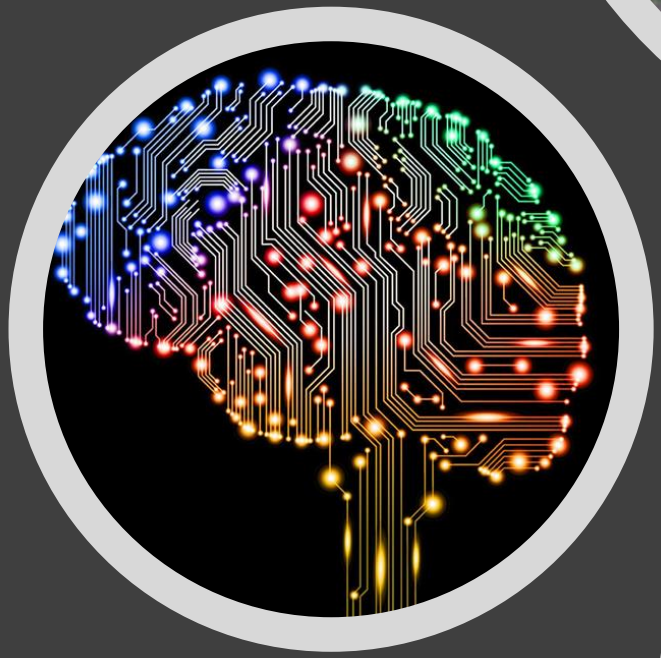
https://www.linkedin.com/pulse/9-take-aways-digital-health-from-2020-bertalan-mesk%C3%B3-md-phd/?trk=eml-email_series_follow_newsletter_01-hero-1-title_link&midToken=AQFi90tixbv4eg&fromEmail=fromEmail&ut=3vj5SWxsSXMpA1

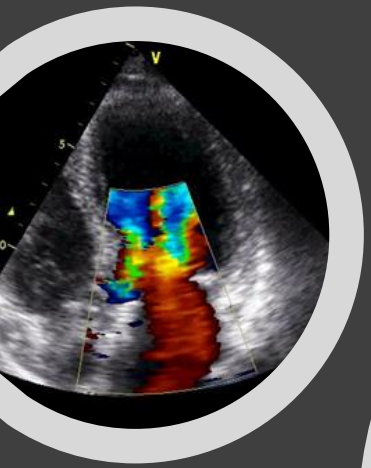
Remote consultation



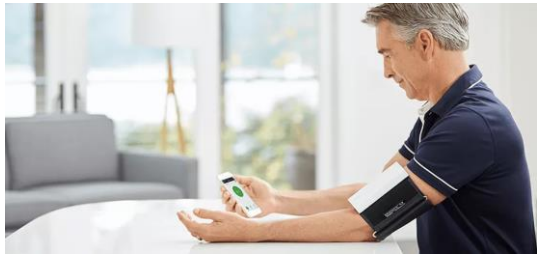
Remote Monitoring

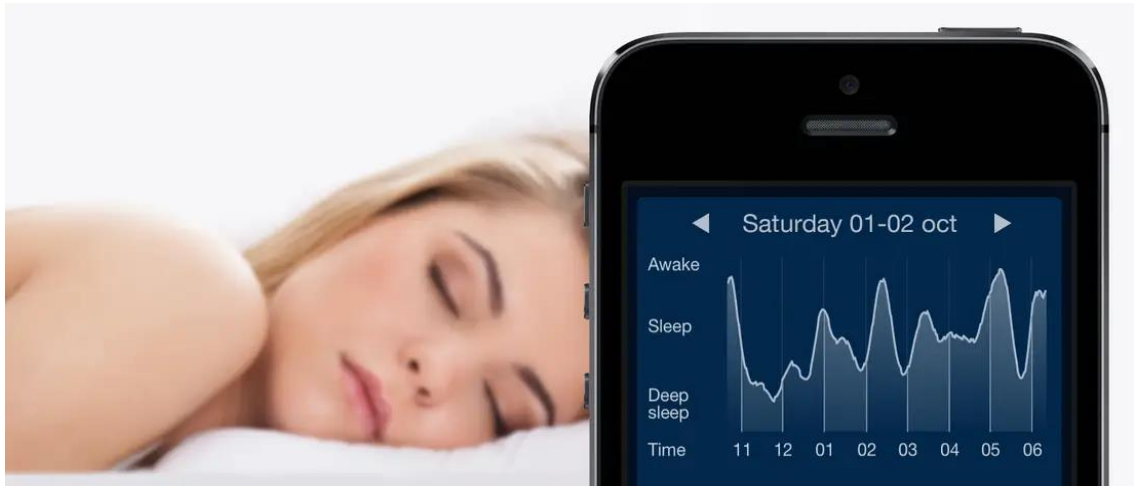
https://www.2mel.nl/project/cardiosense/



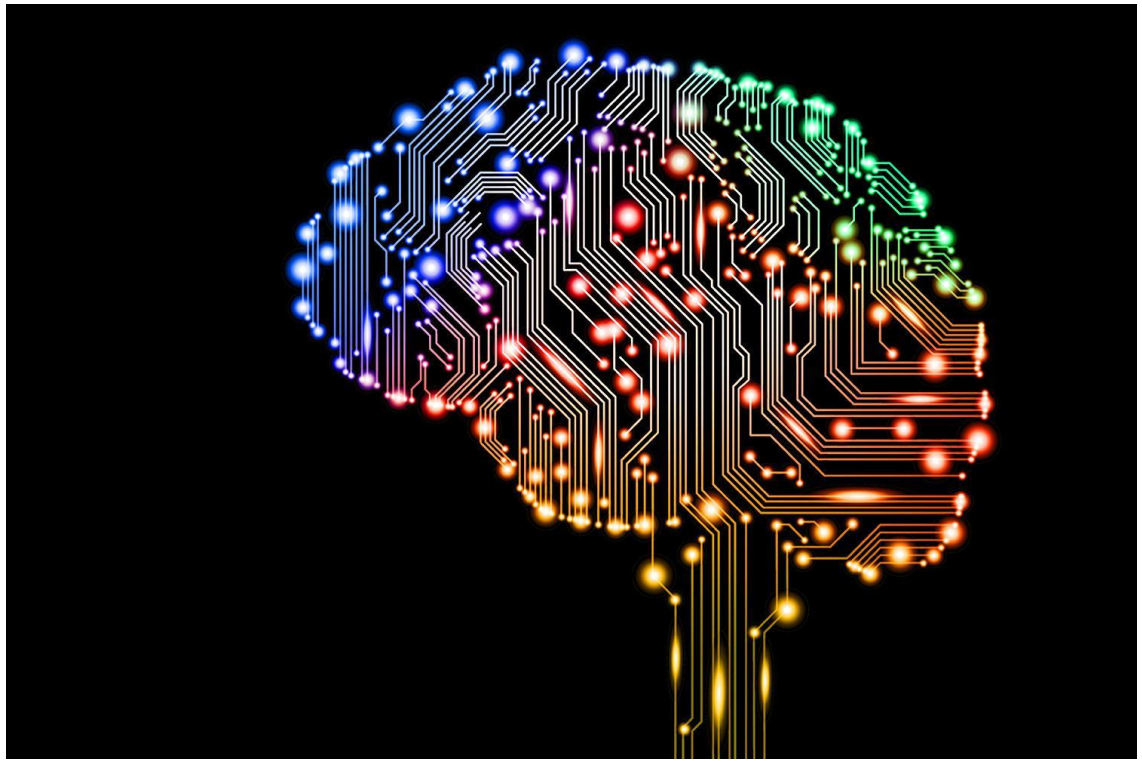


A digital “fingerprint” of our patients





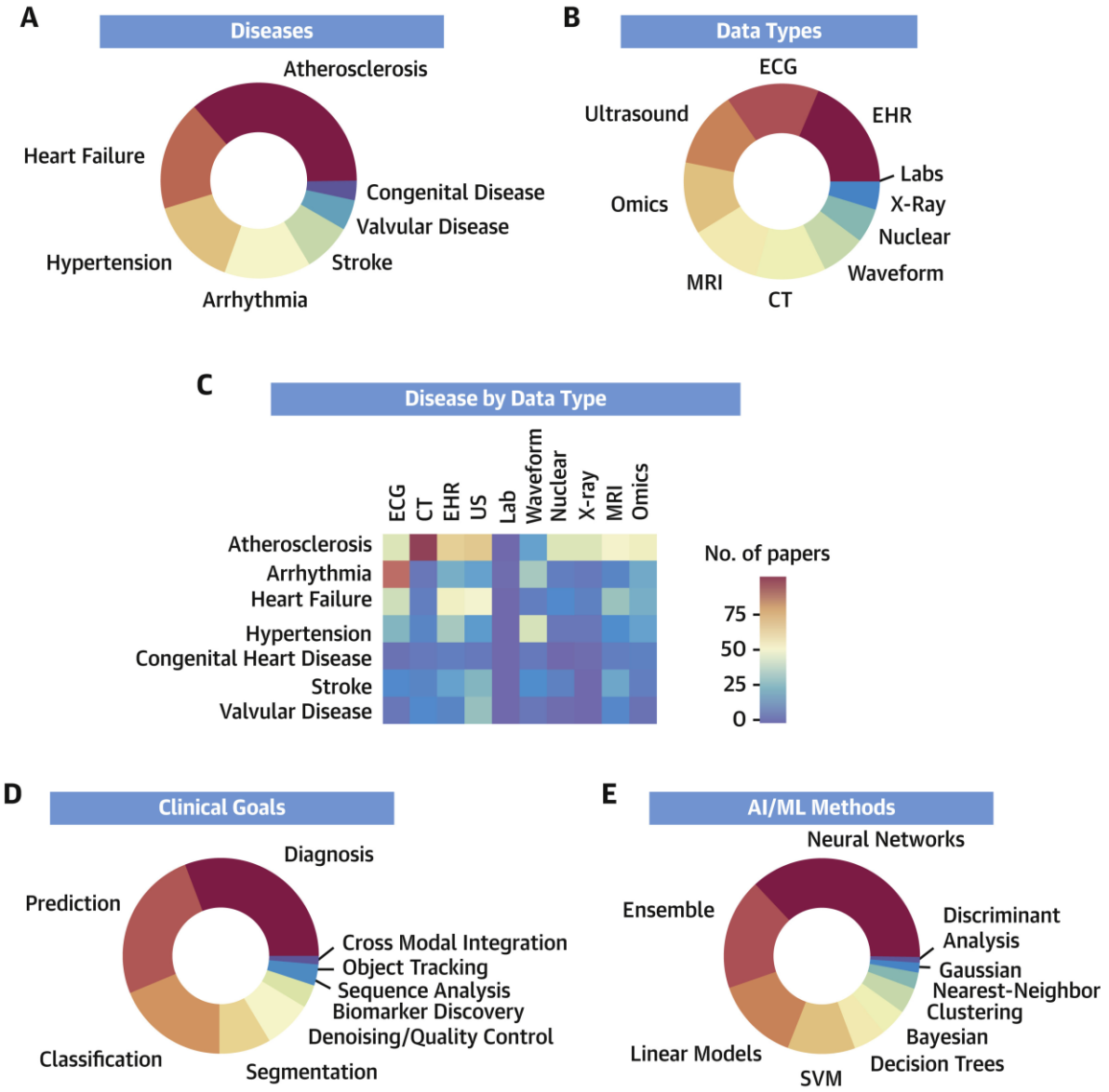
The complexity of medicine now exceeds the human mind



ML to the rescue…

- If designed, validated and implemented appropriately, ML will HELP in acquiring, interpreting and synthesizing healthcare data from multiple sources and putting it at our fingertips…..”like an expert subspecialist to call upon for every patient and for every clinical situation”….

Quer G et al. JACC 2021; 77: 300-13



Quer G et al. JACC 2021; 77: 300-13

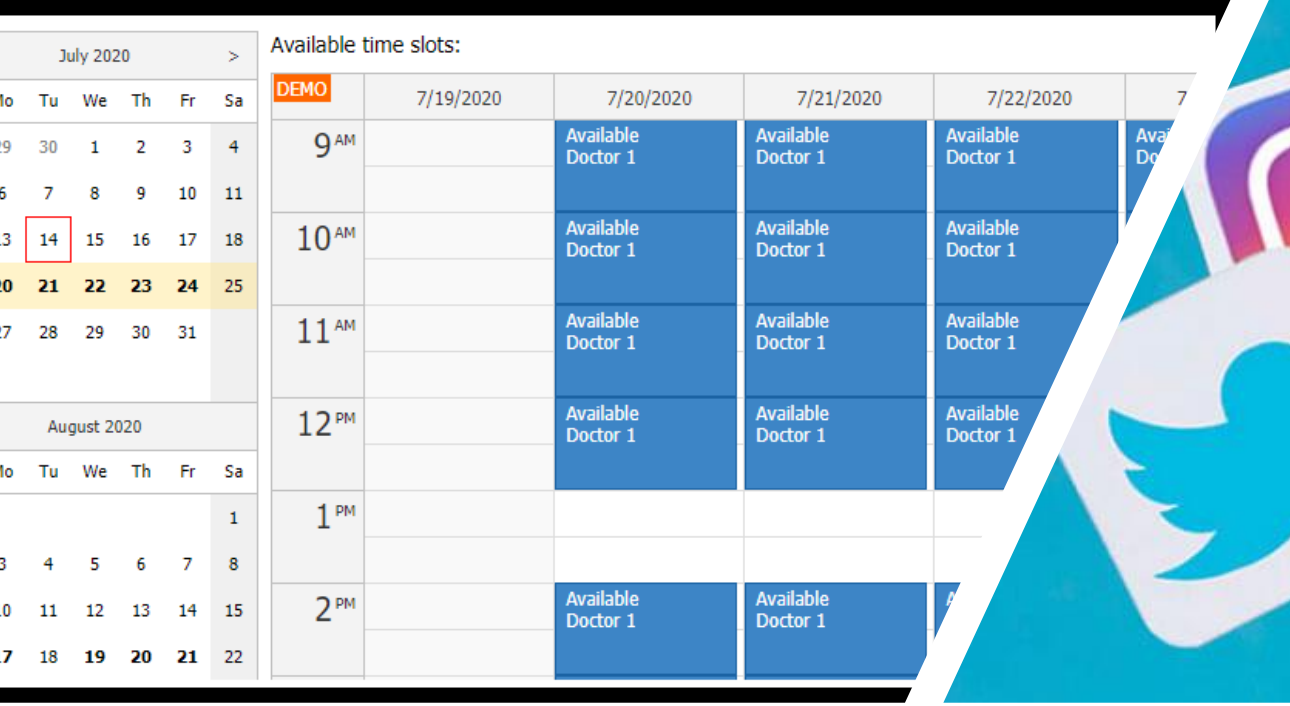
TABLE 3 Select FDA-Cleared Machine Learning Products for Cardiology

Company	Product	Indication
AliveCor	AliveCor Heart Monitor	Atrial fibrillation detection
Apple	Apple Watch	Atrial fibrillation detection
Arterys	CardioDL	CMR measurement
Caption Health	EchoMD AutoEF, Guidance	Echocardiogram LVEF measurement, guidance
Canon	Advanced Intelligent Clear-IQ Engine (AiCE)*	General biomedical image denoising
Eko Devices	Eko Analysis Software	Audiogram interpretation
FitBit	ECG App	Atrial fibrillation detection
PhysIQ	Heart Rhythm and Respiration Module	ECG, vital signs, cardiac function
Qompium	FibriCheck	Atrial fibrillation detection
Shenzhen Carewell Electronics	AI-ECG Platform & Tracker	ECG interpretation
Subtle Medical	SubtlePET,* SubtleMR*	General biomedical image denoising
Ultromics	EchoGo Core	Echocardiogram measurements
Zebra Medical Vision	HealthCCS	Coronary calcium score

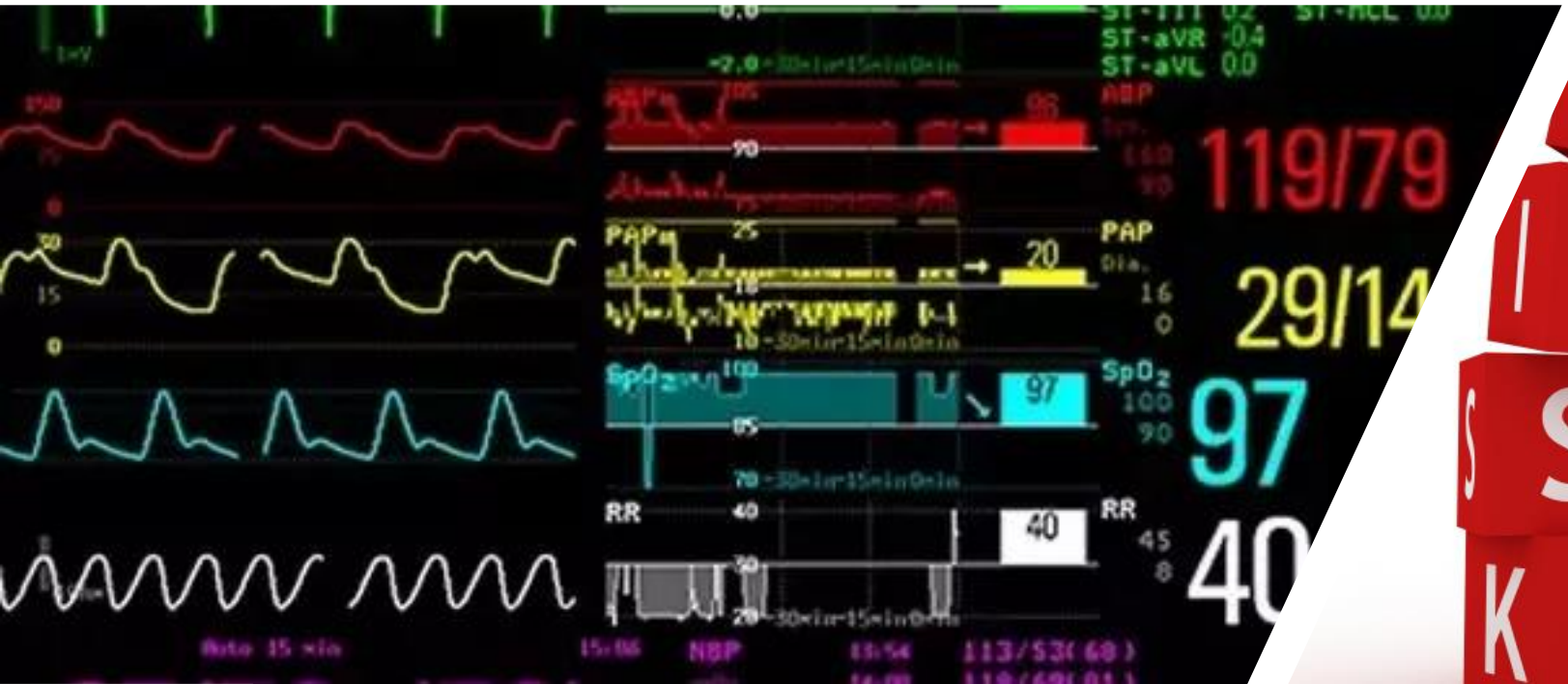
*These products are not specifically cardiovascular, but provide general tools for image denoising

CMR = cardiac magnetic resonance imaging; ECG = electrocardiogram; LVEF = left ventricular ejection fraction.

Quer G et al. JACC 2021; 77: 300-13

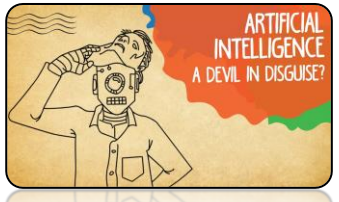

July 2020
Mo Tu We Th Fr Sa
August 2020
Mo Tu We Th Fr Sa
Available time slots:
DEMO
7/19/2020
7/20/2020
7/21/2020
7/22/2020
9 AM
10 AM
11 AM
12 PM
1 PM
2 PM
Available Doctor 1


You Tube


ST-aVR -0.4
ST-aVL 0.0
119/79
PAP
29/14
97
RR
40

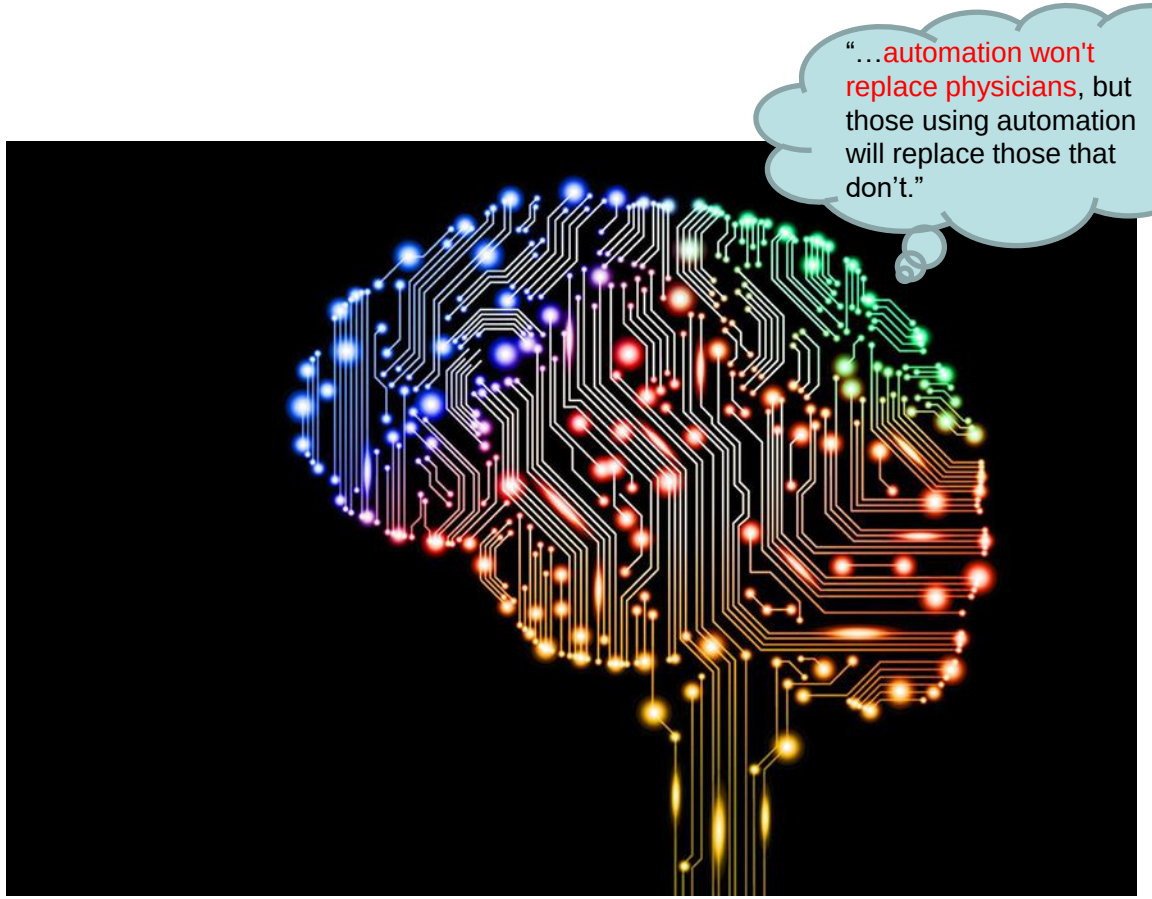

R
I
S
K

But what about the downsides?



Ethical and Regulatory Concerns

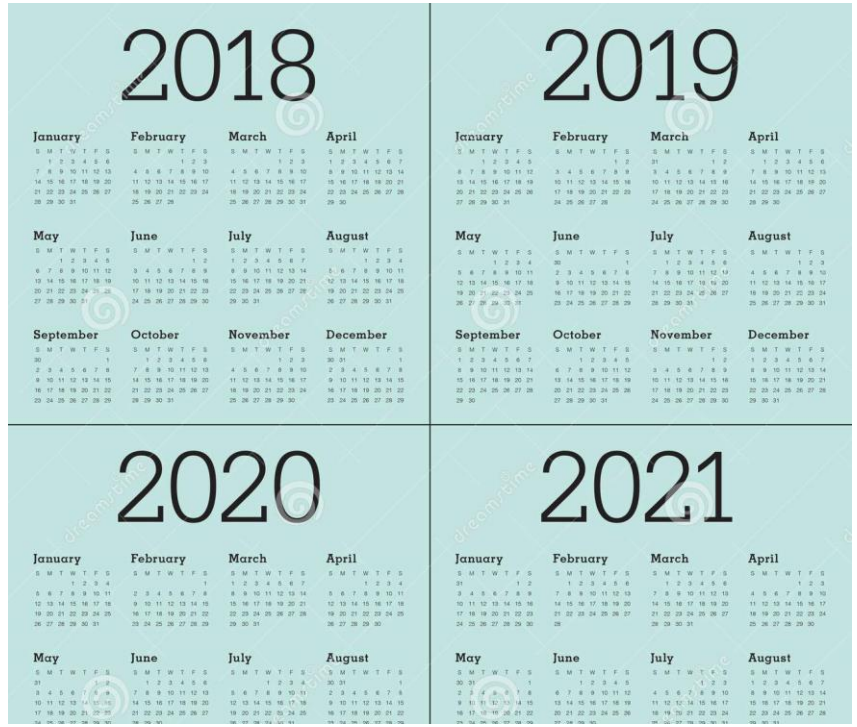
- ?Biases
- ?Lack of transparency
- ?Privacy concerns with the data used for training AI models
- ?Safety and liability issues with AI applications in clinical environments
- ?Does it work in real life?



J Am Med Inform Assoc 2020; 27: 491–497
https://doi.org/10.1093/jamia/ocz192

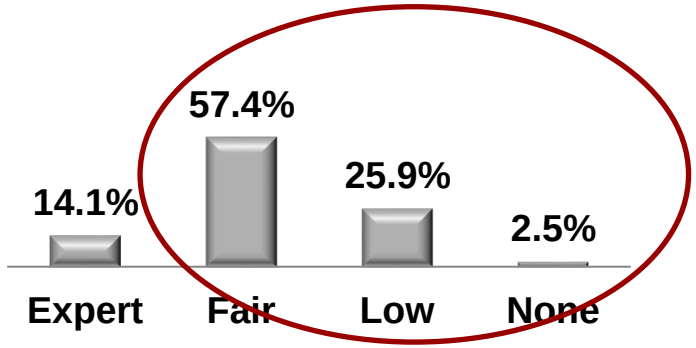
The roadmap

- Set up the Digital Health Committee to co-ordinate a strategic approach across the ESC
  - Educate members about DH
  - Support evidence-based implementation
  - Advocacy for standards & best practice
  - Stakeholder engagement to ensure co-design & appropriate evaluation of DH tools
  - Foster DH research in CV disease

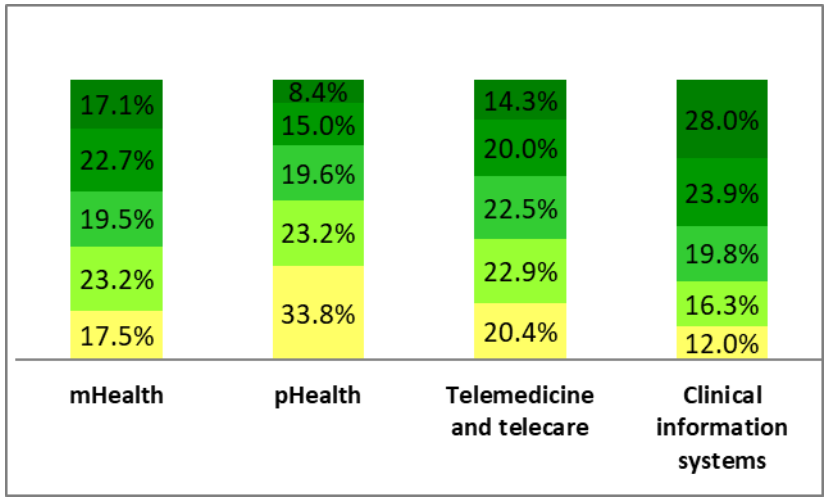


Listening to our members needs

Asteggiano R et al. Eur Heart J Digit Health 2021 https://doi.org/10.1093/ehjdh/ztab032

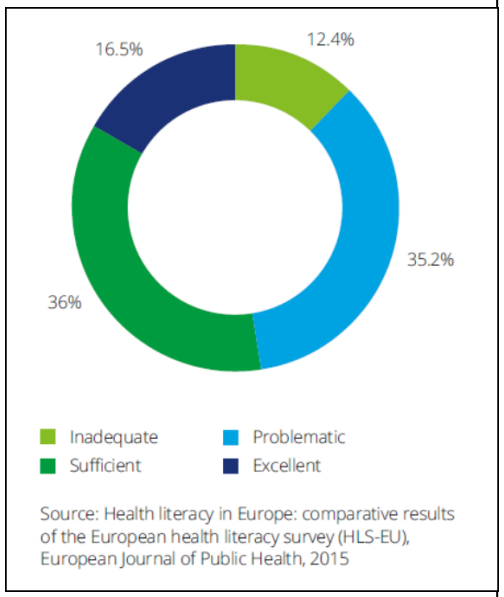


Knowledge about Digital Health



Daily exposure to Digital Health

Barriers and Solutions…



Frederix I et al. Eur J Prev Card 2019; 11: 1166 – 1177

BARRIERS

Stakeholder resistance to adopt digital health based care:
- Lack of patient motivation and digital health literacy skills
- Lack of healthcare provider belief in digital health care

Legal, ethical & technical barriers:
- Mobile data privacy, security & liability concerns
- Lack of interoperability

Other barriers:
- Lack of health economical evaluations
- Lack of reimbursement

How to deploy digital health based care in Europe?

SOLUTIONS

Stakeholder resistance to adopt digital health based care:
- Establish patient digital health education programs
- Redesign contemporary workflow models

Legal, ethical & technical barriers:
- Establish European-wide digital health certification programs
- Assure compliance to applicable digital health directives
- Assure interoperability of digital health servcies

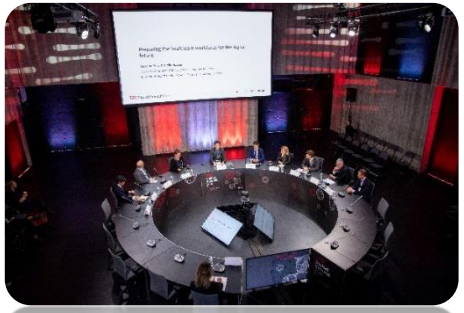
Other barriers:
- Encourage economical evaluations of digital health based care
- Inform health insurance industry & policy makers
- Stimulate digital health related knowledge & experience sharing

ESC e-Cardiology Working Group Position Paper: Overcoming challenges in digital health implementation in cardiovascular medicine

Digital Health Activities @ESC

ESC European Society of Cardiology

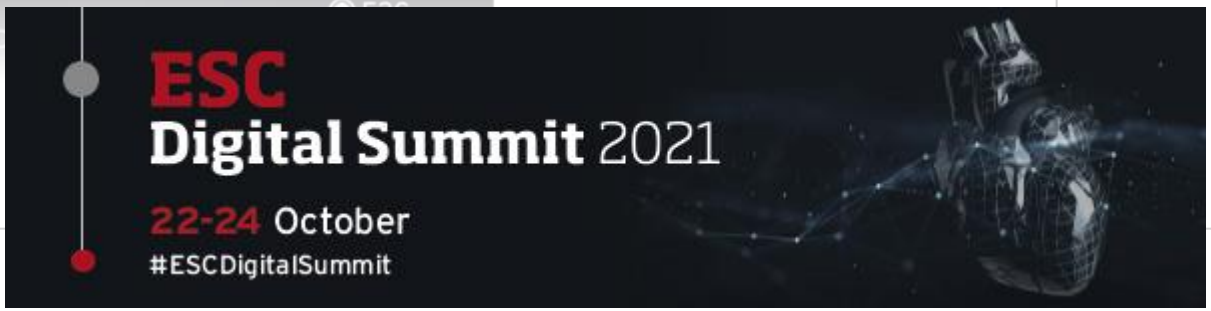
FROM a Summit 2019



TO launch of a new journal

TO a Digital event 2020

#ESCDigital #ESCDigitalSummit



Digital Health Week 2020: 3 Themes

Devices & mobile applications in cardiology
What works in 2020?

Artificial intelligence & Big Data in cardiology
Evidence & perspectives in 2020

Telemonitoring & remote/teleconsultations
Integrating advances into daily practice

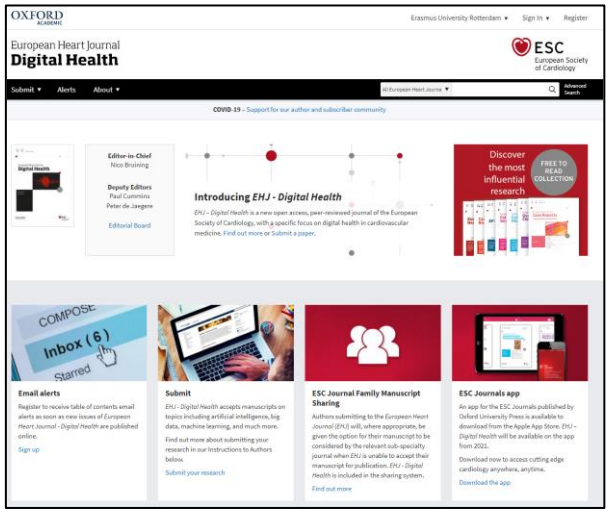
European Heart Journal - Digital Health

Goals:

- To become the preferred Digital Health journal in Cardiology
- Open access
- First issue Nov 2020, with 4 issues per year
- Accepted papers published immediately on-line

- Aim: PubMed central 12 months ✓
- Aim: Medline inclusion 18 months
- Aim: Impact factor 3 years

- Editor-in-Chief: Nico Bruining, NL



https://academic.oup.com/ehjdh

Advocacy & Best practice

Being part of the conversation


THE BEST WAY
TO PREDICT THE
FUTURE
IS TO CREATE IT