

BigData@Heart webinar on wearables for cardiovascular patients

Keeping big data @ heart with wearable devices...



UNIVERSITY OF
BIRMINGHAM



University Hospitals
Birmingham



NHS Foundation Trust



Dipak Kotecha, Professor of Cardiology & Consultant Cardiologist

Disclosures

Research grants – Menarini, Amomed

Collaborative research – Bayer, AstraZeneca, Merck, Menarini, Daiichi Sankyo, GlaxoSmithKline, Novartis, Servier

Advisory board / Speaker fees – Bayer, Amomed, Myokardia, Atricure

No conflicts of interest or financial disclosures

Funding:

National Institute for Health Research UK: **CDF-2015-08-074 (RATE-AF), HTA-130280 (DaRe2THINK), EME-132974 (D2T-NeuroVascular)**

British Heart Foundation: **PG/17/55/33087, AA/18/2/34218, FS/CDRF/21/21032**

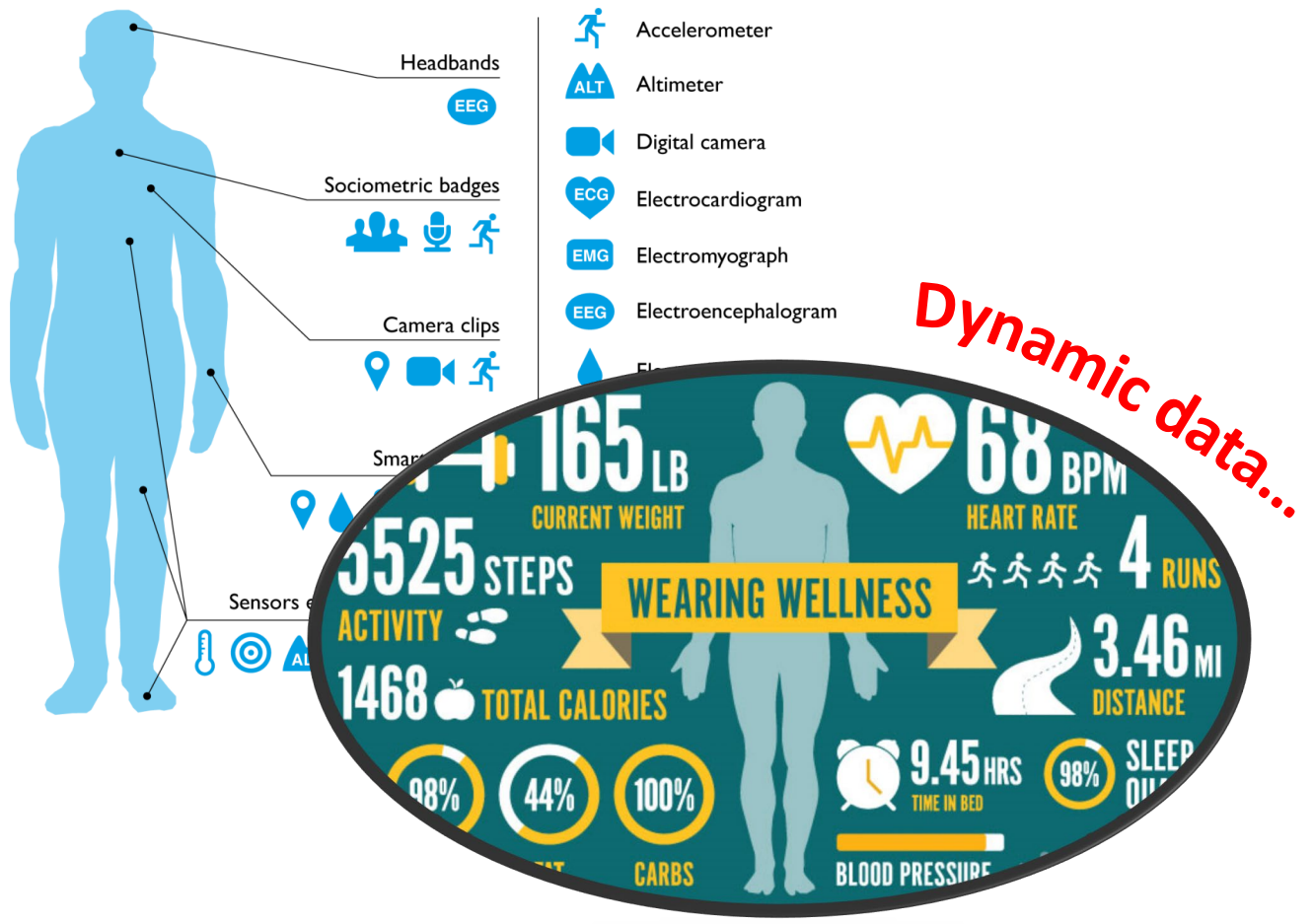
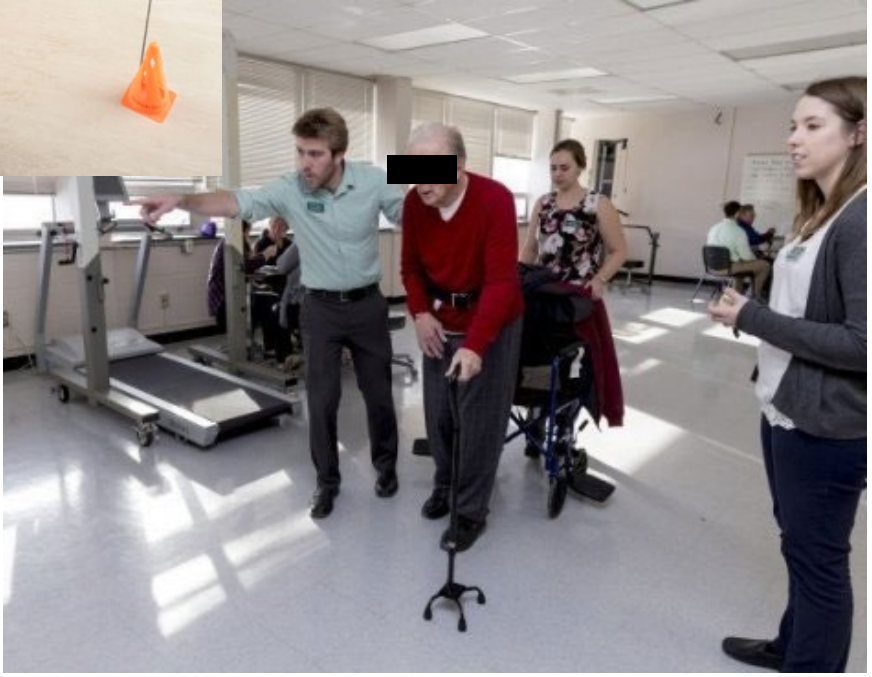
EU Innovative Medicines Initiative: **BigData@Heart Consortium #116074**

European Society of
Cardiology (ESC)
committees: see yearly
ESC disclosures
@escardio.com

For more
information or to
[join our team](#),
please email
e.bruce@bham.ac.uk

Physiological markers/outcomes

▶▶▶ potential for wearable devices



Application of wearables in HF

Fluid volume

Remote Dielectric Sensing vest (intrathoracic fluid)



SCG Patch



Blood flow

Chest vibrations patch
(seismocardiogram)

ECG & activity

(multi-sensor)



Weight

Smart shoe



Haemodynamics

Smart mirrors

Smartphone visual and
auditory sensors

Pulse properties through PPG

Connected smart-home devices



“Bowl us over”

This Toilet Will Predict if You'll Have Heart Failure

The best way to monitor patients with heart disease might be with a simple hack of their bathroom habits.

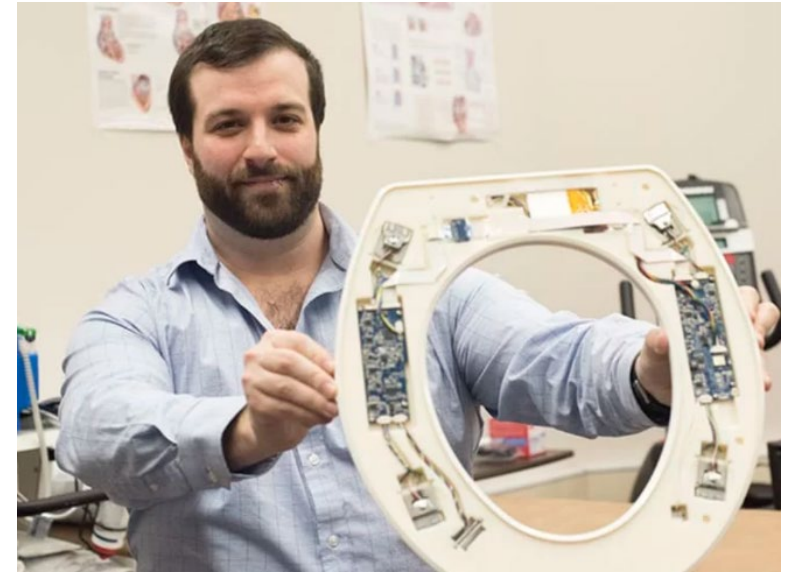
DAILY BEAST



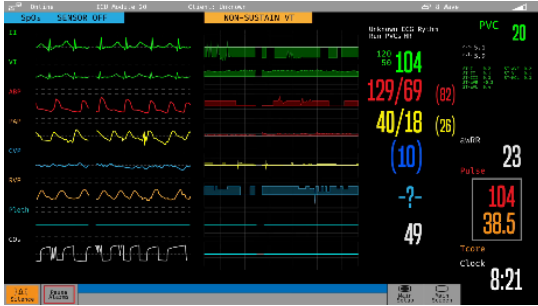
Erin Biba 05.22.19 5:32 AM ET



Nicholas Conn,
postdoctoral fellow
Rochester Institute of
Technology



Understanding limitations



Medical



Patient with disease



Consumer

- High grade
- Expensive
- Rarely portable
- Validated
- (Reproducible)
- Regulated

- Mass produced
- (Cheap, relatively)
- Small and wearable
- Poorly validated
- Commercial
- 'Black box'

Understanding limitations

- **Data security**
- **Implications of excessive self-monitoring**
- **Inaccurate:**
 - Error margins of up to 25% for wearables to track physical activity ¹
 - Failure rate of 30% with smartphone apps for melanoma detection ²
- **Effort required by user:**
 - 32% of users stop wearing devices after six months
 - 50% after one year ³



TECH
Apple Watch's New Heart-Monitoring Functions Triggers Health Debate
Doctors say device could help detect serious medical conditions but also cause false alarms, unnecessary medical care

¹ Case; JAMA. 2015; 313:10-11

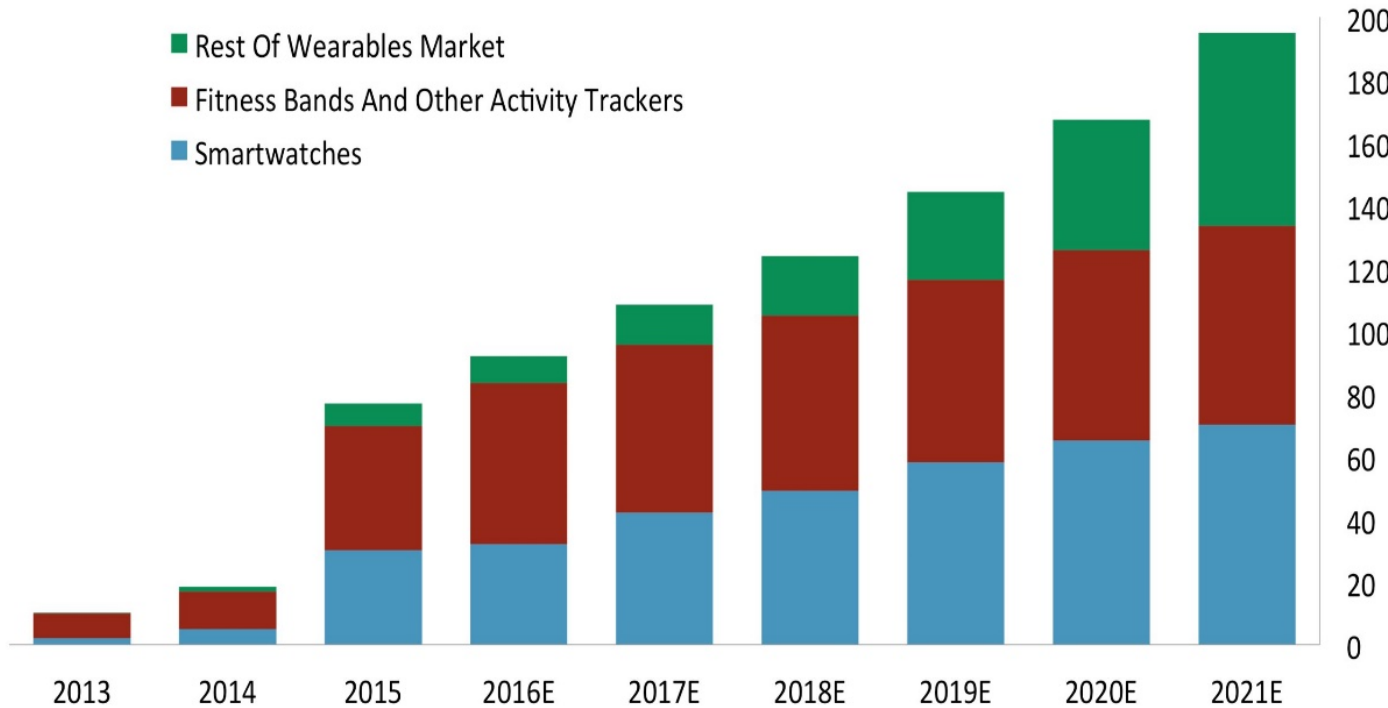
² Wolf; JAMA Dermatology. 2013; 149:422

³ Ledger; Endeavour Partners; 2014

Wearables market

Global Wearables Shipment Forecast, By Device

Millions



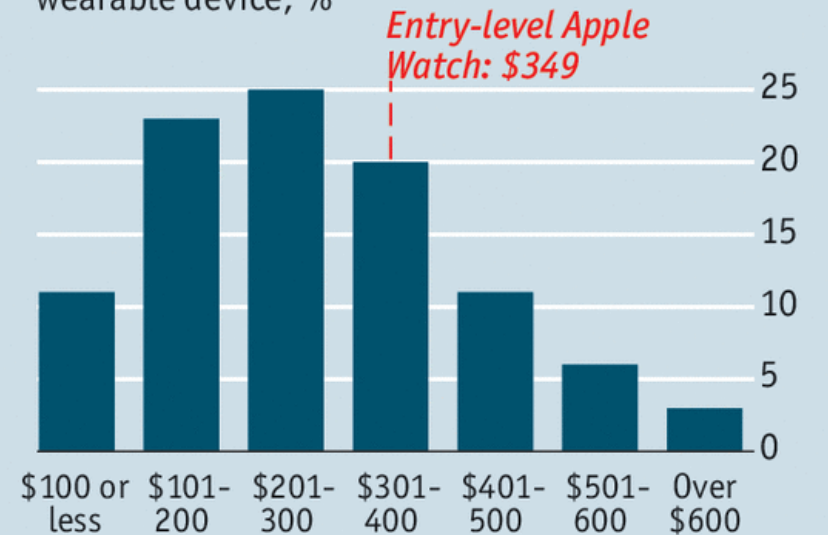
Source: IDC, BI Intelligence estimates

BI INTELLIGENCE

If the price is right

2

How much respondents* are willing to pay for a wearable device, %



Source: Morgan Stanley

*Based on a survey of 10,500 people in Brazil, Britain, China, France, Germany, Japan and United States, August 2014

Economist.com



BigData@Heart

Designed to have a transformative impact on the way that AF, HF and ACS are defined, classified, sub-phenotyped and outcomes are recorded; that existing drugs are employed, evaluated and clinical guidelines are developed; and that new drugs and innovative personalised treatment approaches are developed.

- 5-year project funded by the Innovative Medicines Initiative
- Started March 2017
- 120 scientists
- 19 partners (14 public, 5 industry)



efpia

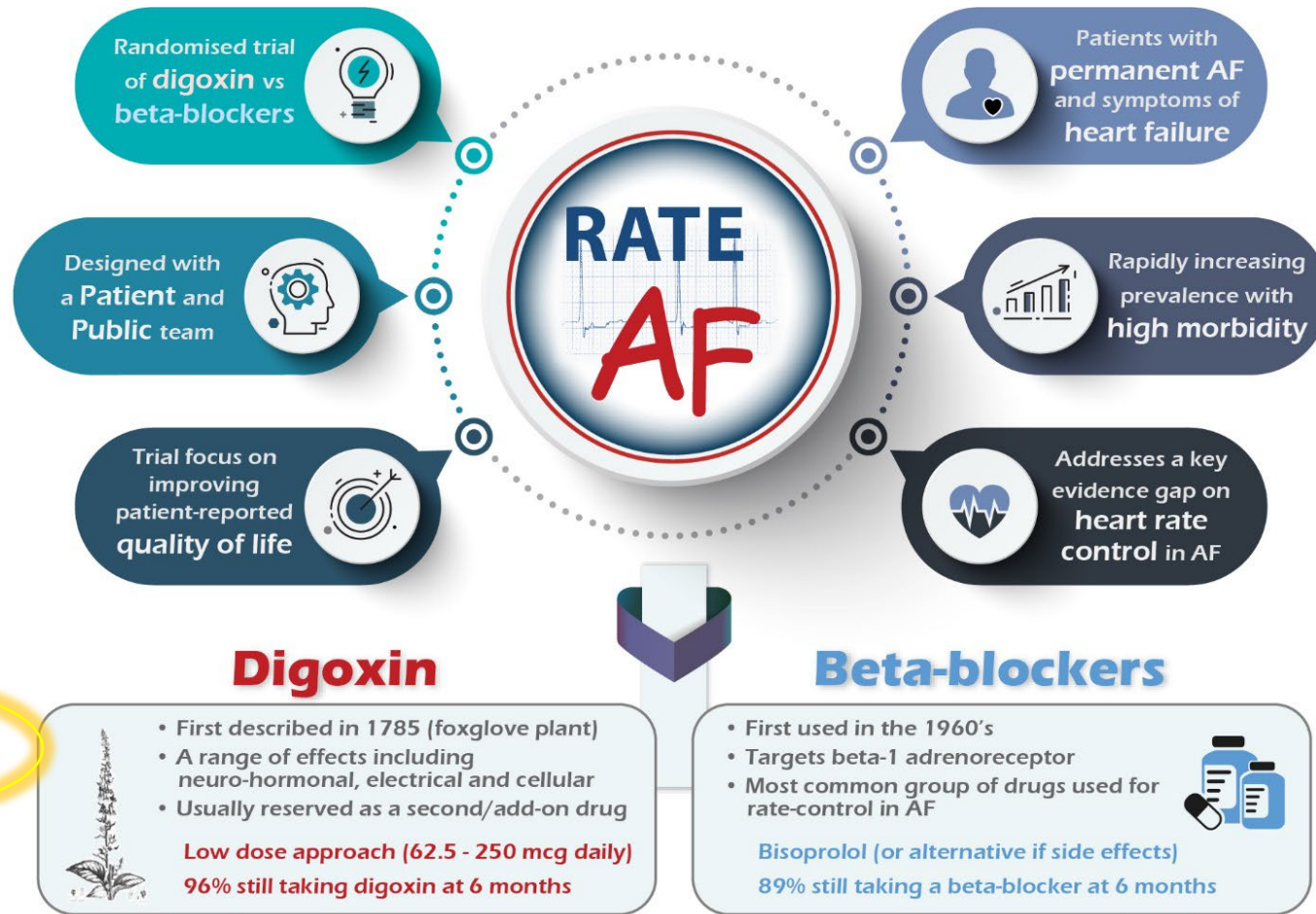


innovative medicines initiative

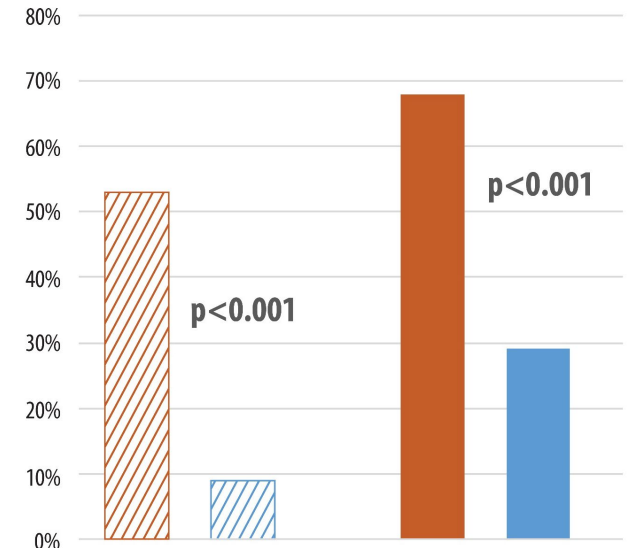
This work has received support from the EU/EFPIA Innovative Medicines Initiative [2] Joint Undertaking BigData@Heart grant n° 116074

www.bigdatahearts.eu  @bigdataheart

New physiological markers/outcomes



**AF symptom class:
2-level improvement from baseline**



160 patients randomised

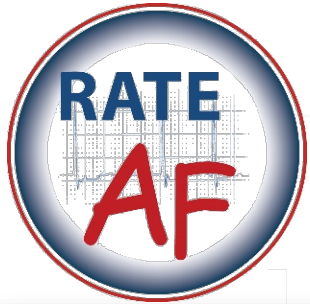
Average age 76

46% women

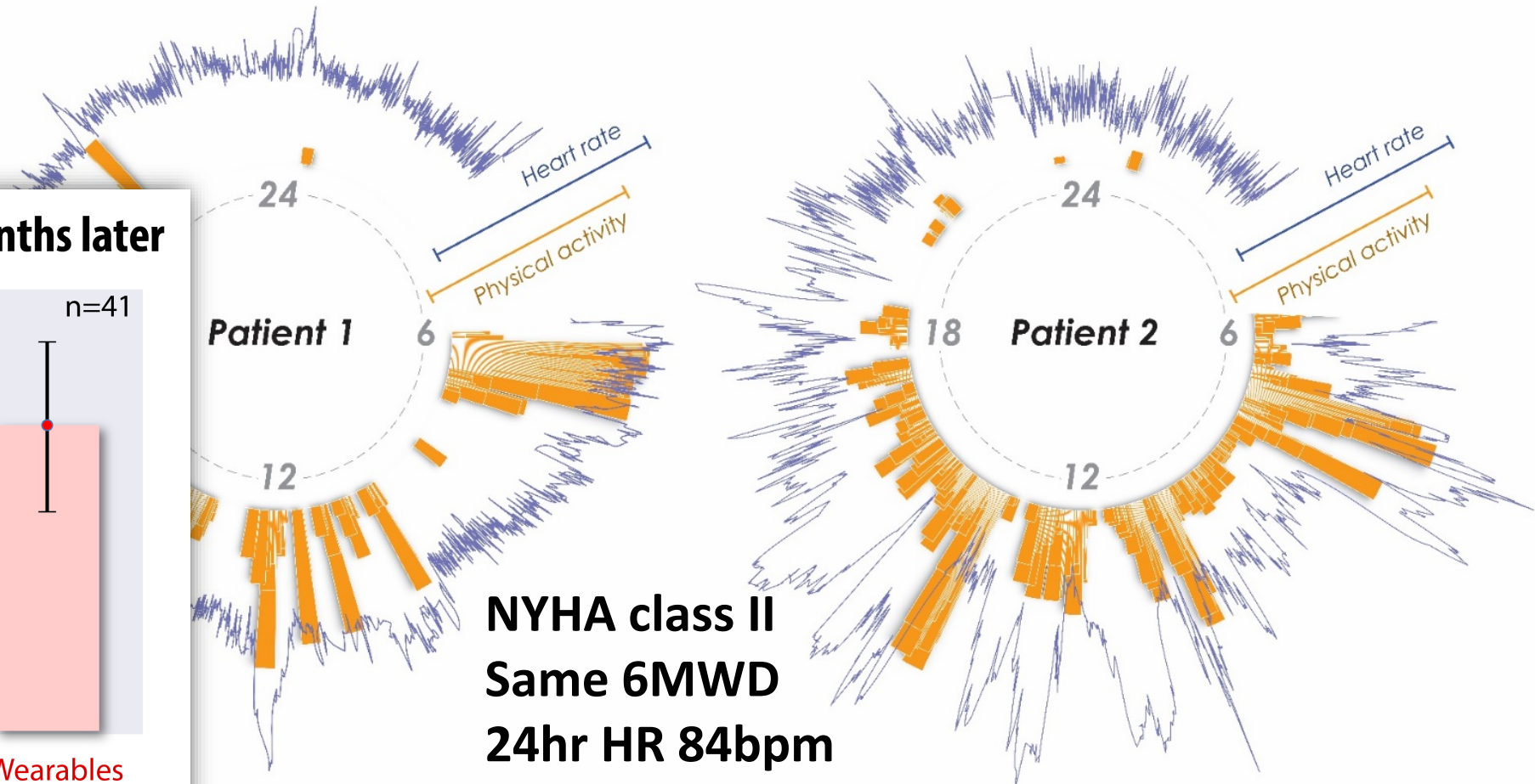
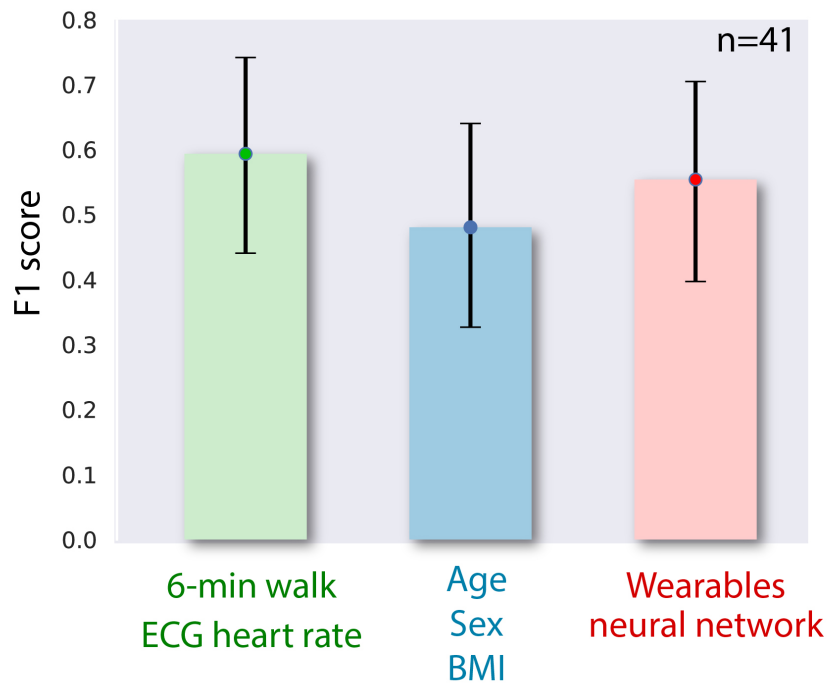
Symptoms:



New physiological markers/outcomes



Prediction of NYHA class 5 months later



Future gazing....

Prevent HF

Prevent adverse outcomes

Alert to person to seek risk factor modification / share data

Alert to person to seek treatment

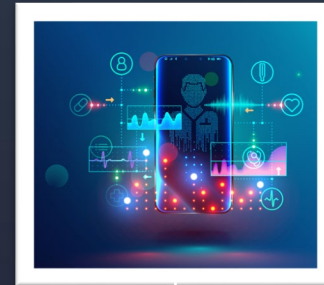
Integrated tech
(home, wearables, phone)

Prediction pre-disease
(HF stage A and B)

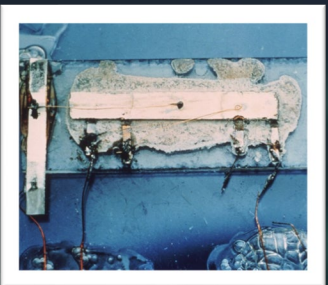
Early diagnosis and HF
monitoring (stage C and D)



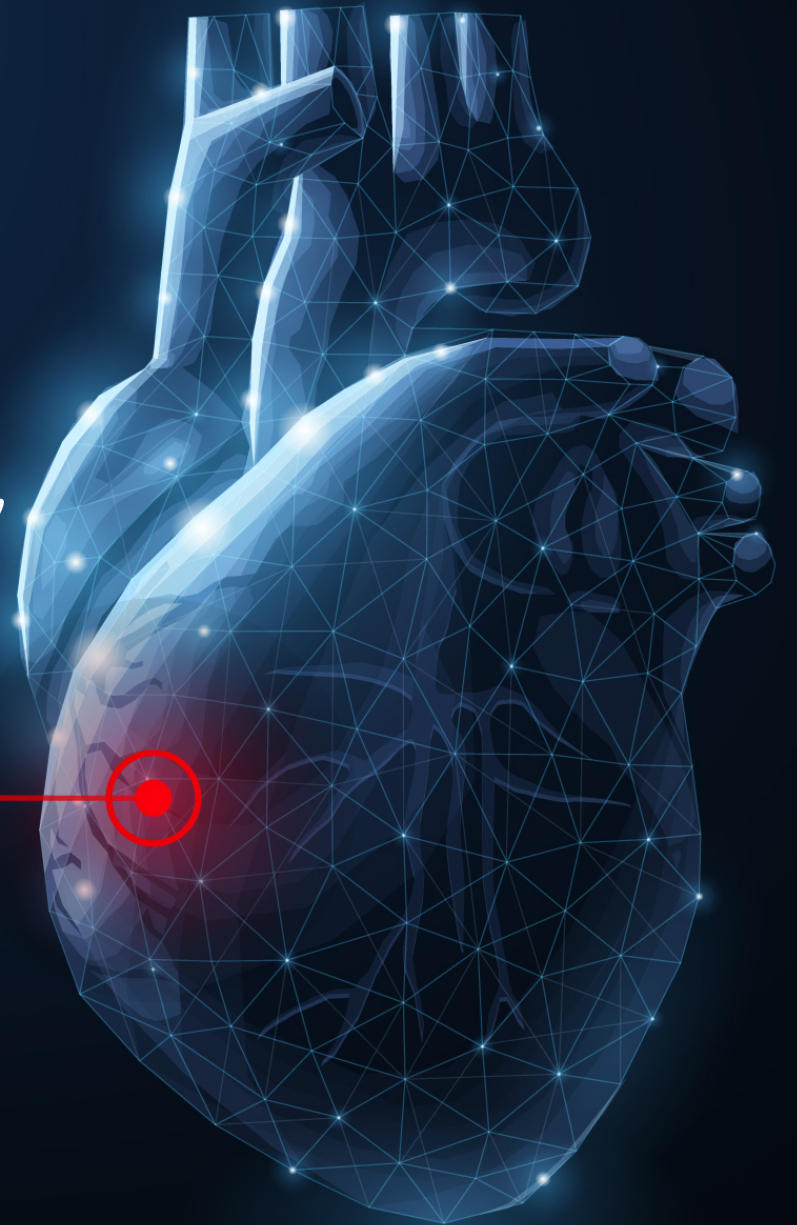
Pocket supercomputer
2021



Kilby/Noyce
1958/1959



~~Tech~~
revolution
in care



healthcare DATA for pragmatic clinical REsearch

DaRe² THINK



UNIVERSITY OF
BIRMINGHAM

INSTITUTE OF
CARDIOVASCULAR
SCIENCES