Apps and Wearables to Keep Track of Your Heart Failure Patient

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Disclosures

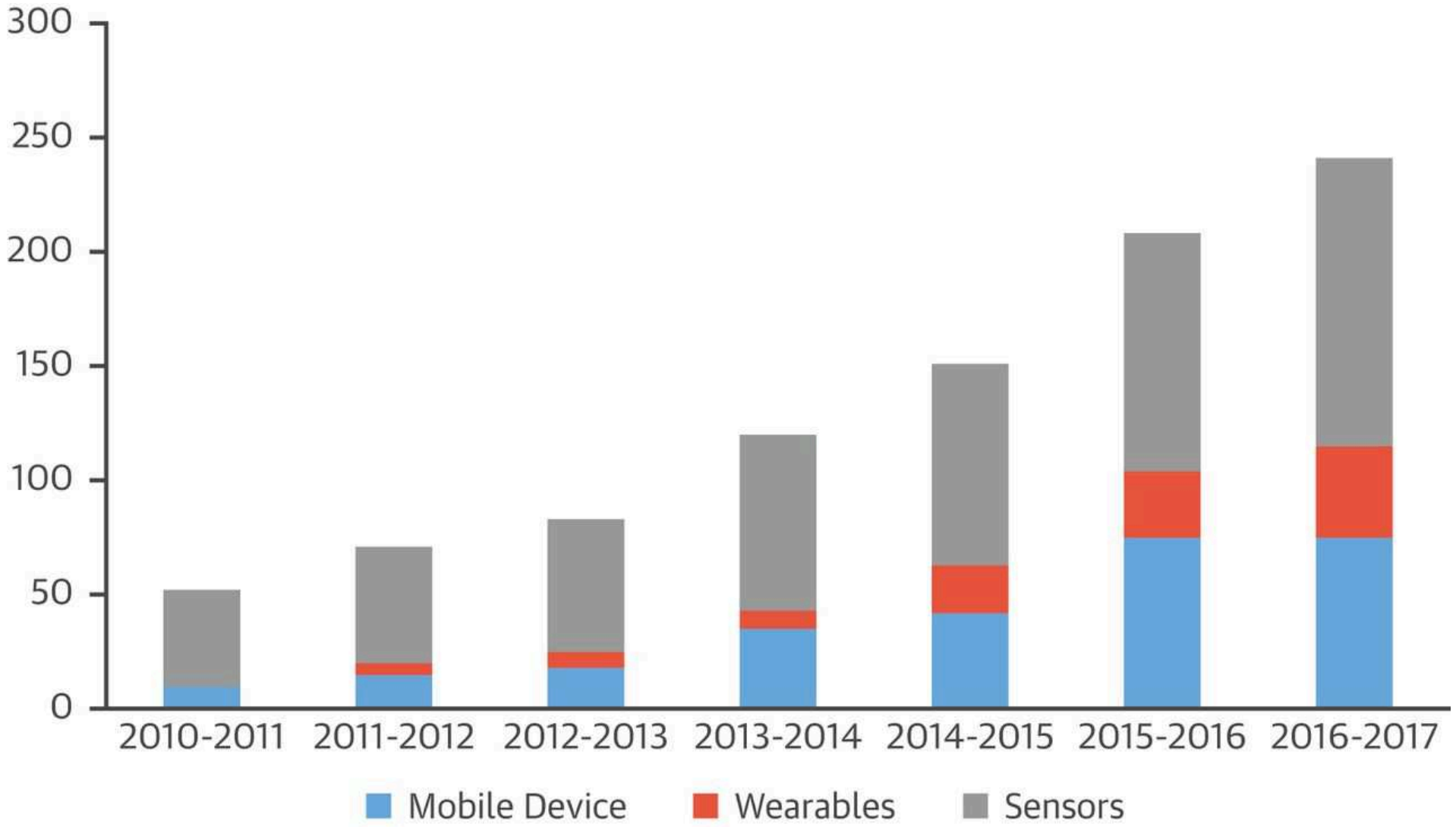
- AHA Strategically Focused Research Network
- ESC Young Investigator Research Grant
- Bayer-Vascular Canadian Cardiovascular Society grant
- Roche Diagnostics
- Takeda
- BMS-Pfizer
- B.I-CVCT Fellow
- Boeringer-Ingelhiem

Agenda

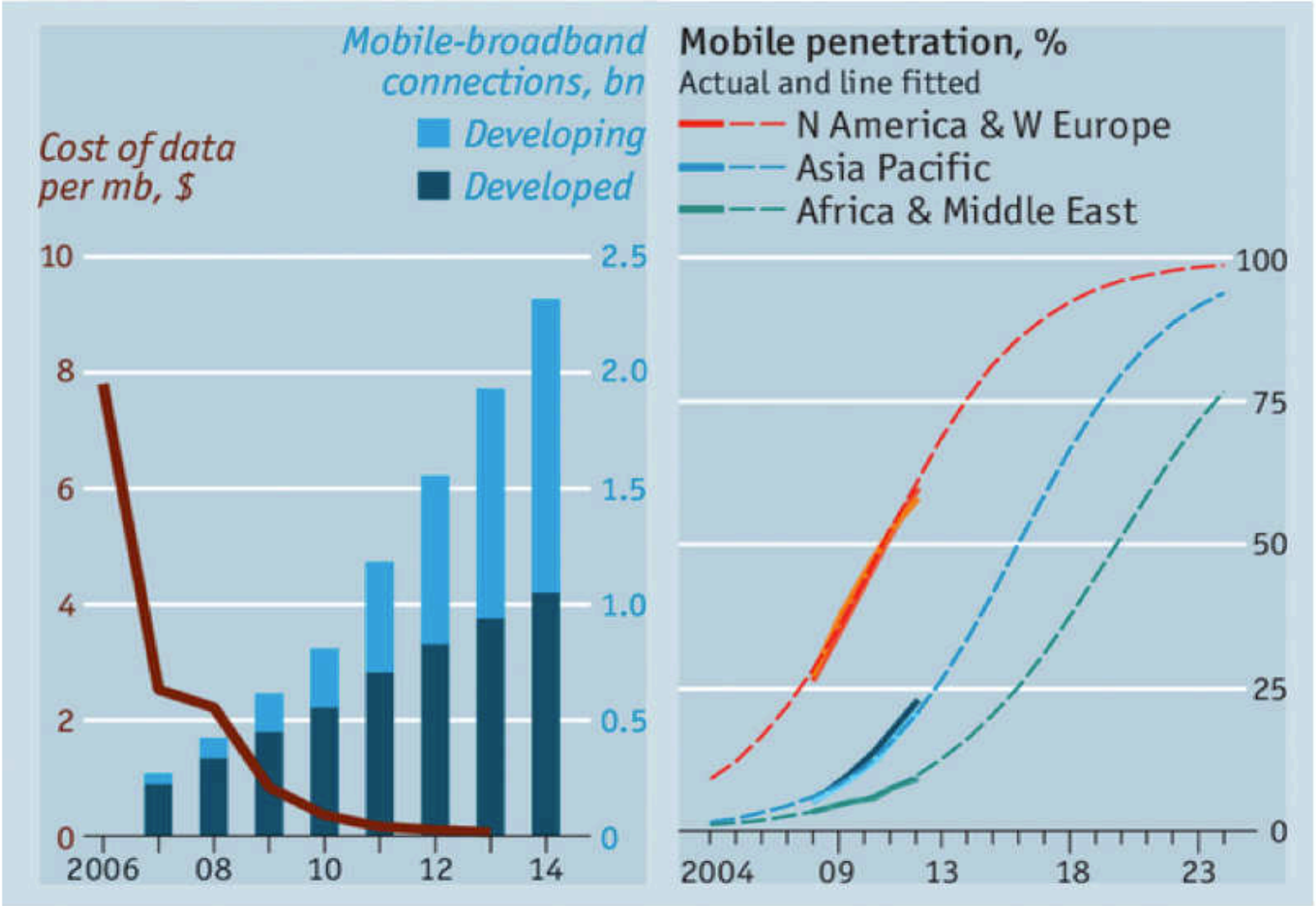
- Introduction
- How can apps and wearables help our patients with HF?

  - Vital signs
  - Medication optimization
  - Physical activity
  - Comorbidity management

- Conclusion and discussion



Sharma et al. JACC 2018;71:2680-2690


Mobile-broadband connections, bn
Developing
Developed
Cost of data per mb, $
10
8
6
4
2
0
2.5
2.0
1.5
1.0
0.5
0
2006
08
10
12
14
Mobile penetration, %
Actual and line fitted
N America & W Europe
Asia Pacific
Africa & Middle East
100
75
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25
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2004
09
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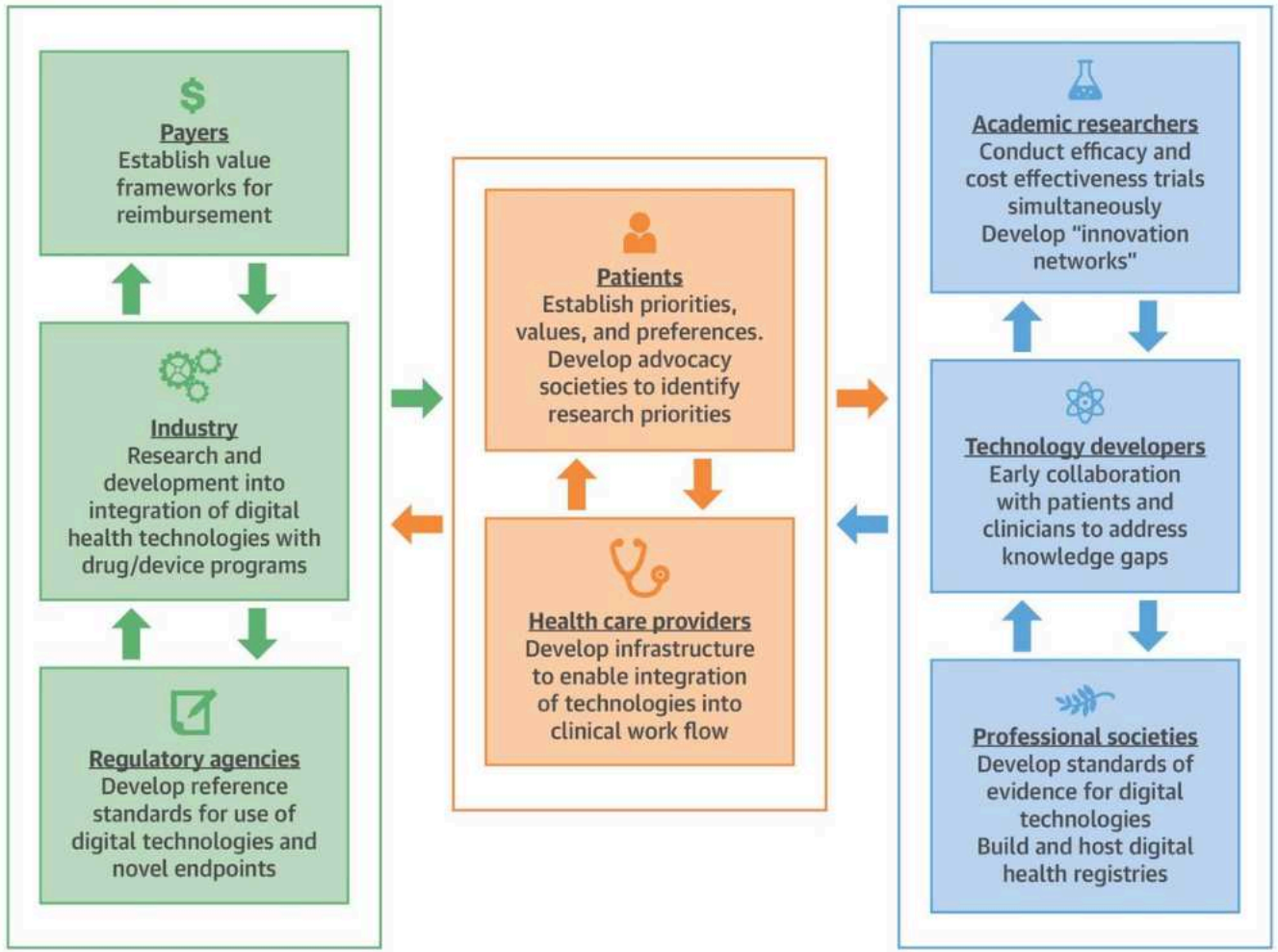
23

CENTRAL ILLUSTRATION: Framework for Stakeholder Relationship for the Use of Digital Technology in Healthcare Delivery and Clinical Trials



Sharma, A. et al. J Am Coll Cardiol. 2018;71(23):2680-90.

Role of Apps in Heart Failure

Vital Signs

- Limited by need for blue-tooth linked devices
- Often challenging for older patients to set this up
- New technologies to use **facial scans** to identify vital signs

Facial Scan to Identify Vital Signs

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Local News

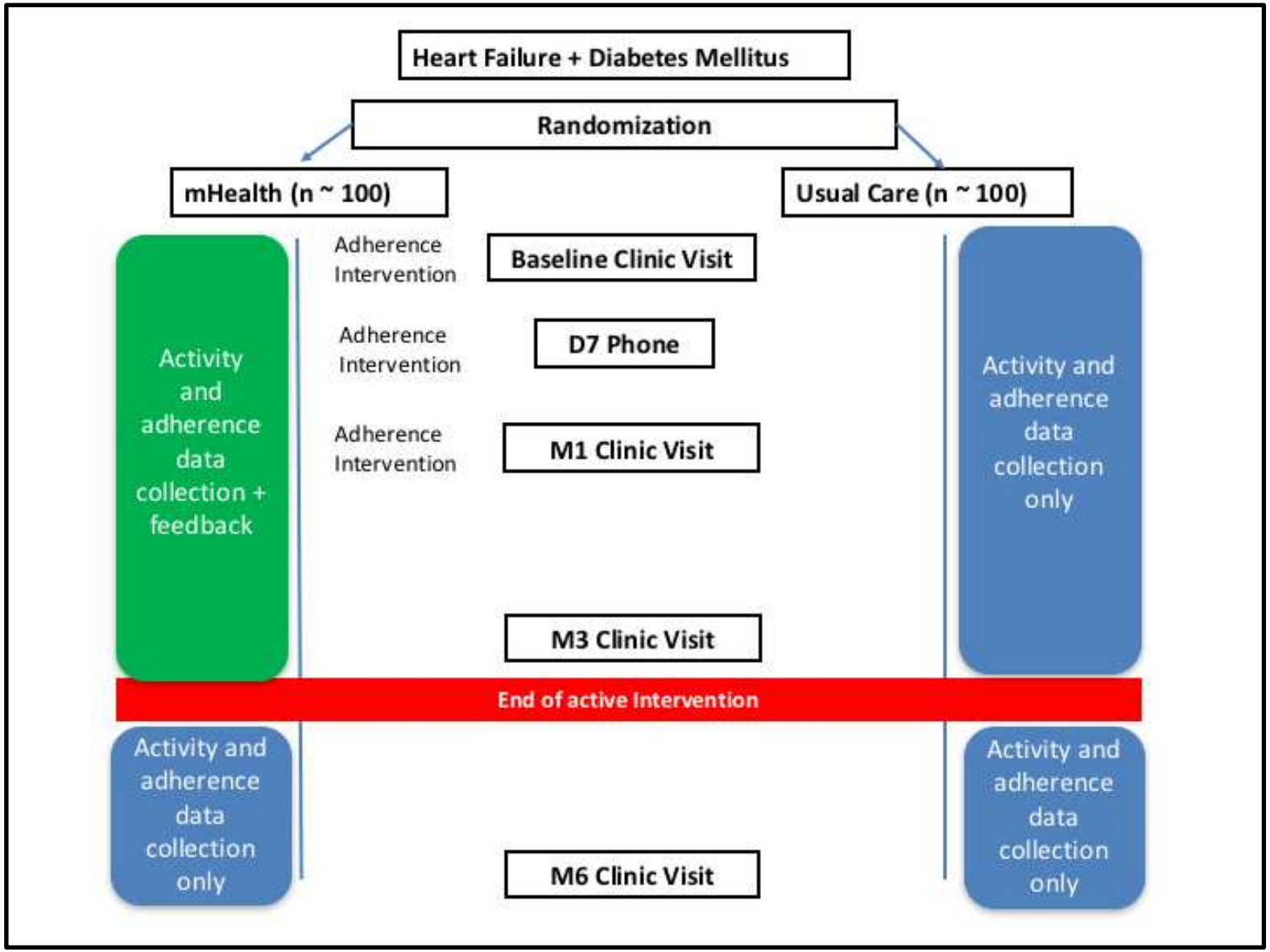
Jewish General set to roll out game-changing app in coronavirus battle

Drug Adherence

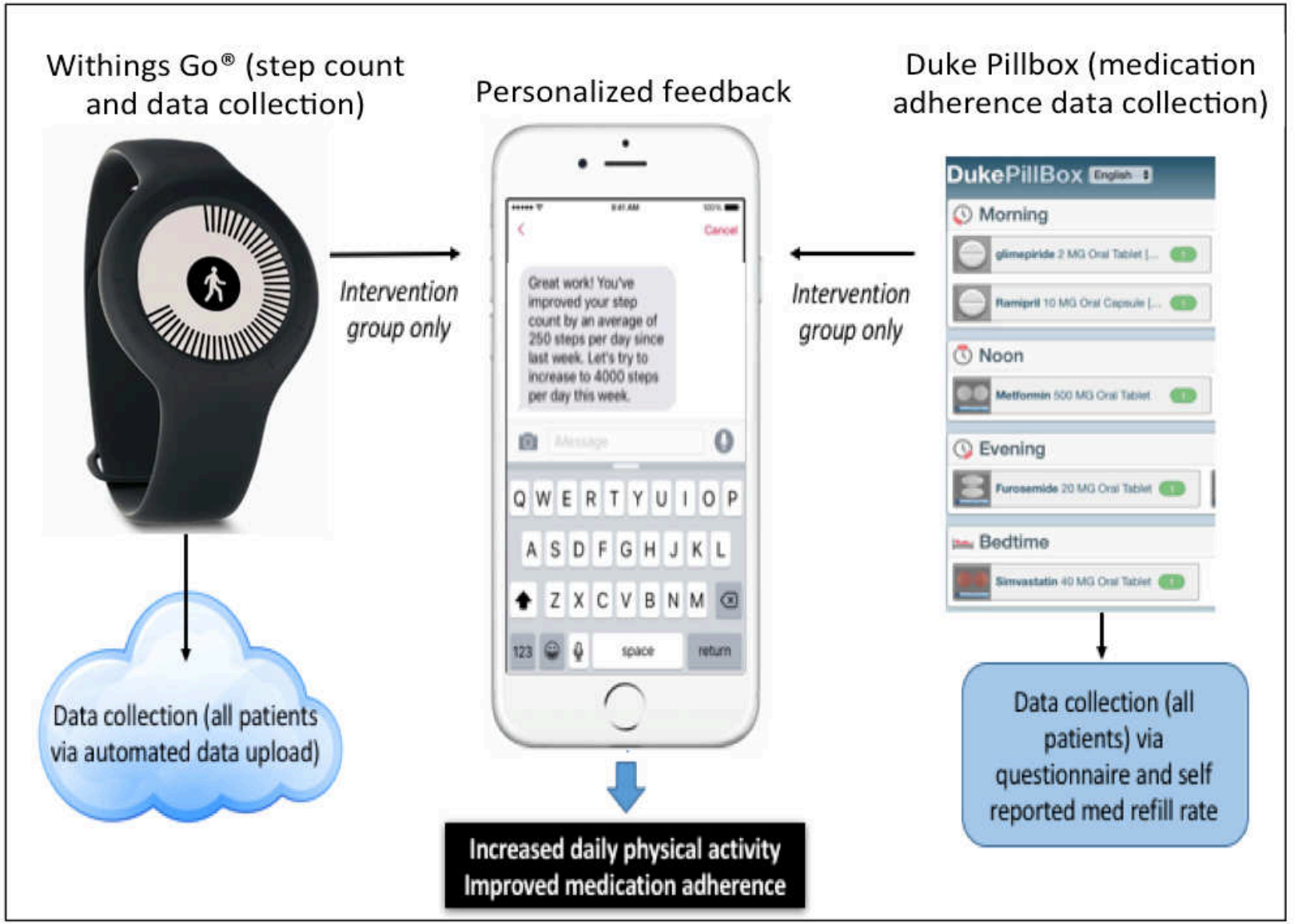
- Applications can play a significant role in encouraging patients to adhere to medication regimens
- Many of these strategies remain untested
- ‘Nudges’ can play an important role in changing patient behavior

Sharma et al. JACC 2018;71:2680-2690;
Brown and Gaggin. JCF 2019;25:5

Utilizing mobile technologies to improve physical activity and medication adherence in patients with heart failure and diabetes mellitus: Rationale and design of the TARGET-HF-DM Trial

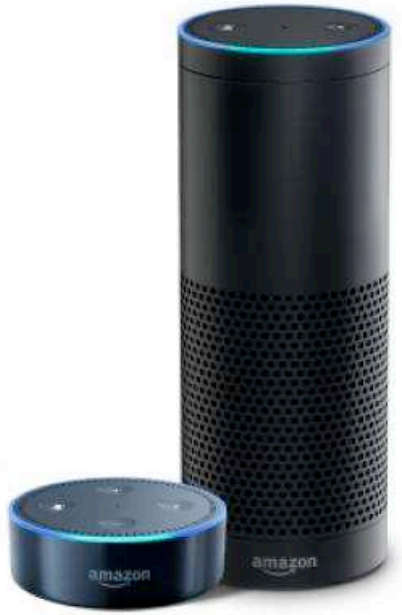


Sharma et al. (under review) Circulation Heart Failure



Sharma; Am Heart J. 2019 May;211:22-33

Drug Adherence

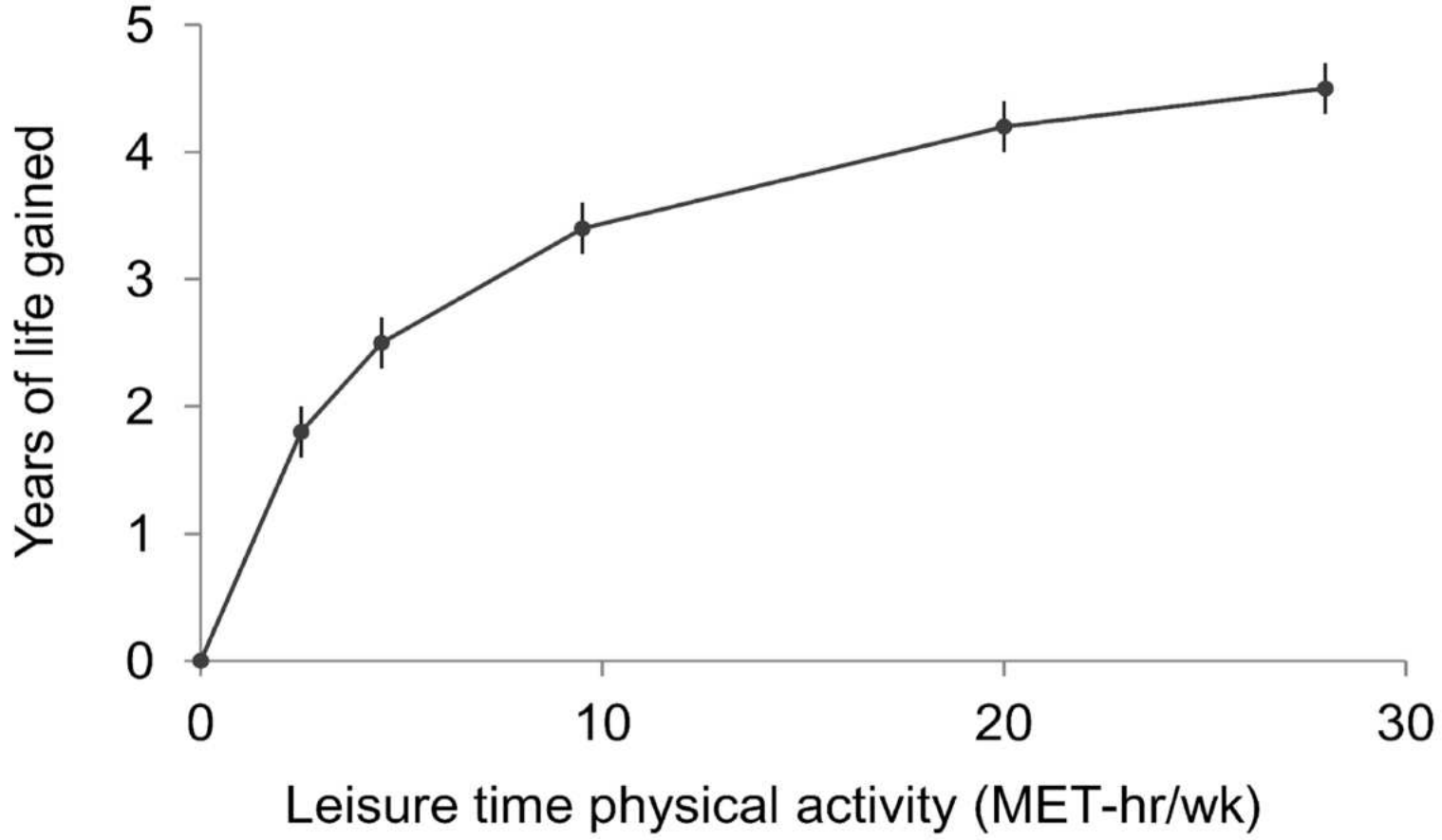


Pill Pack
by amazon pharmacy

NowRx

giant eagle

Physical Activity



Moore et al PLoS Med. 2012

January 2017

Feasibility of Obtaining Measures of Lifestyle From a Smartphone App

The MyHeart Counts Cardiovascular Health Study

Michael V. McConnell, MD, MSEE[1,2,3]; Anna Shcherbina, MEng[1,2]; Aleksandra Pavlovic, BS[1,2]; et al

» Author Affiliations | Article Information

JAMA Cardiol. 2017;2(1):67-76. doi:10.1001/jamacardio.2016.4395

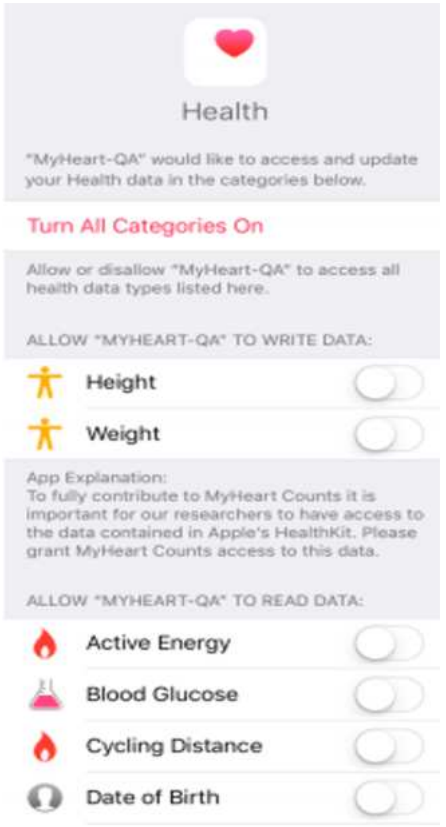
Make *your* heart count!

What keeps your heart its healthiest? Help us find out.

New version of MyHeart Counts App now available for download at the App Store

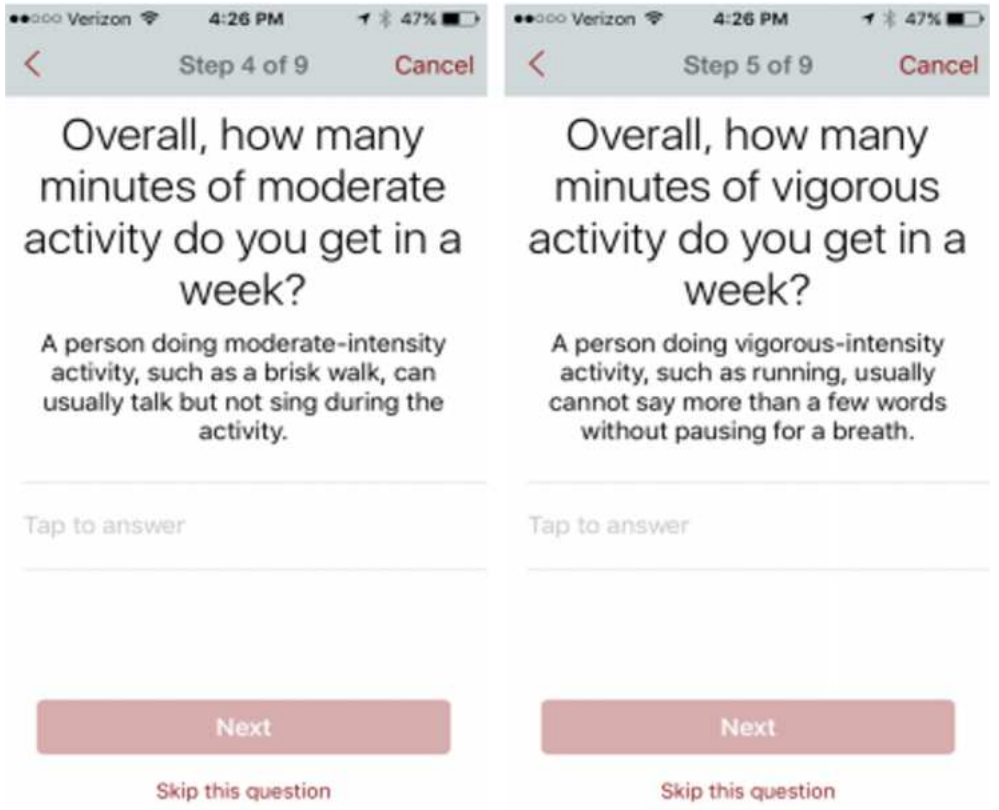
MHC App Integrates Three Sources of Physical Activity Data

Daily step count and distance walked from Apple platform

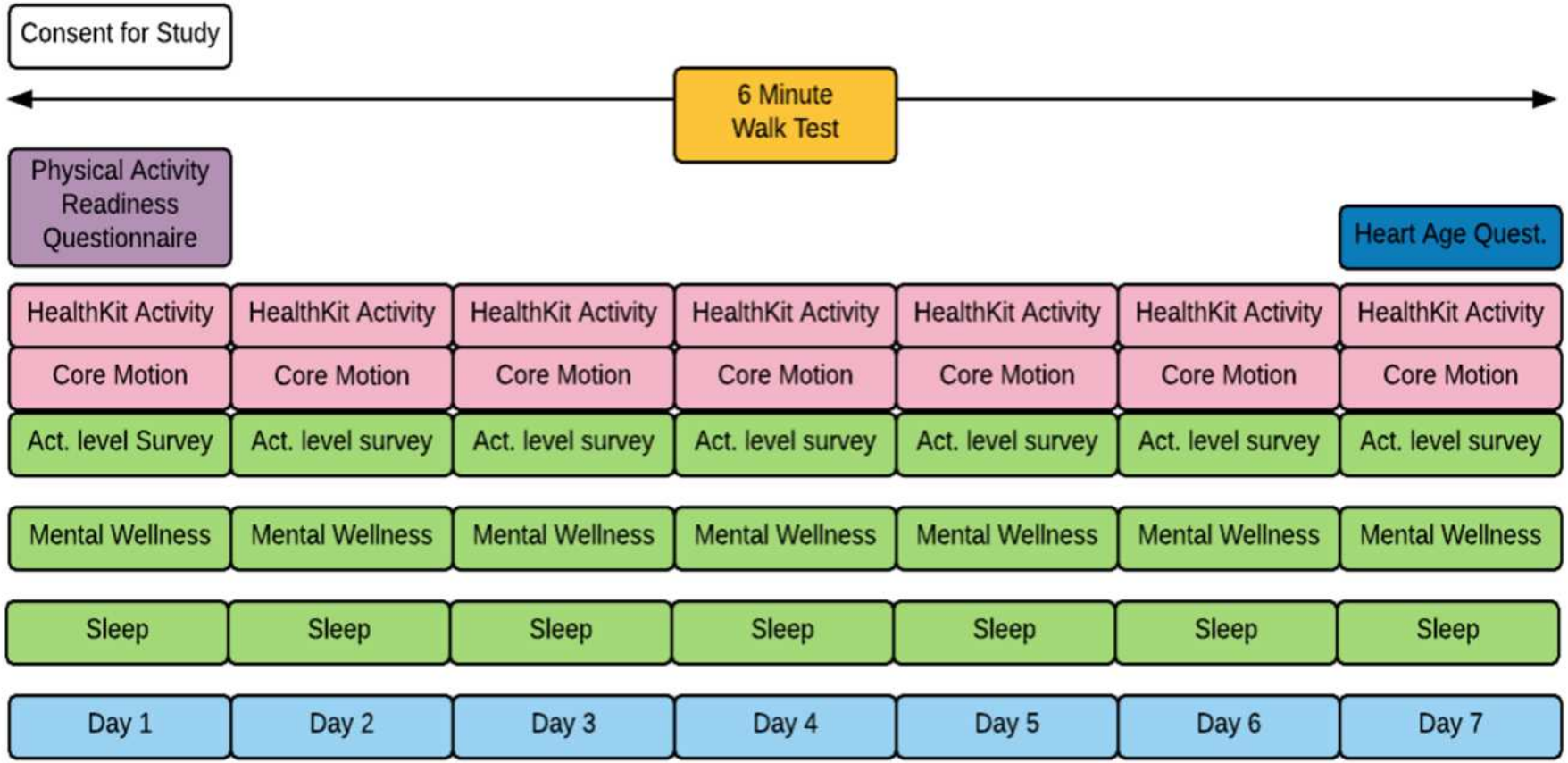


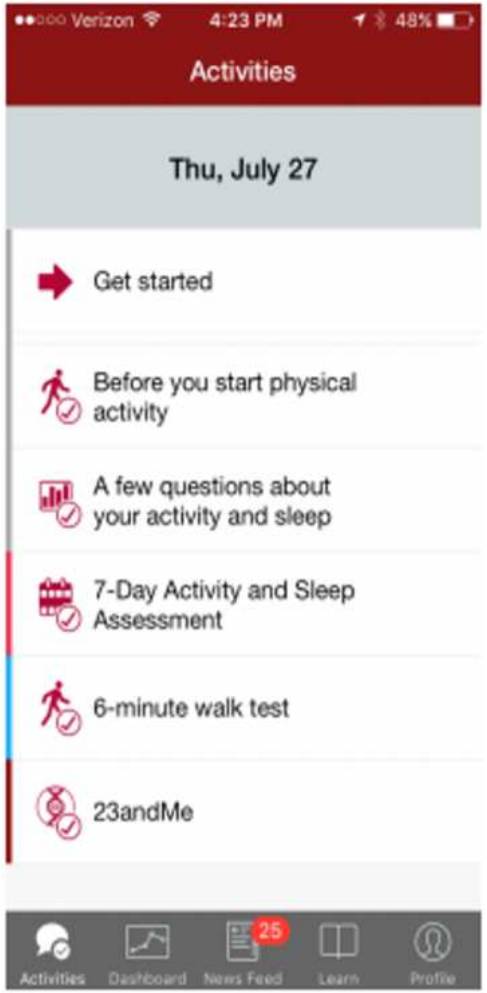
Core motion activity detection from phone accelerometry

Self-reported survey responses about daily and weekly physical activity levels

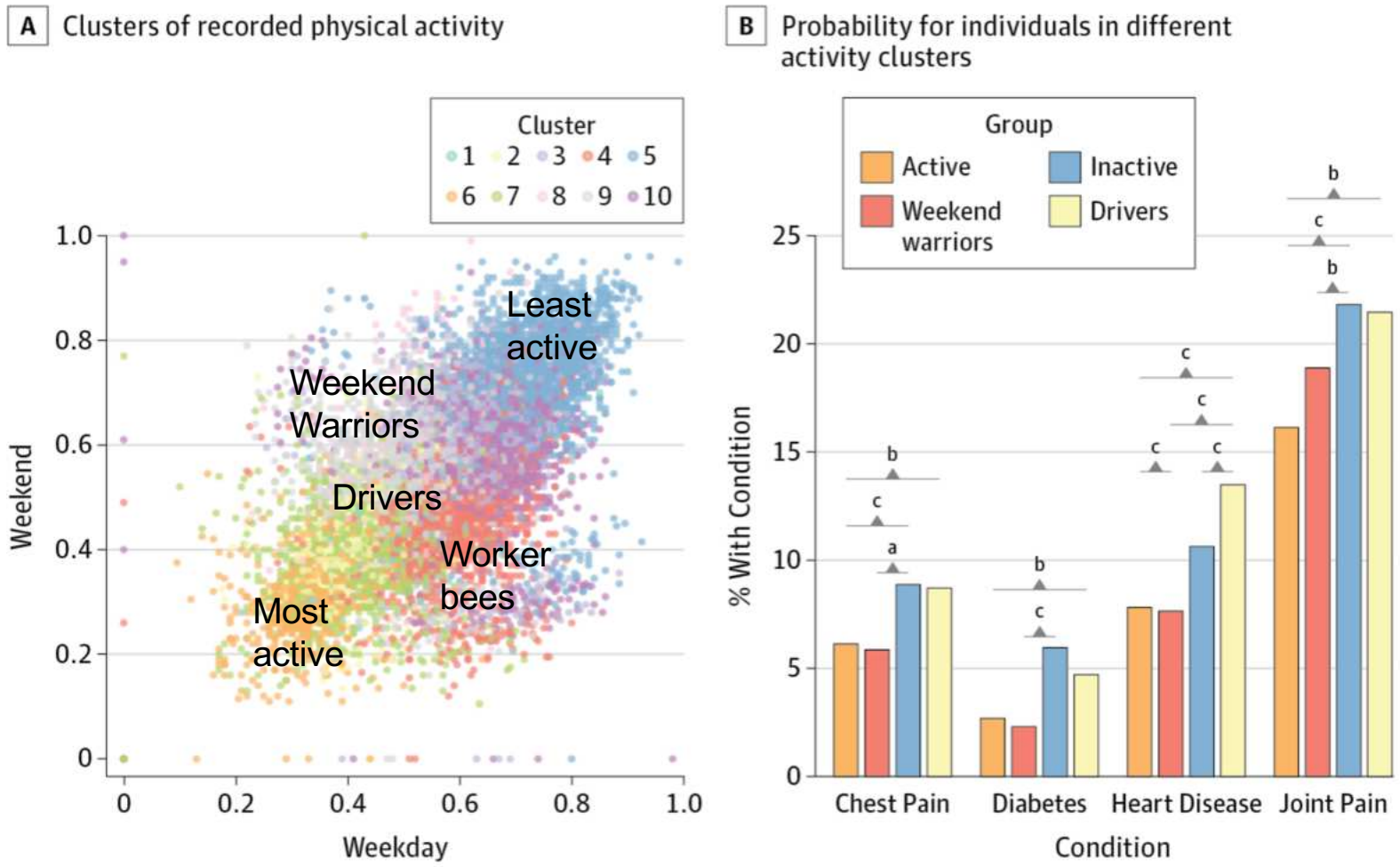


User Flow Through Baseline Week of MHC Study





Based on a Week of Baseline Activity Levels, Participants Assigned to One of Five Activity Clusters

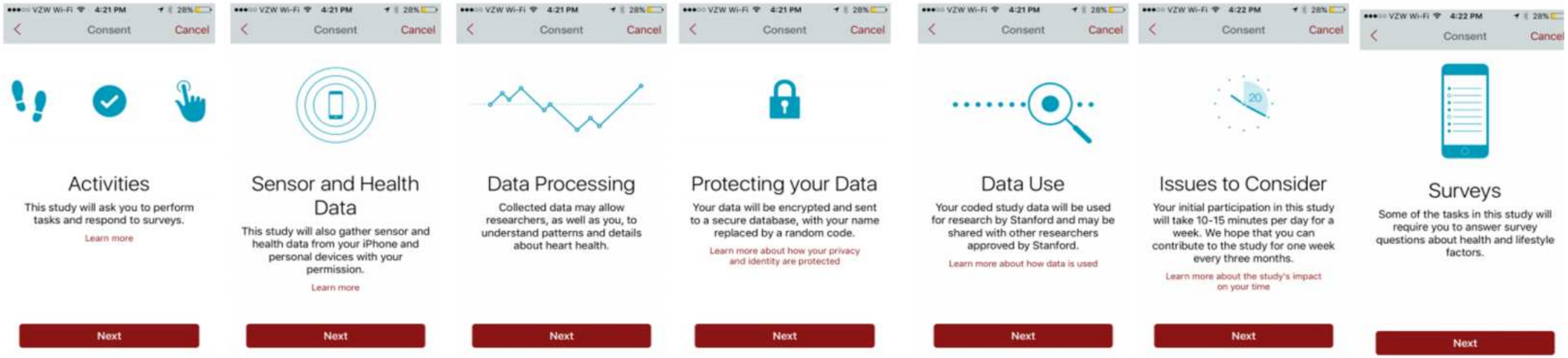


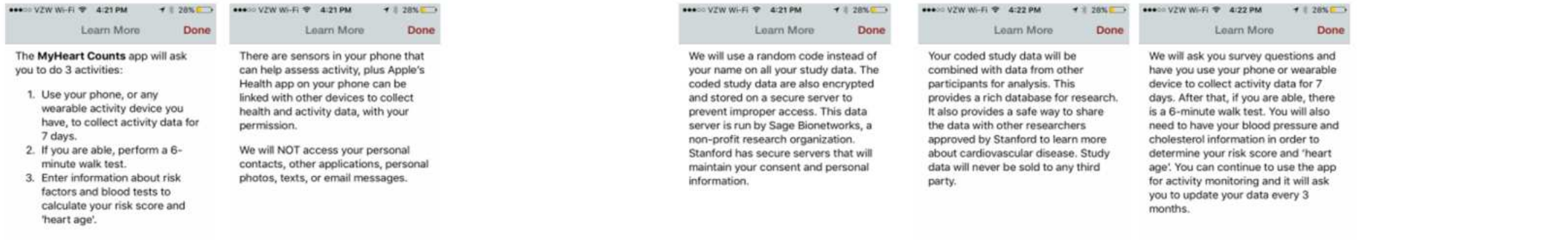
MyHeart Counts Study: Fully Digital Randomized Controlled Trial of Physical Activity e-Coaching

- Primary outcome: Daily step count

- Secondary outcomes:
  - Sleep duration
  - Sleep quality
  - Self-reported daily happiness on a scale of 1 - 10

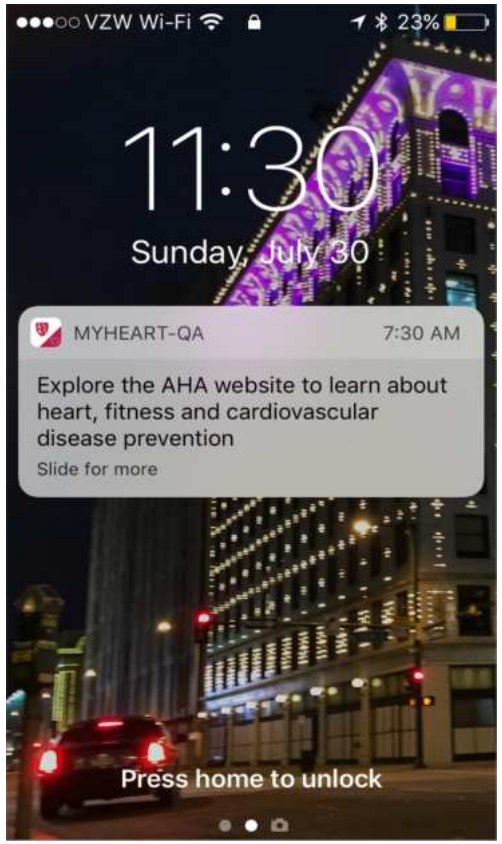
Mobile Study Consent

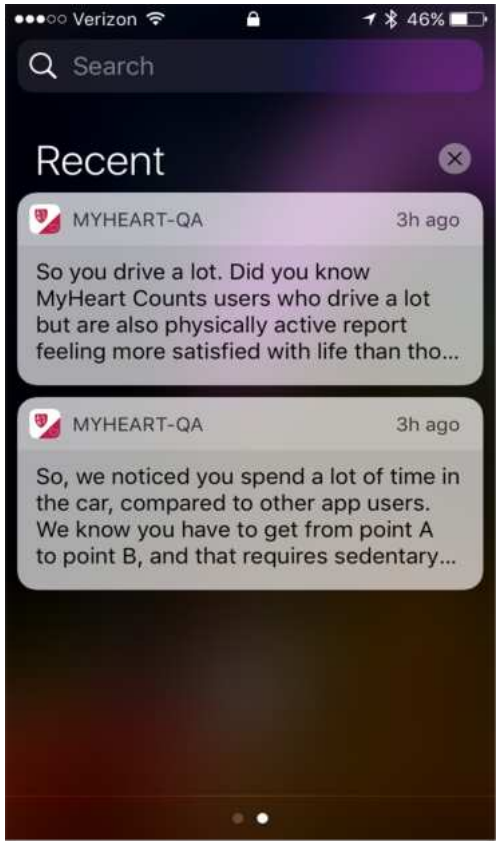


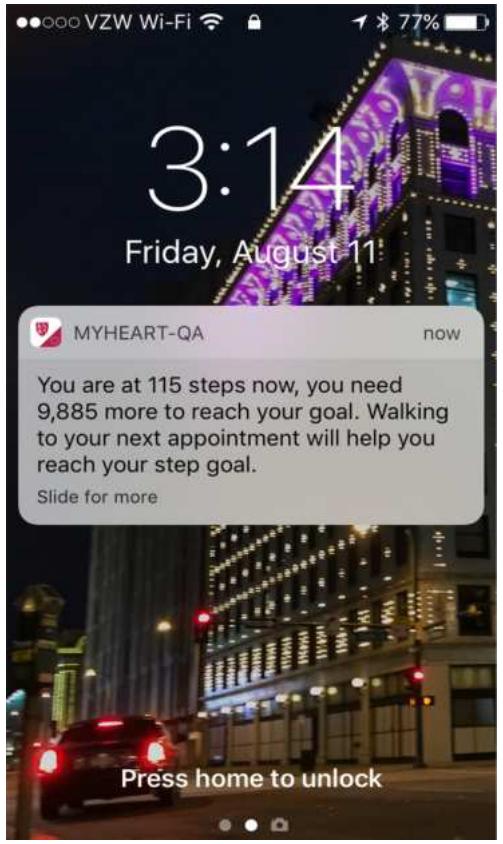


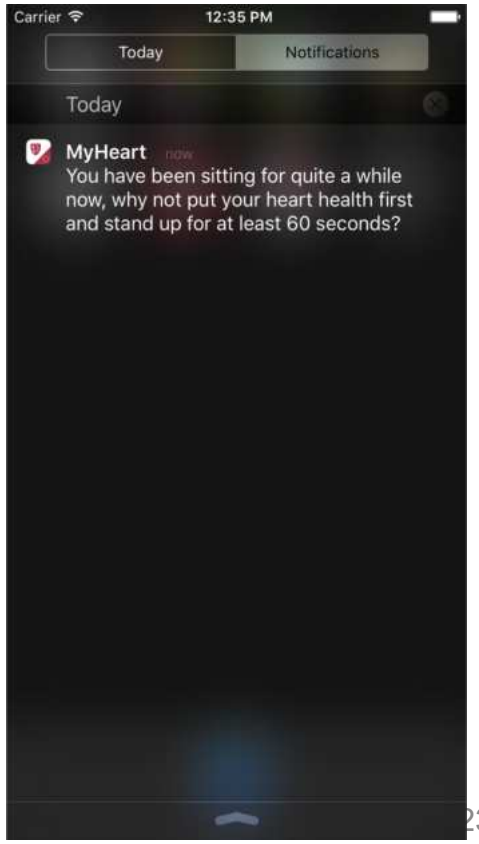
Four Interventions Delivered By The MHC Application

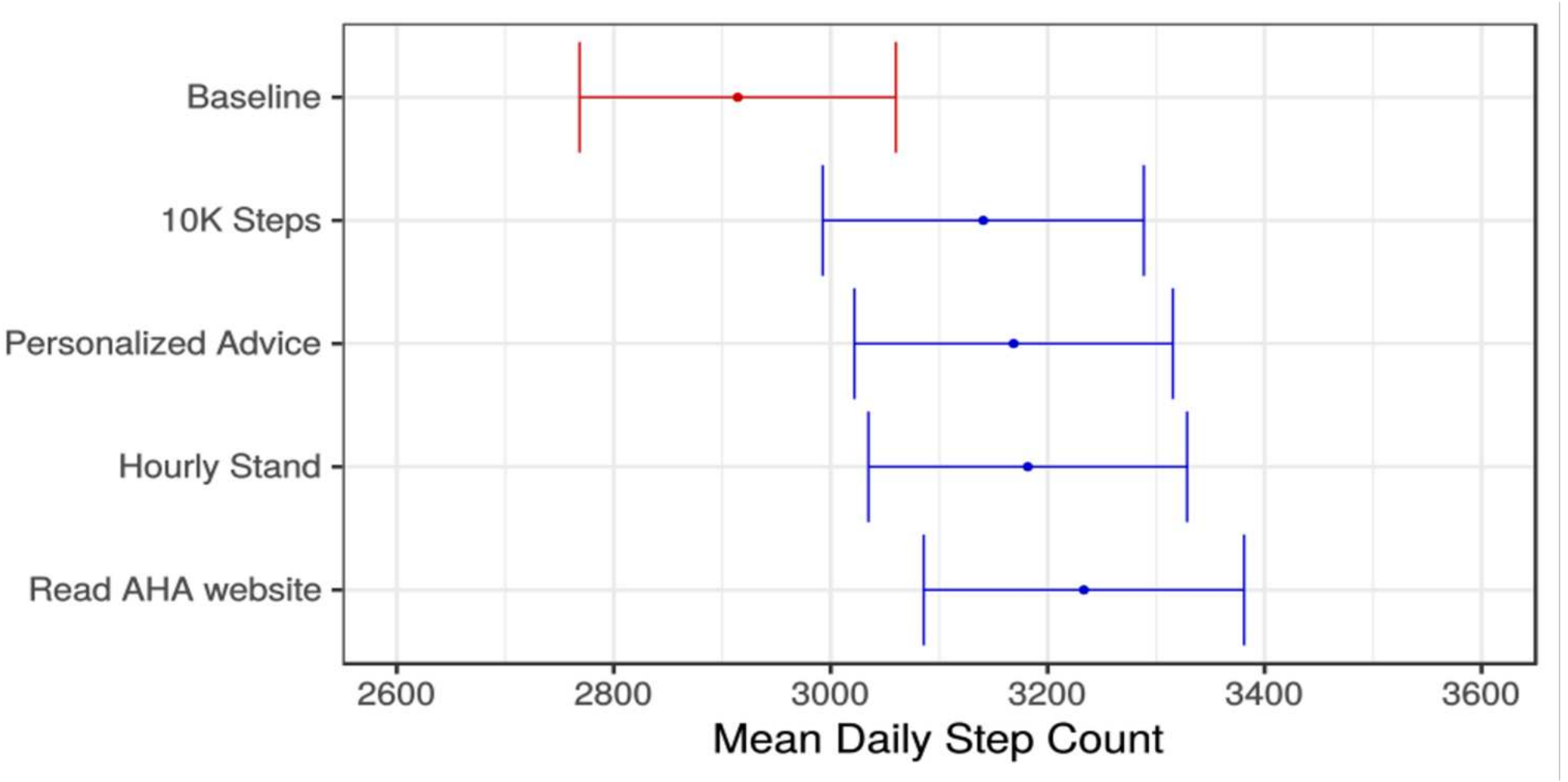
Passive education (American Heart Association)	Personalized coaching based on activity cluster	Daily mid-day 10,000 step prompt	Continuous 1 hour sedentary trigger to stand and walk





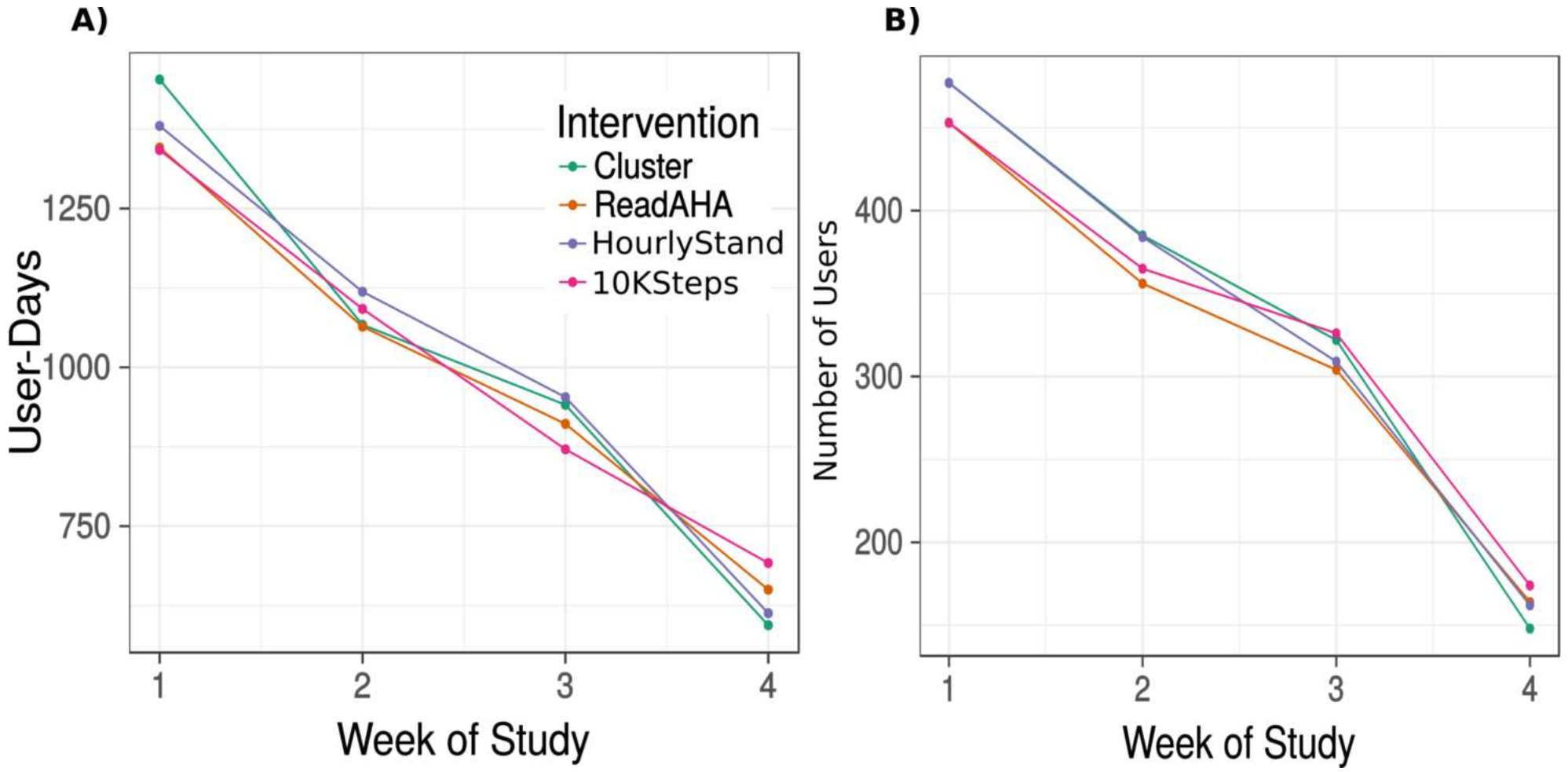






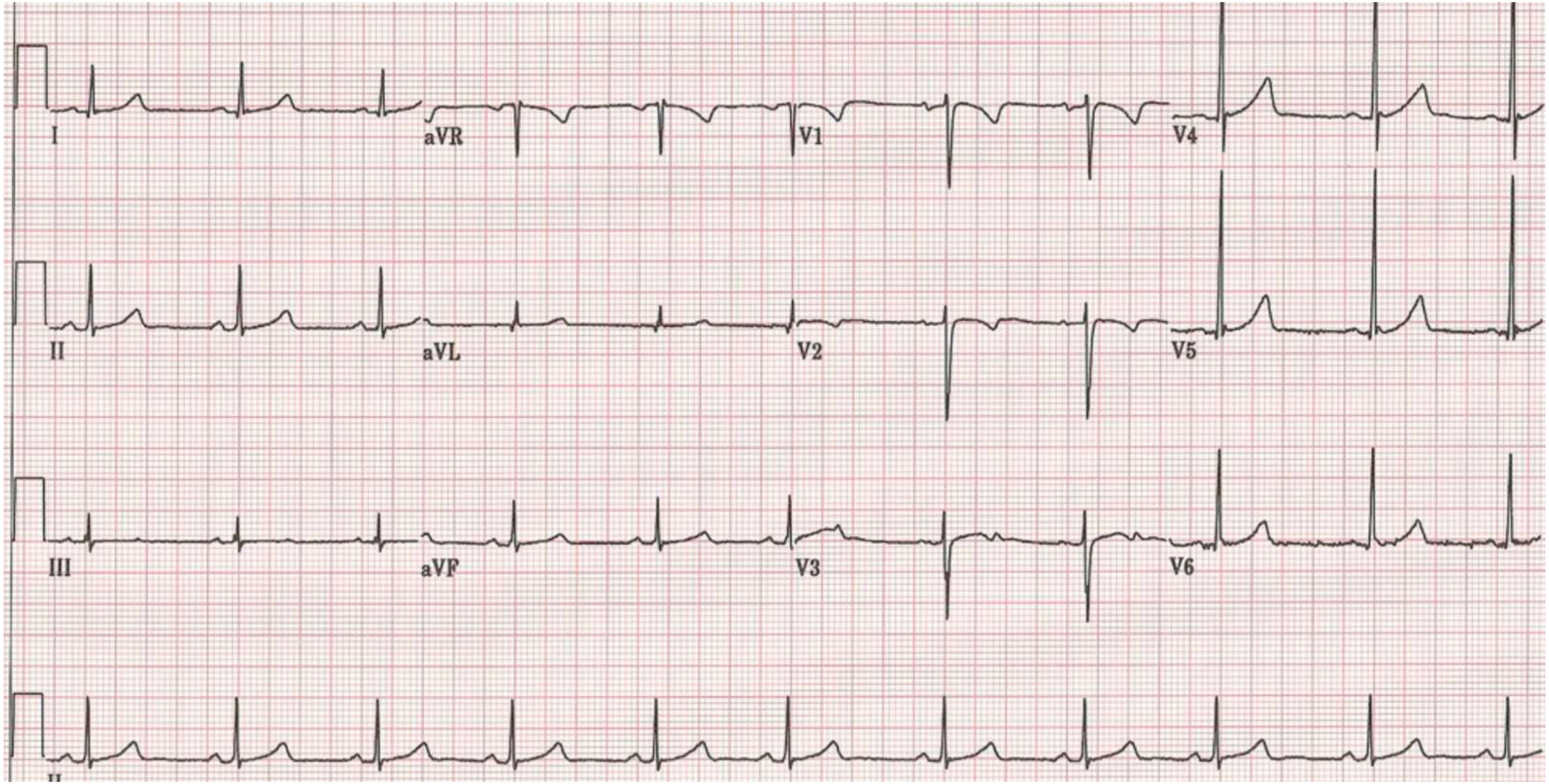
***Lancet Digital Health* 2019; 1: e344–52**

Long-term user engagement is one of the main challenges of digital RCT



Diagnosing Comorbidities

- Challenge in diagnosing and managing comorbidities in patients with HF
- Diabetes is one of the most common comorbidities
- Given the emergence of therapies that can aid in reducing the risk of outcomes of patients with diabetes, we need to increase our ability to screen for such disorders


I
aVR
V1
V4
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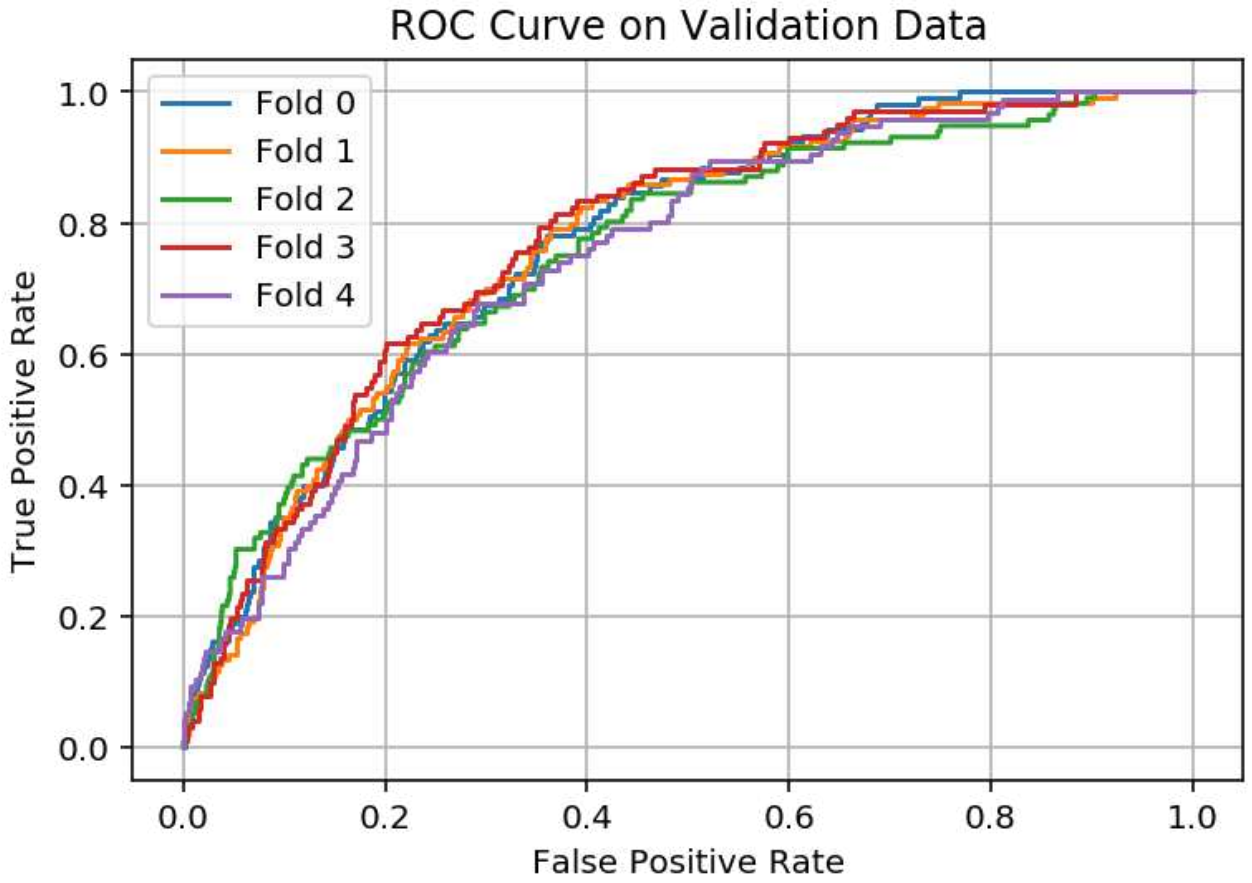
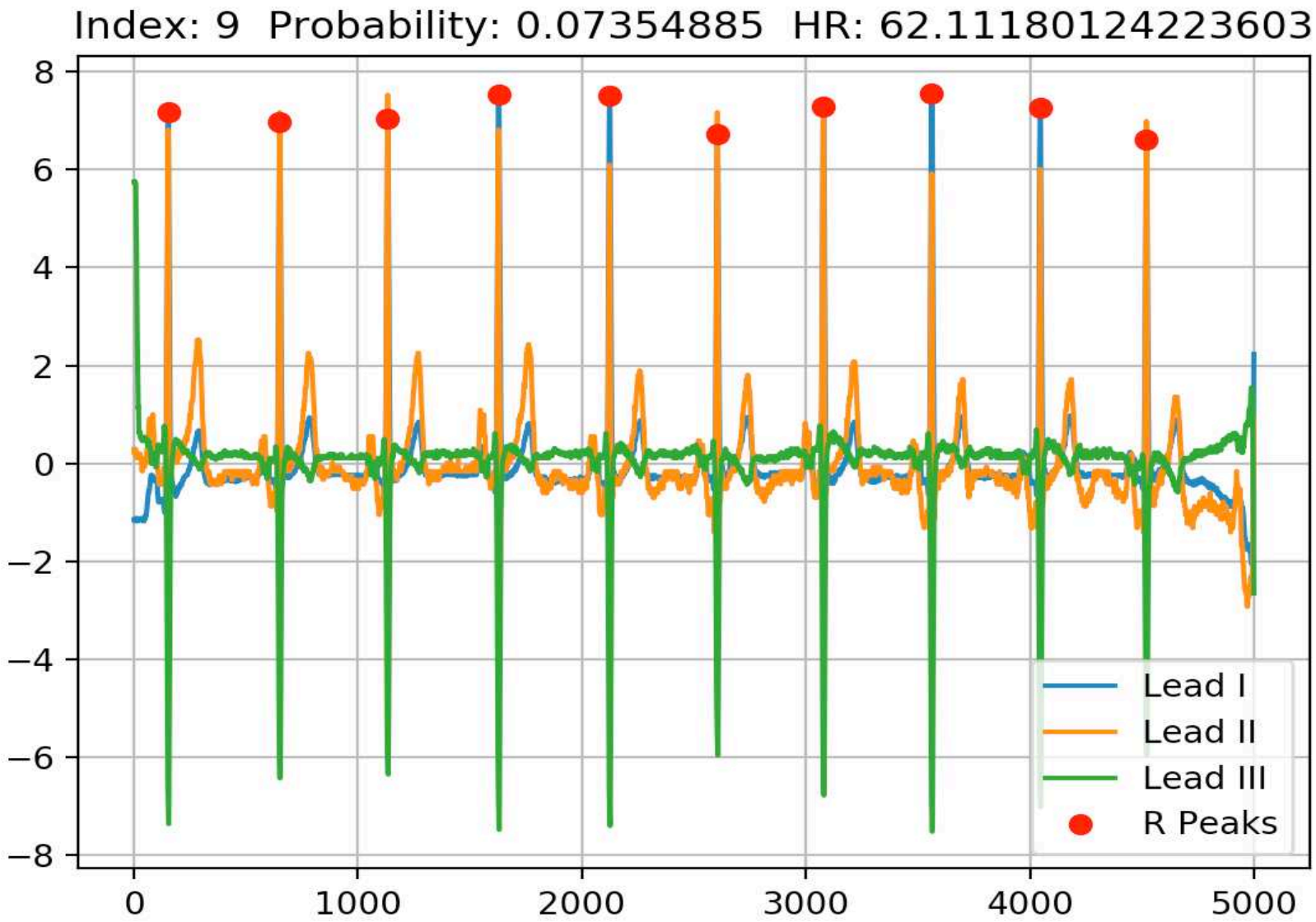
aVL
V2
V5
III
aVF
V3
V6
II

Deep learning: ECG screening for diabetes




Index: 9 Probability: 0.07354885 HR: 62.11180124223603
8
6
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−6
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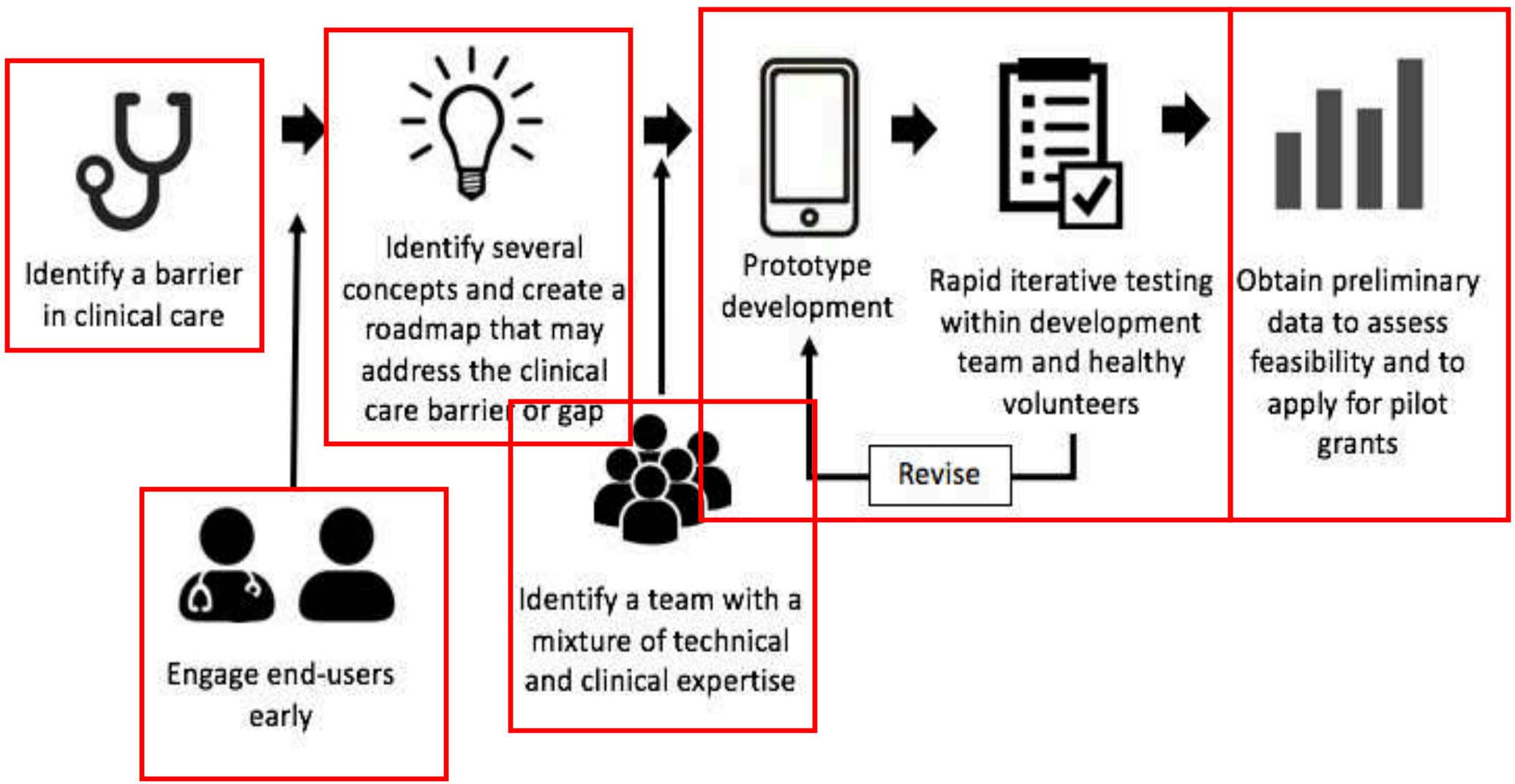
0
1000
2000
3000
4000
5000
Lead I
Lead II
Lead III
R Peaks


91 BPM
10:38
10 sec
Note: Apple Watch never checks for heart attacks.

Key Questions if Making Your Own App or Wearable

- Who is the app targeted towards – i.e. what is the ONE key user
- What is defined as ‘success’ if the app works well
- What is defined as ‘failure’
- How is the project/app going to sabotage itself
- What is the plan for sustainability


Identify a barrier in clinical care
Identify several concepts and create a roadmap that may address the clinical care barrier or gap
Prototype development
Rapid iterative testing within development team and healthy volunteers
Obtain preliminary data to assess feasibility and to apply for pilot grants
Revise
Identify a team with a mixture of technical and clinical expertise
Engage end-users early

Thank You!

Questions?

Please submit your questions by clicking on the Q&A icon on your screen