

Apps and Wearables to Keep Track of Your Heart Failure Patient

A red ECG line graphic runs horizontally across the slide. It features several regular heartbeats followed by a significantly larger and more complex spike on the right side, which is partially cut off by the edge of the frame.

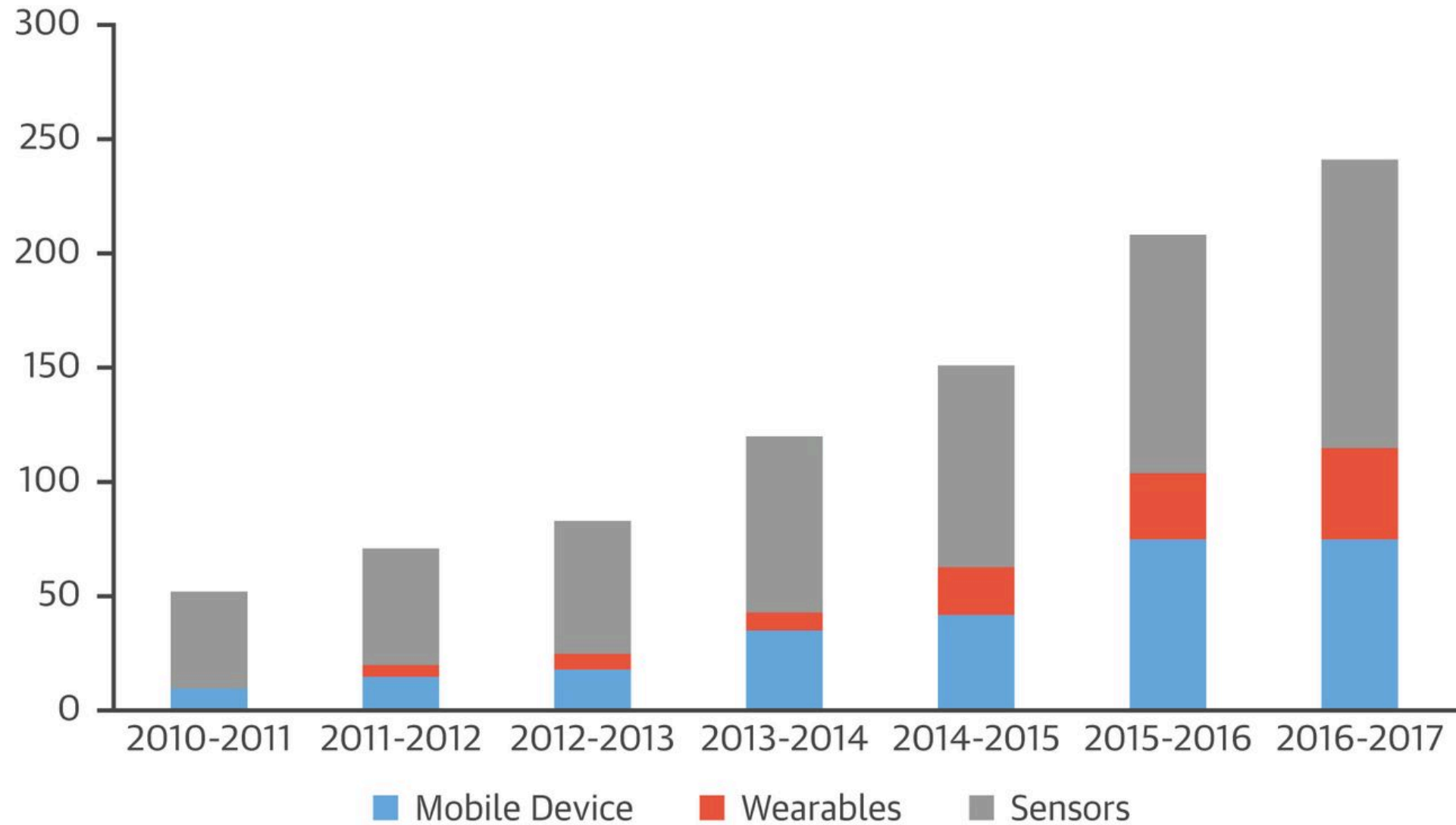
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Disclosures

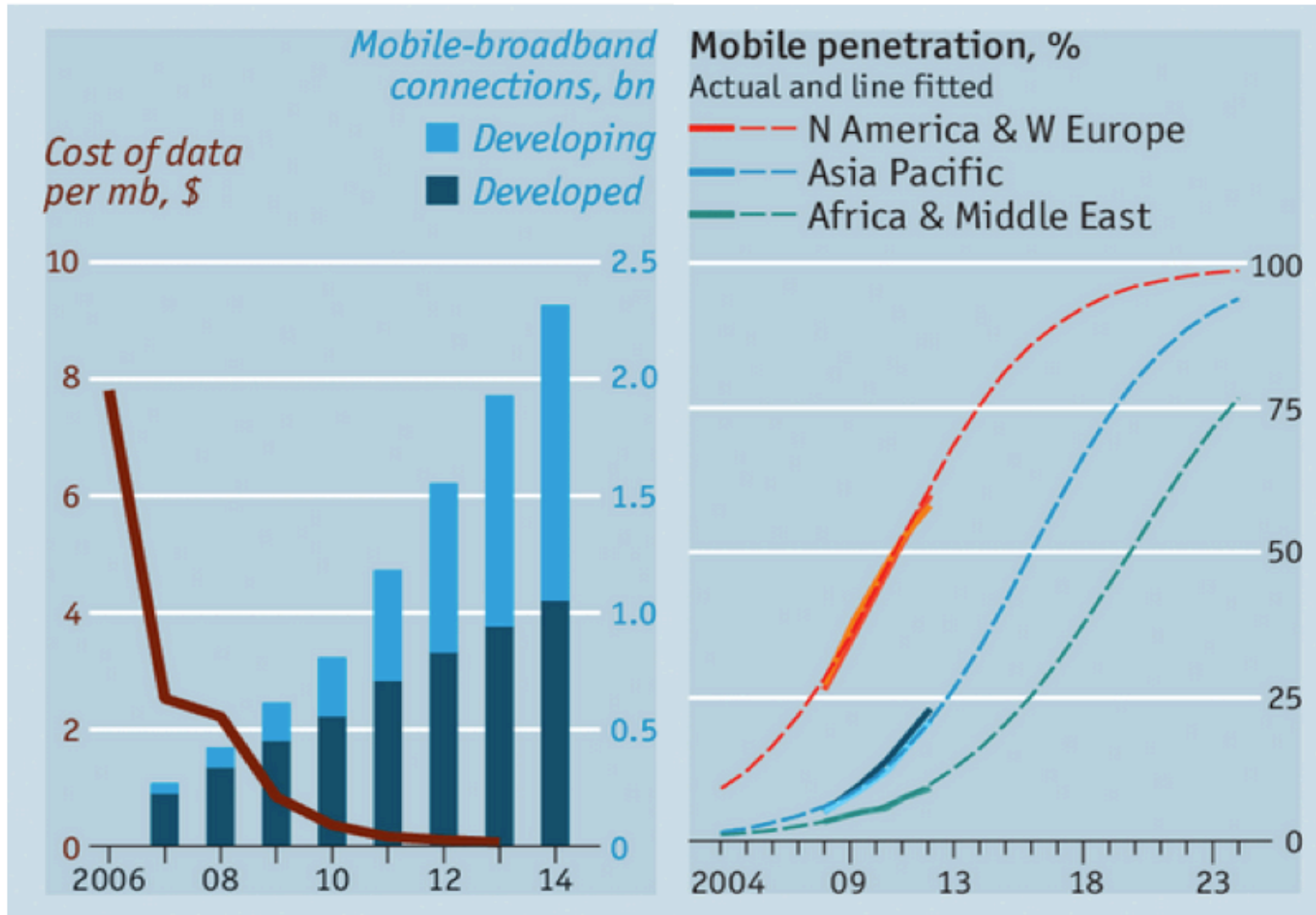
- AHA Strategically Focused Research Network
- ESC Young Investigator Research Grant
- Bayer-Vascular Canadian Cardiovascular Society grant
- Roche Diagnostics
- Takeda
- BMS-Pfizer
- B.I-CVCT Fellow
- Boeringer-Ingelhiem

Agenda

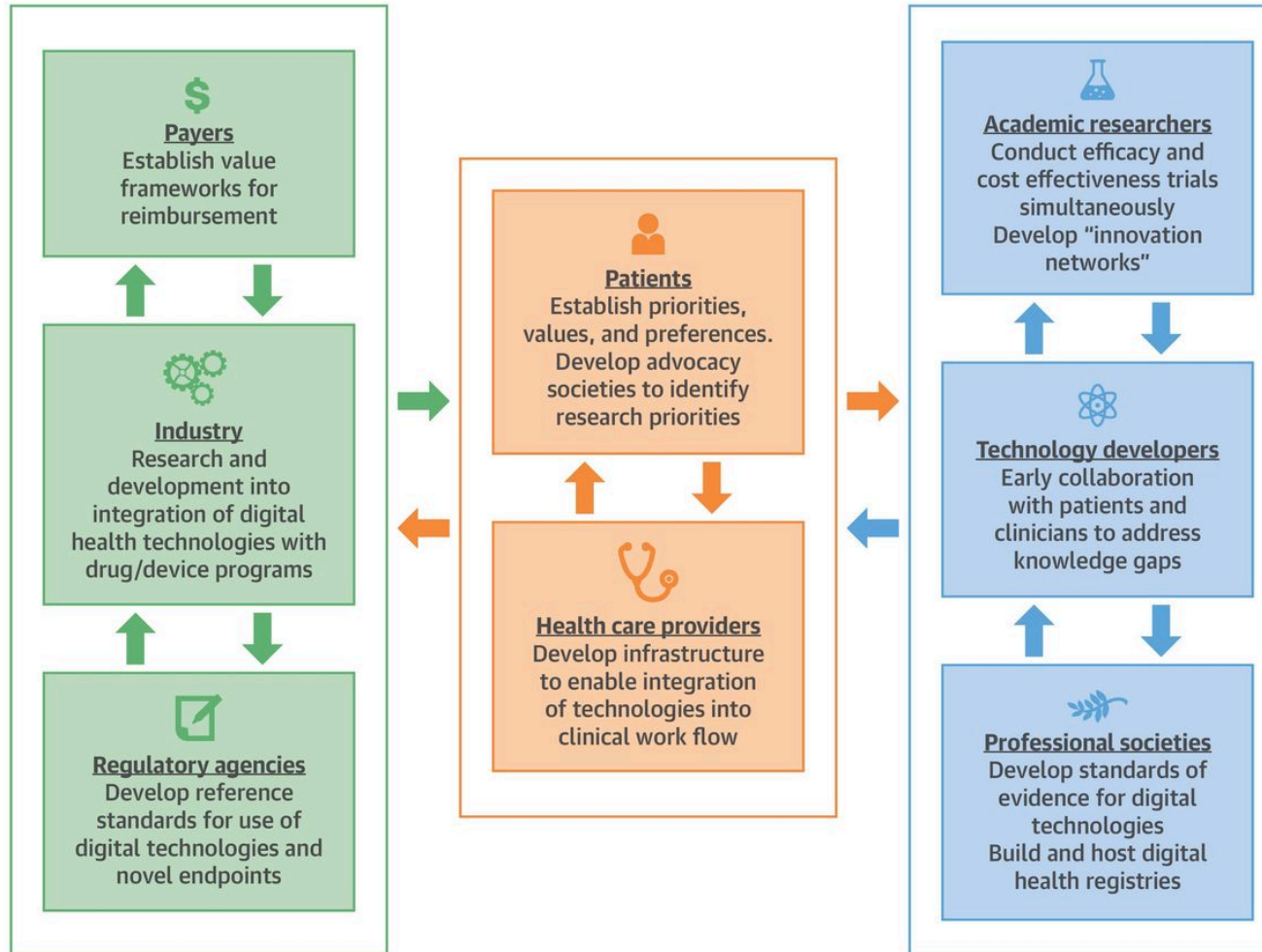
- Introduction
- How can apps and wearables help our patients with HF?
 - Vital signs
 - Medication optimization
 - Physical activity
 - Comorbidity management
- Conclusion and discussion



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



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



Local News

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

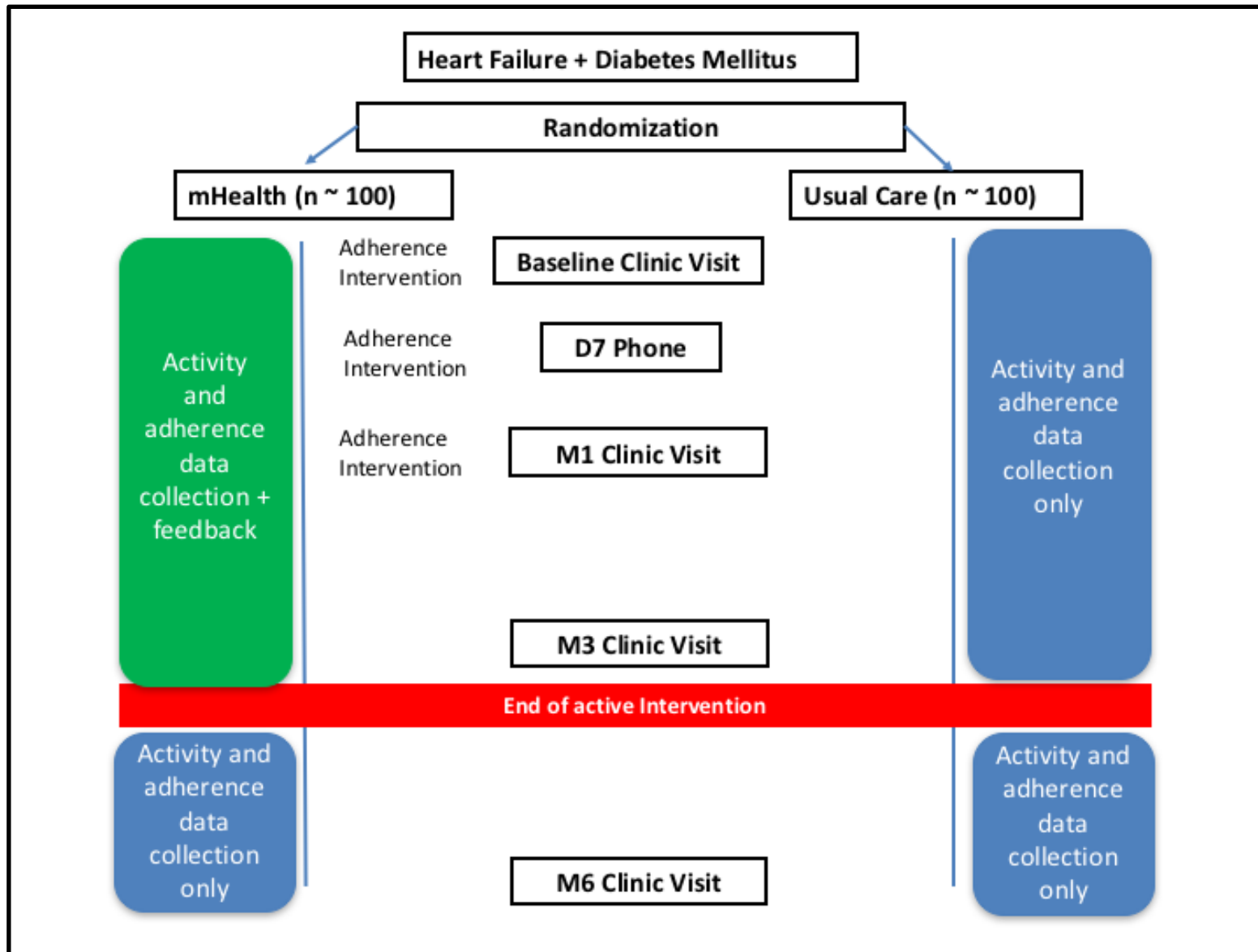


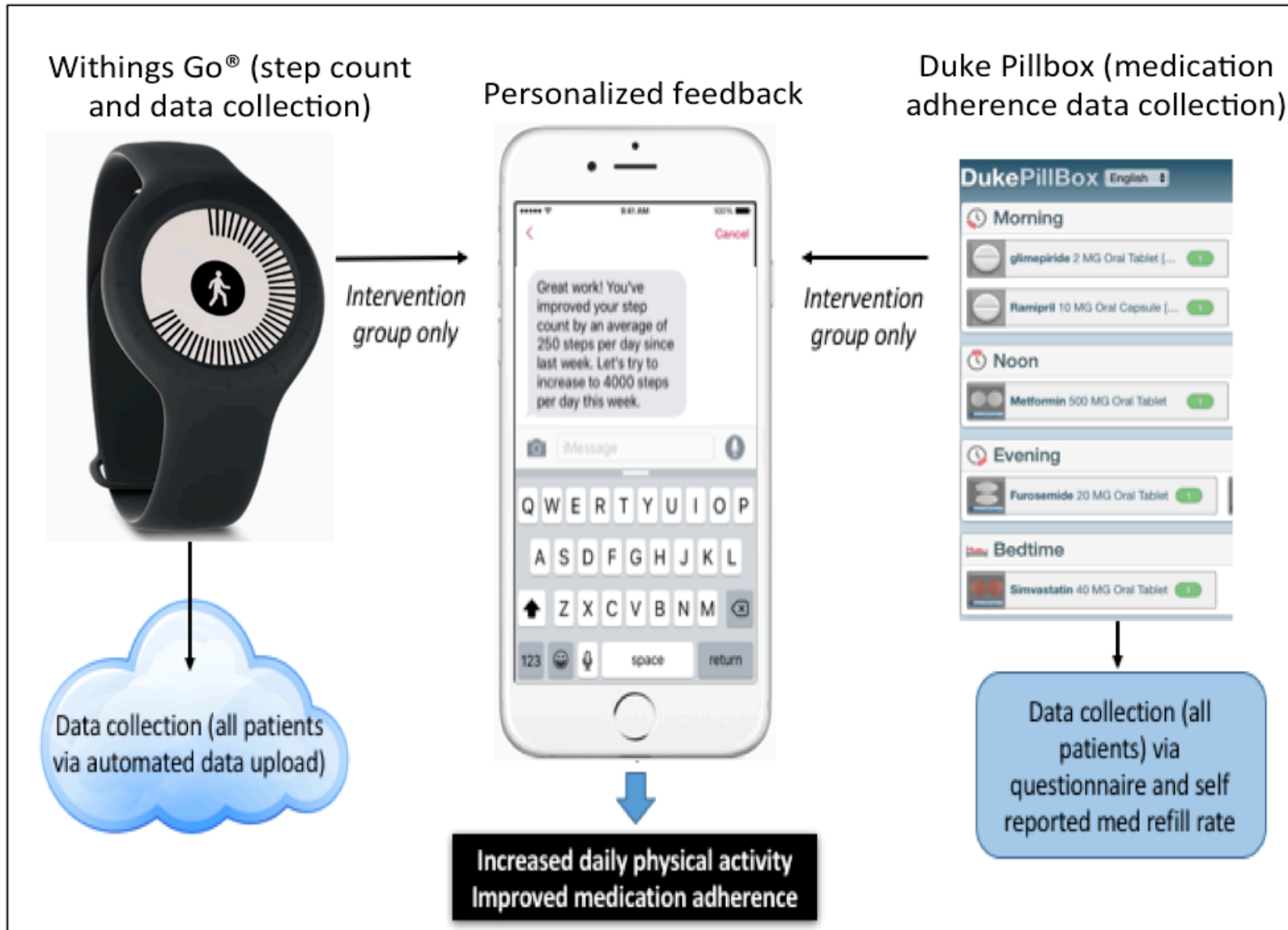
Drug Adherence

- 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





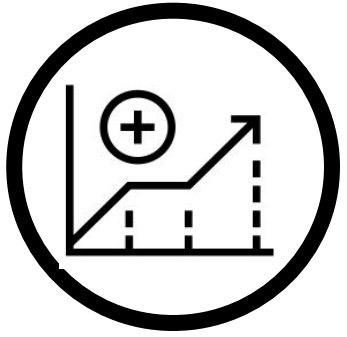


Drug Adherence

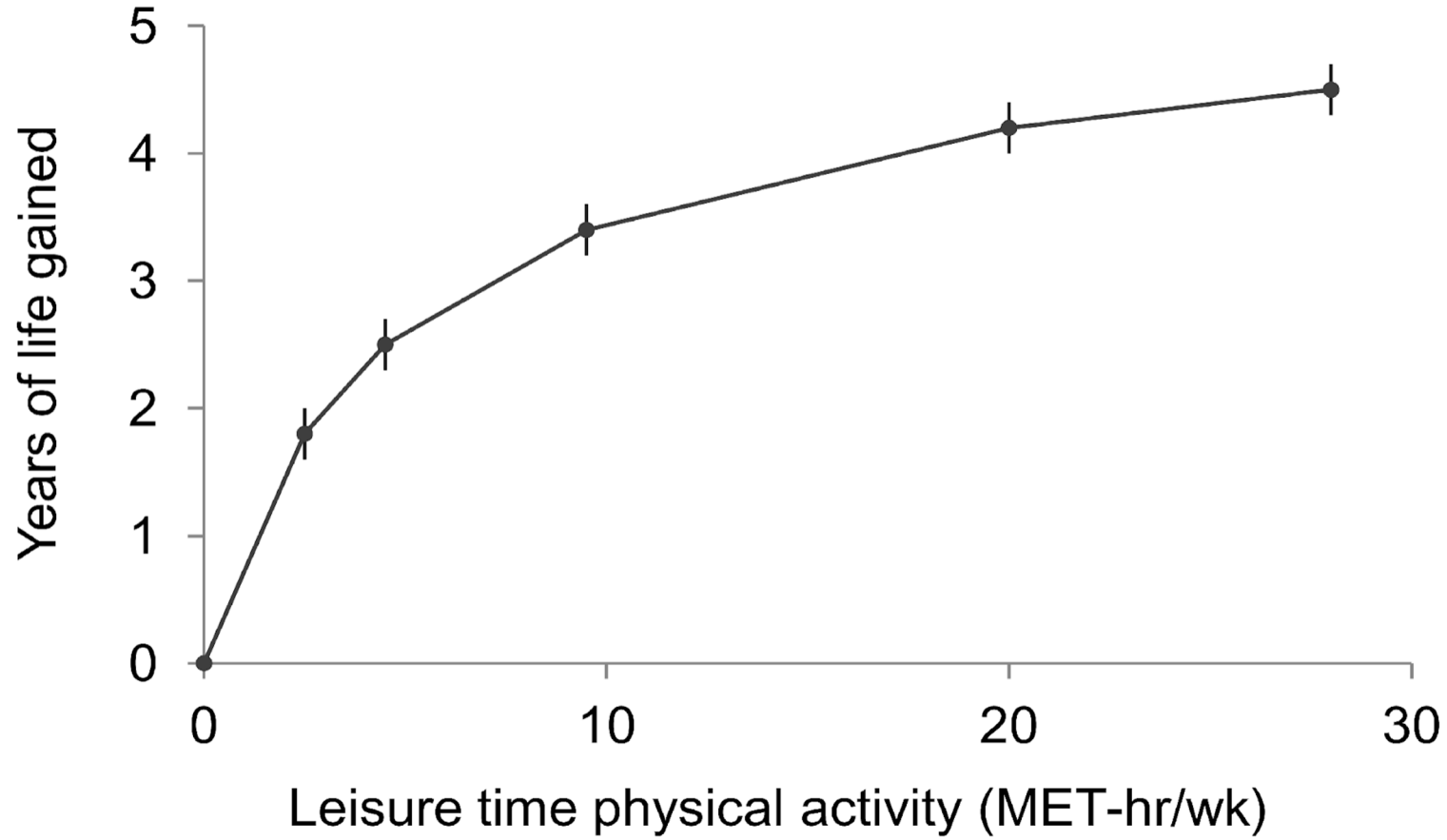


by  pharmacy





Physical Activity



January 2017

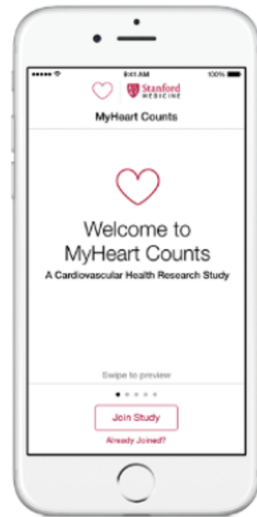
Feasibility of Obtaining Measures of Lifestyle From a Smartphone App

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



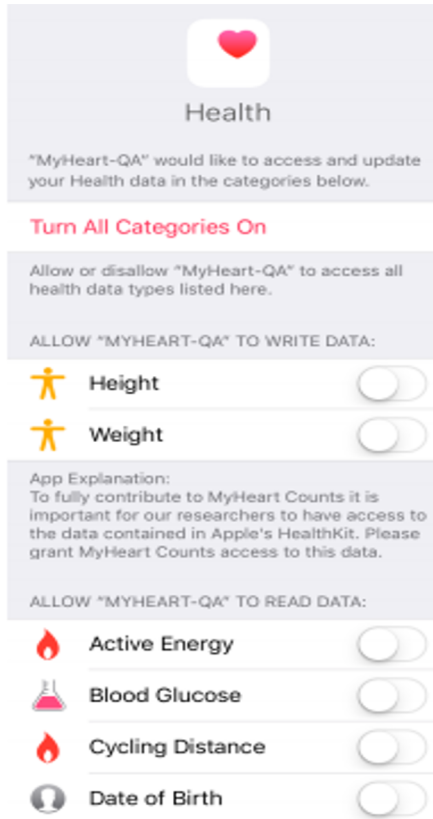
Make *your* heart count!

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

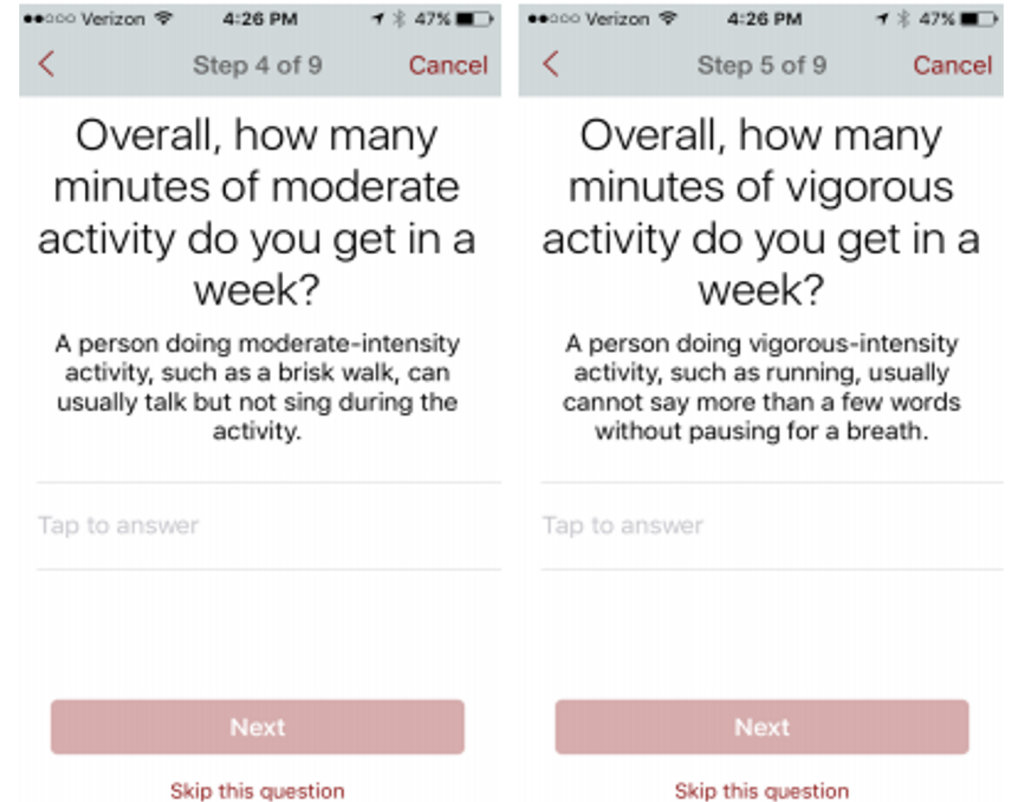
Daily step count and distance walked from Apple platform



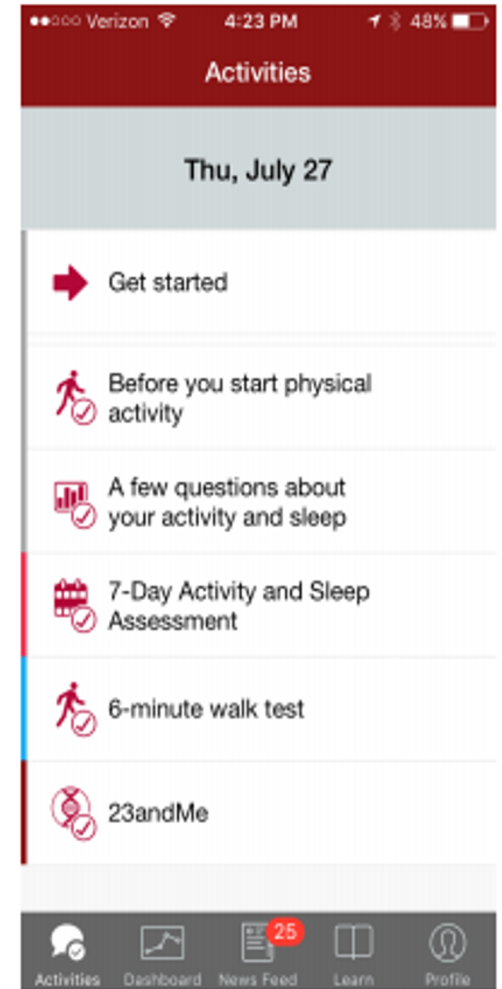
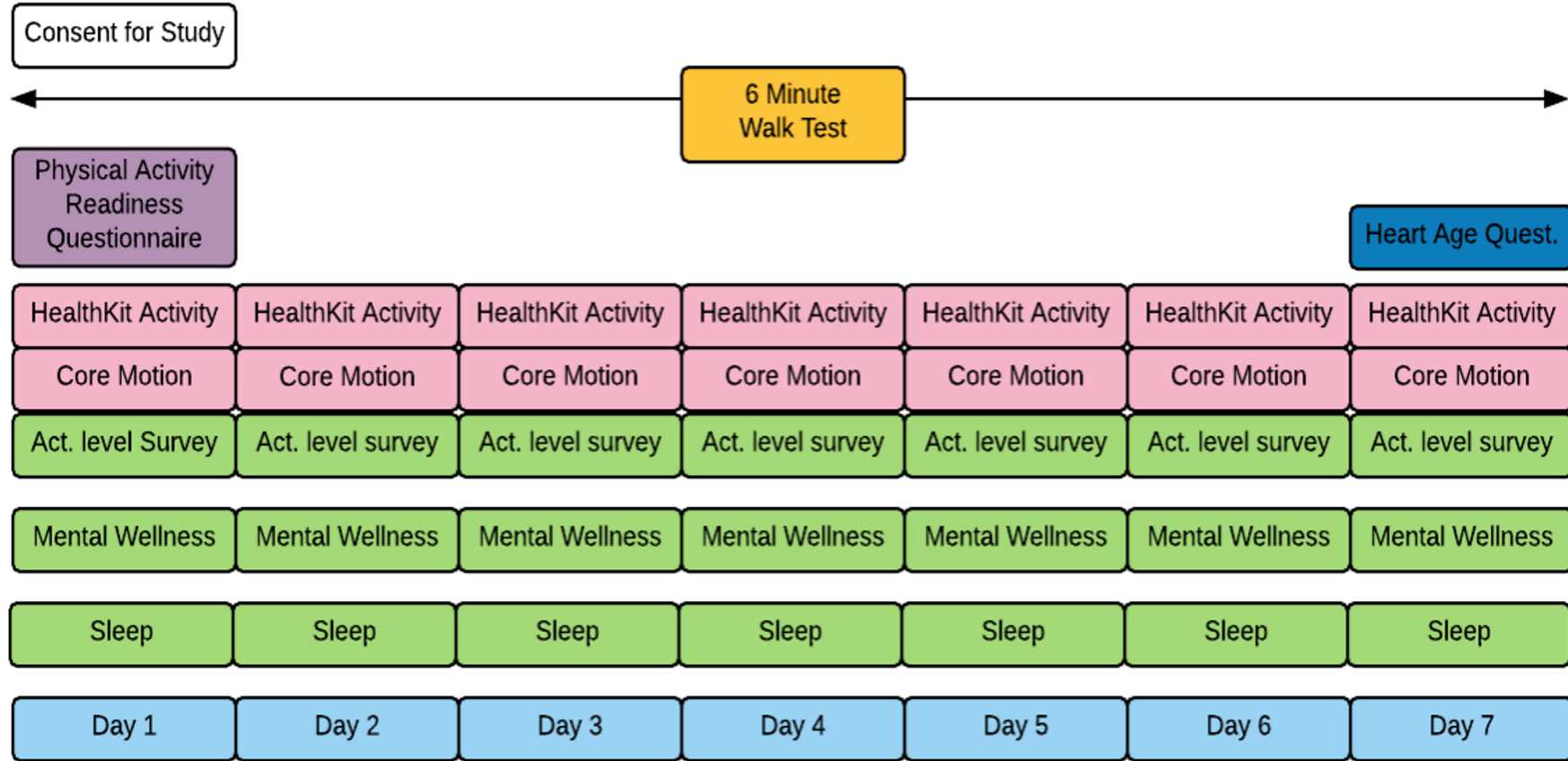
Core motion activity detection from phone accelerometry



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

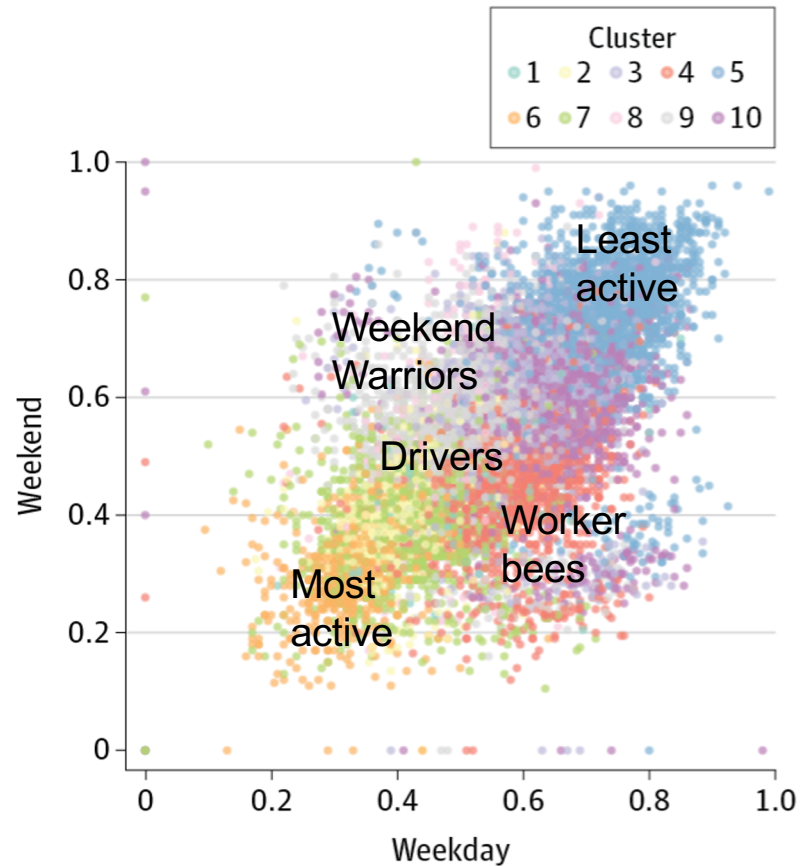


User Flow Through Baseline Week of MHC Study

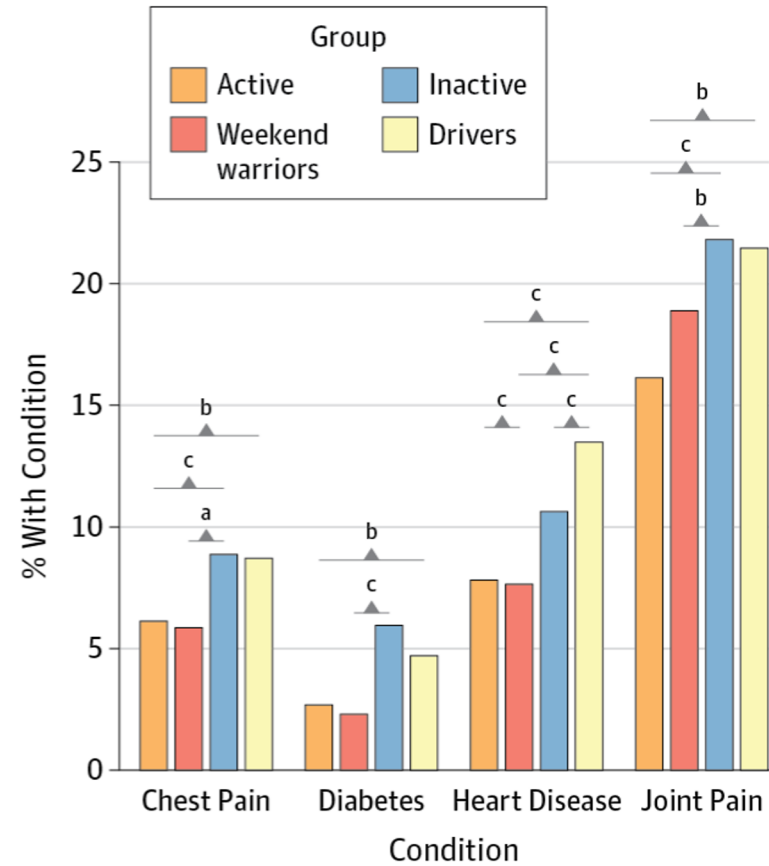


Based on a Week of Baseline Activity Levels, Participants Assigned to One of Five Activity Clusters

A Clusters of recorded physical activity










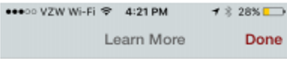
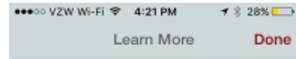
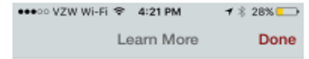
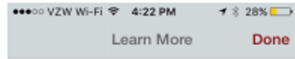
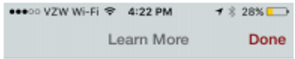
B Probability for individuals in different activity clusters



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

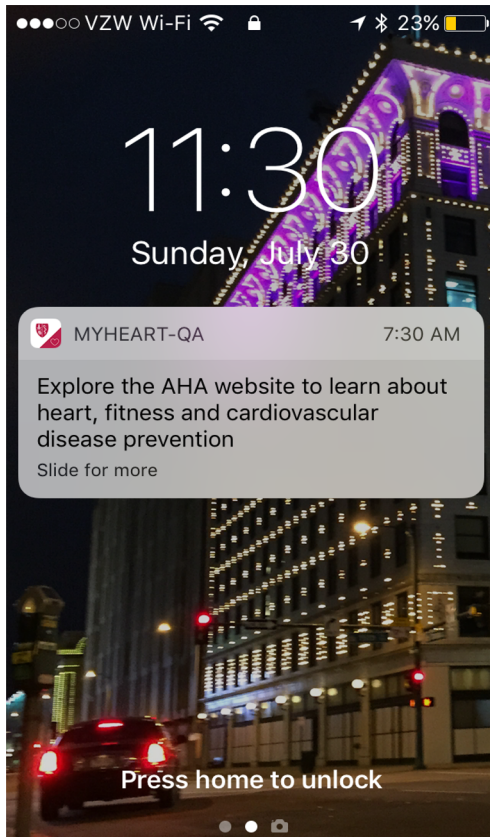
- Primary outcome: Daily step count
- Secondary outcomes:
 - Sleep duration
 - Sleep quality
 - Self-reported daily happiness on a scale of 1 - 10

Mobile Study Consent

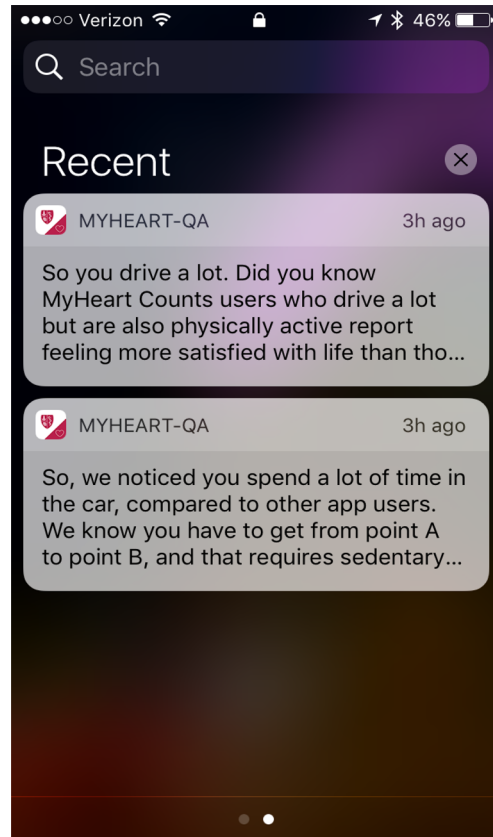
 <h3>Activities</h3> <p>This study will ask you to perform tasks and respond to surveys.</p> <p>Learn more</p> <p>Next</p>	 <h3>Sensor and Health Data</h3> <p>This study will also gather sensor and health data from your iPhone and personal devices with your permission.</p> <p>Learn more</p> <p>Next</p>	 <h3>Data Processing</h3> <p>Collected data may allow researchers, as well as you, to understand patterns and details about heart health.</p> <p>Next</p>	 <h3>Protecting your Data</h3> <p>Your data will be encrypted and sent to a secure database, with your name replaced by a random code.</p> <p>Learn more about how your privacy and identity are protected</p> <p>Next</p>	 <h3>Data Use</h3> <p>Your coded study data will be used for research by Stanford and may be shared with other researchers approved by Stanford.</p> <p>Learn more about how data is used</p> <p>Next</p>	 <h3>Issues to Consider</h3> <p>Your initial participation in this study will take 10-15 minutes per day for a week. We hope that you can contribute to the study for one week every three months.</p> <p>Learn more about the study's impact on your time</p> <p>Next</p>	 <h3>Surveys</h3> <p>Some of the tasks in this study will require you to answer survey questions about health and lifestyle factors.</p> <p>Next</p>
 <p>Learn More Done</p> <p>The MyHeart Counts app will ask you to do 3 activities:</p> <ol style="list-style-type: none">1. Use your phone, or any wearable activity device you have, to collect activity data for 7 days.2. If you are able, perform a 6-minute walk test.3. Enter information about risk factors and blood tests to calculate your risk score and 'heart age'.	 <p>Learn More Done</p> <p>There are sensors in your phone that can help assess activity, plus Apple's Health app on your phone can be linked with other devices to collect health and activity data, with your permission.</p> <p>We will NOT access your personal contacts, other applications, personal photos, texts, or email messages.</p>	 <p>Learn More Done</p> <p>We will use a random code instead of your name on all your study data. The coded study data are also encrypted and stored on a secure server to prevent improper access. This data server is run by Sage Bionetworks, a non-profit research organization. Stanford has secure servers that will maintain your consent and personal information.</p>	 <p>Learn More Done</p> <p>Your coded study data will be combined with data from other participants for analysis. This provides a rich database for research. It also provides a safe way to share the data with other researchers approved by Stanford to learn more about cardiovascular disease. Study data will never be sold to any third party.</p>	 <p>Learn More Done</p> <p>We will ask you survey questions and have you use your phone or wearable device to collect activity data for 7 days. After that, if you are able, there is a 6-minute walk test. You will also need to have your blood pressure and cholesterol information in order to determine your risk score and 'heart age'. You can continue to use the app for activity monitoring and it will ask you to update your data every 3 months.</p>		

Four Interventions Delivered By The MHC Application

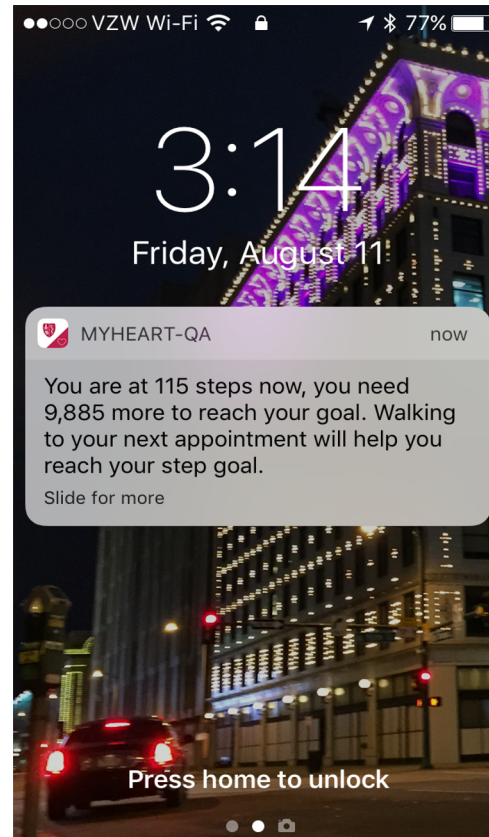
Passive education
(American Heart
Association)



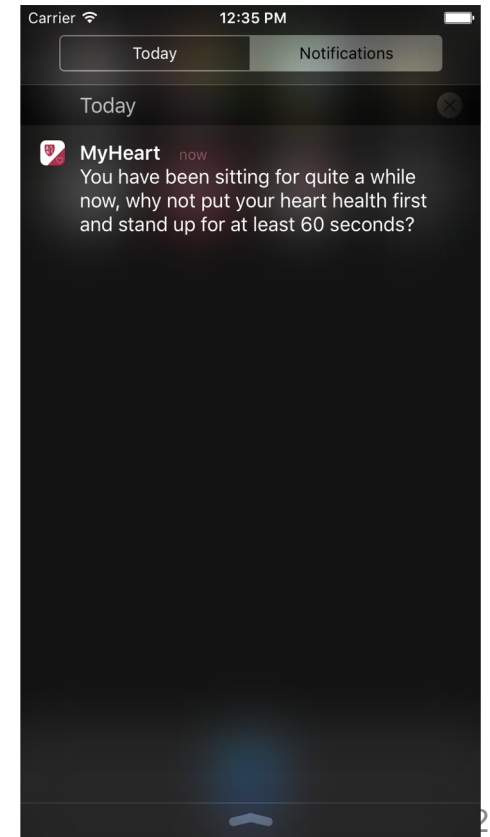
Personalized coaching
based on activity
cluster

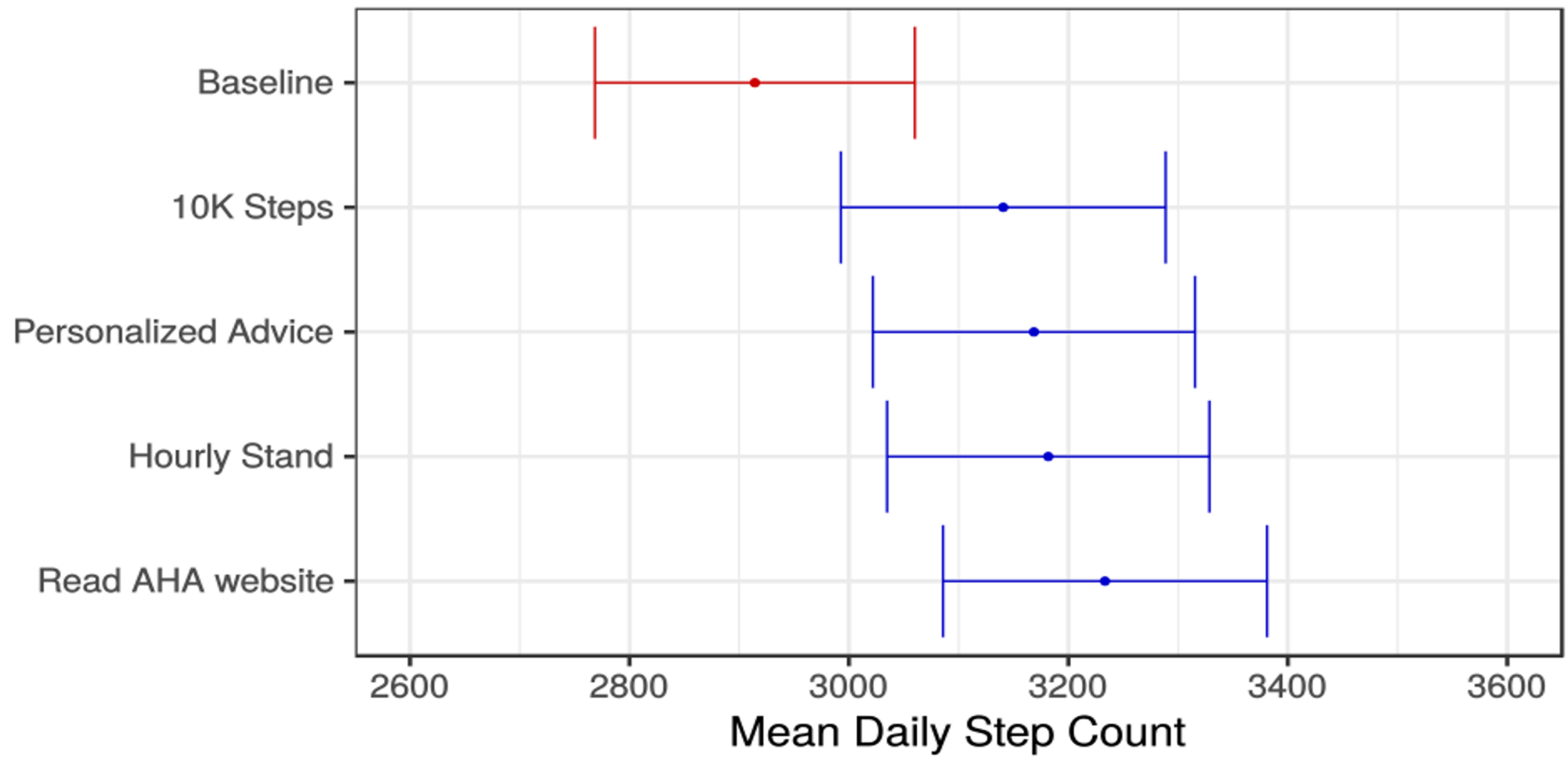


Daily mid-day 10,000
step prompt

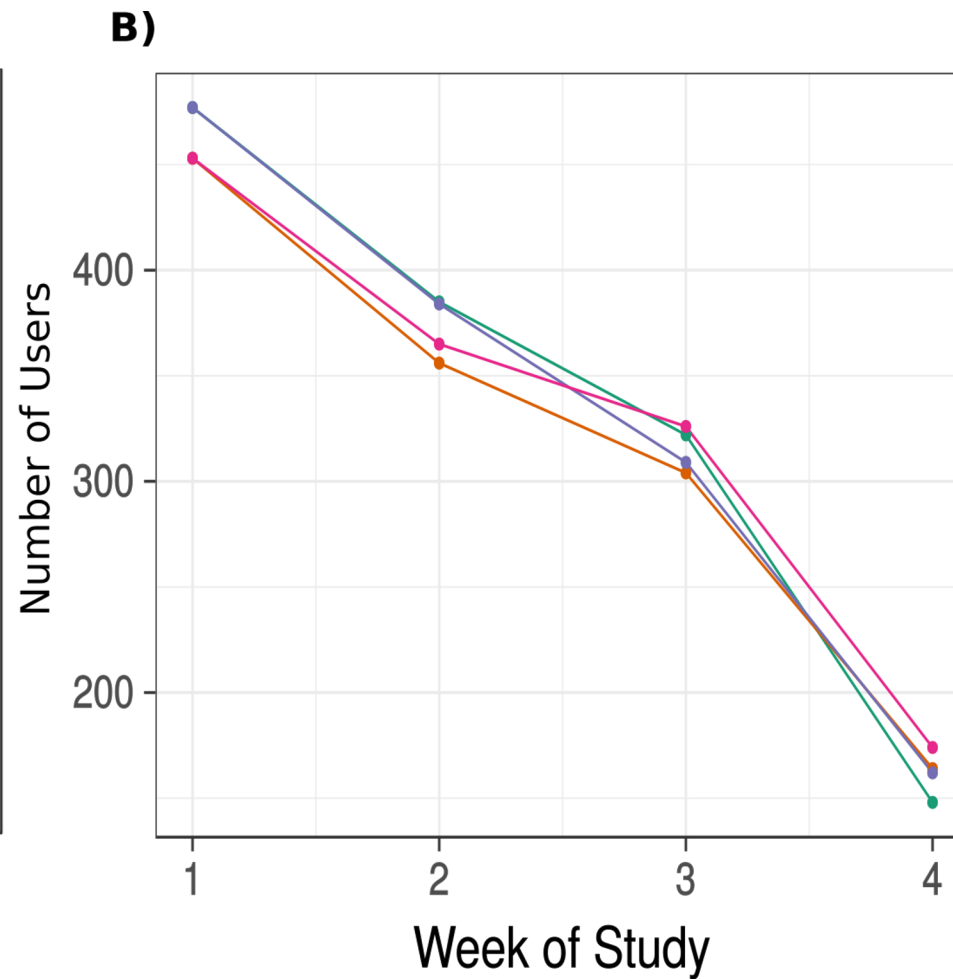
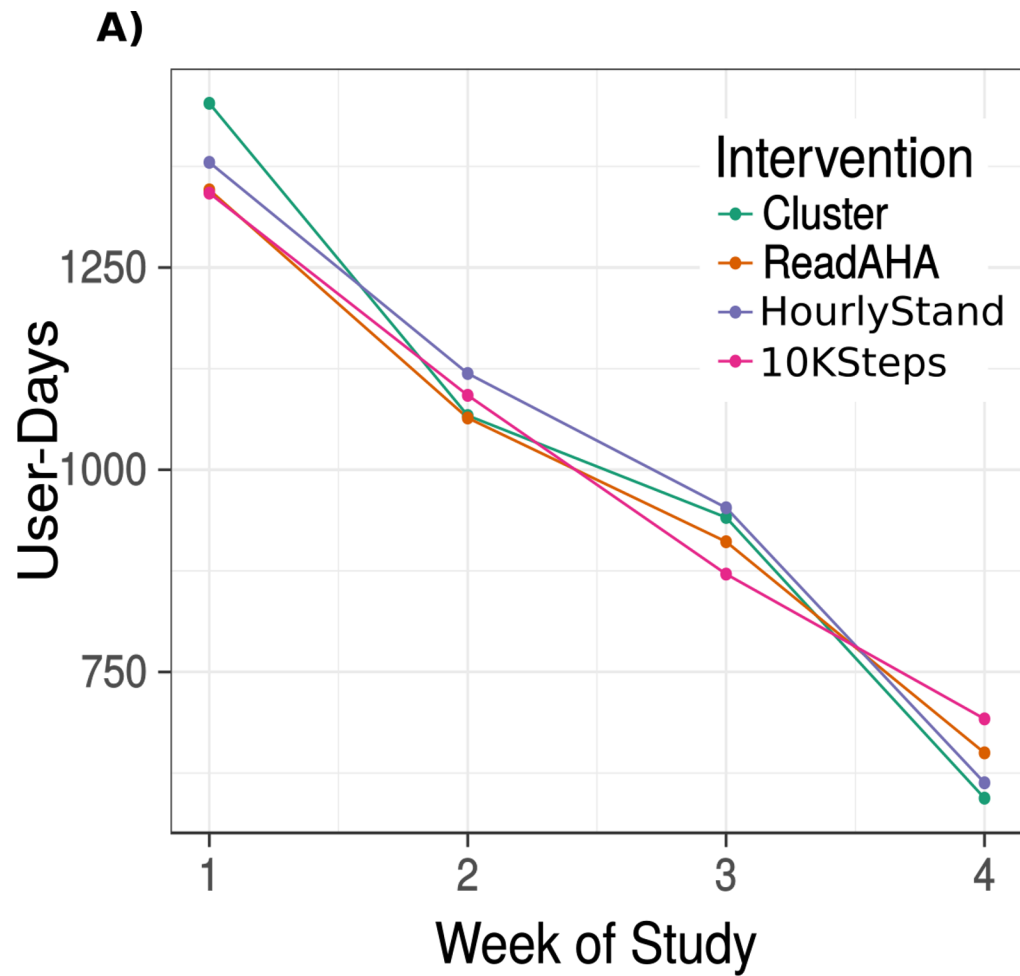


Continuous 1 hour
sedentary trigger to
stand and walk





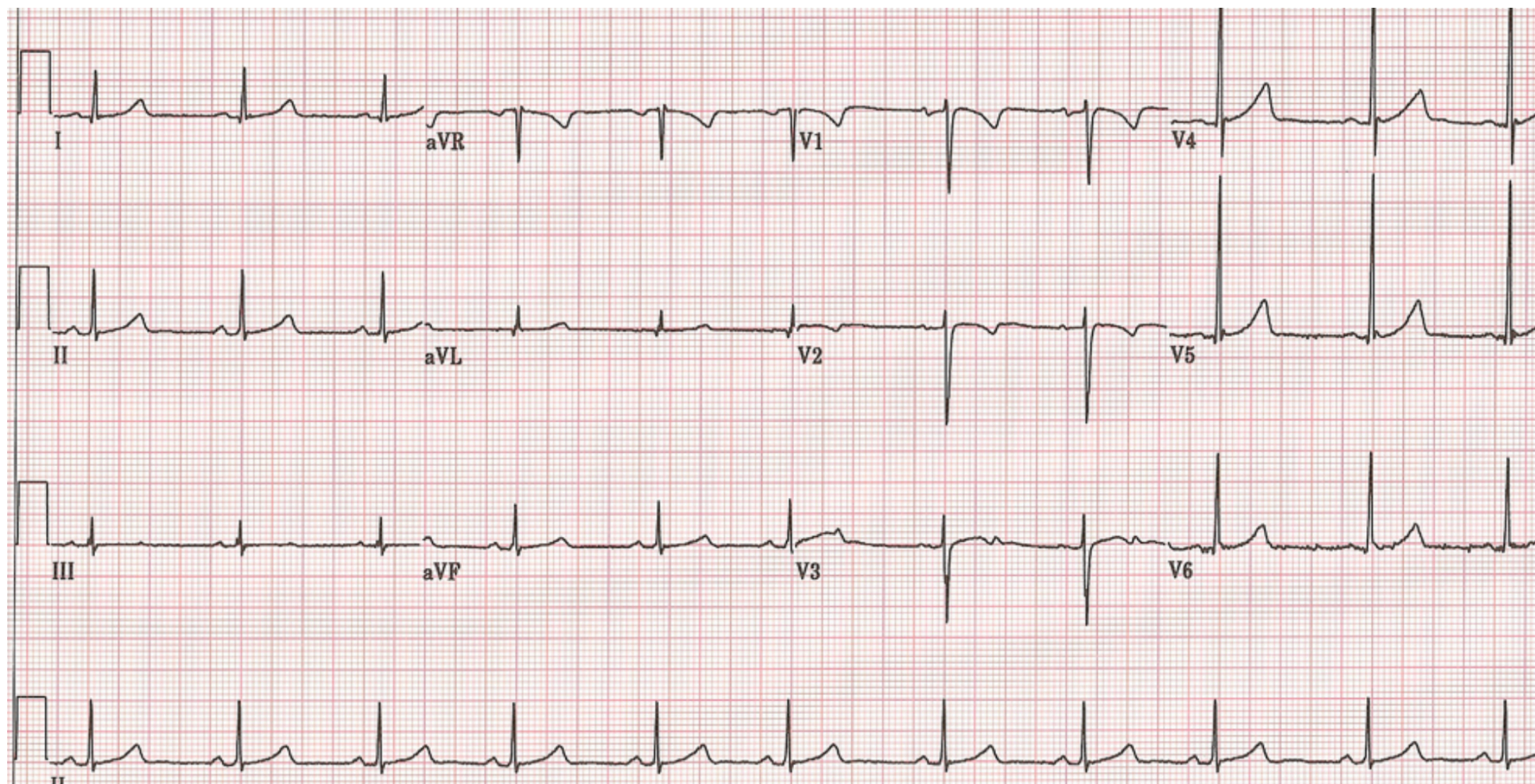
Long-term user engagement is one of the **main challenges** of digital RCT



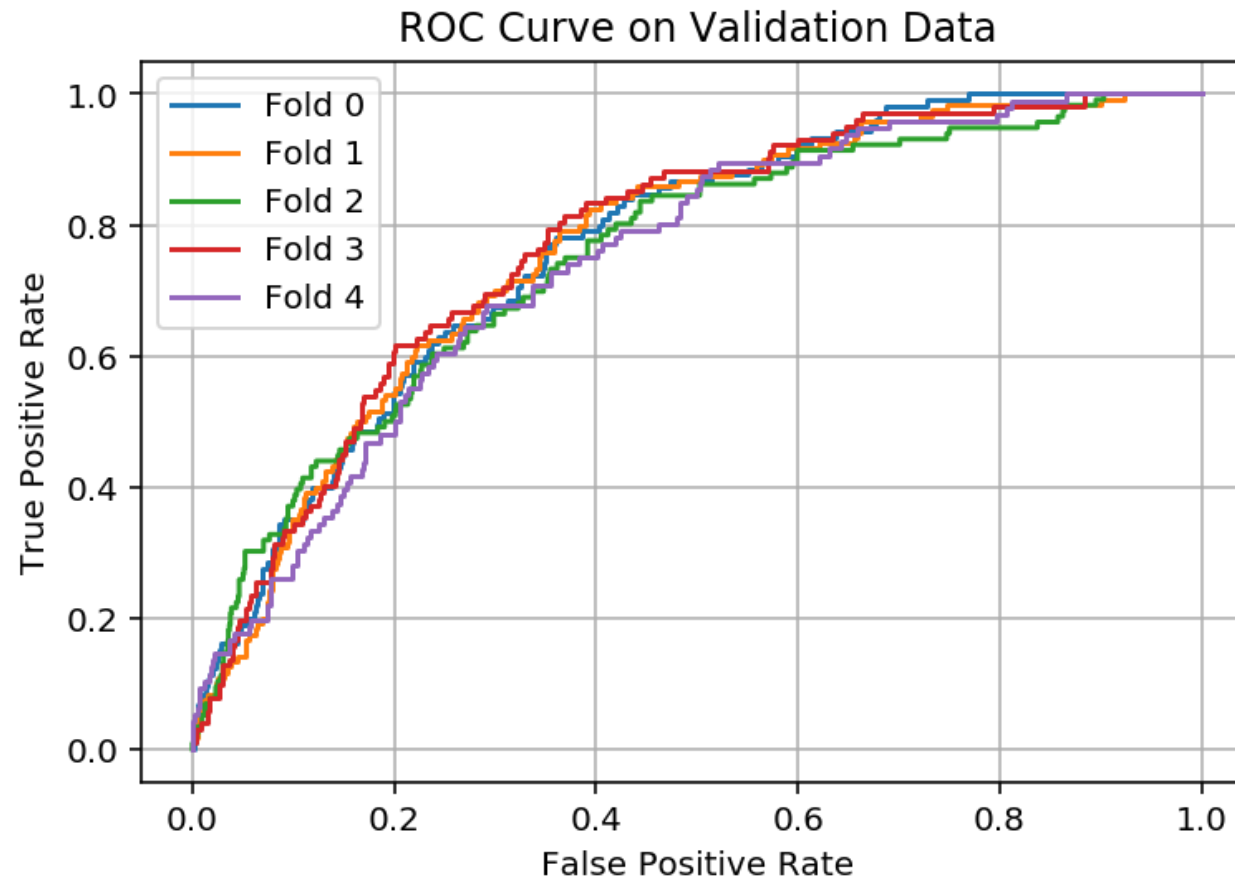


Diagnosing Comorbidities

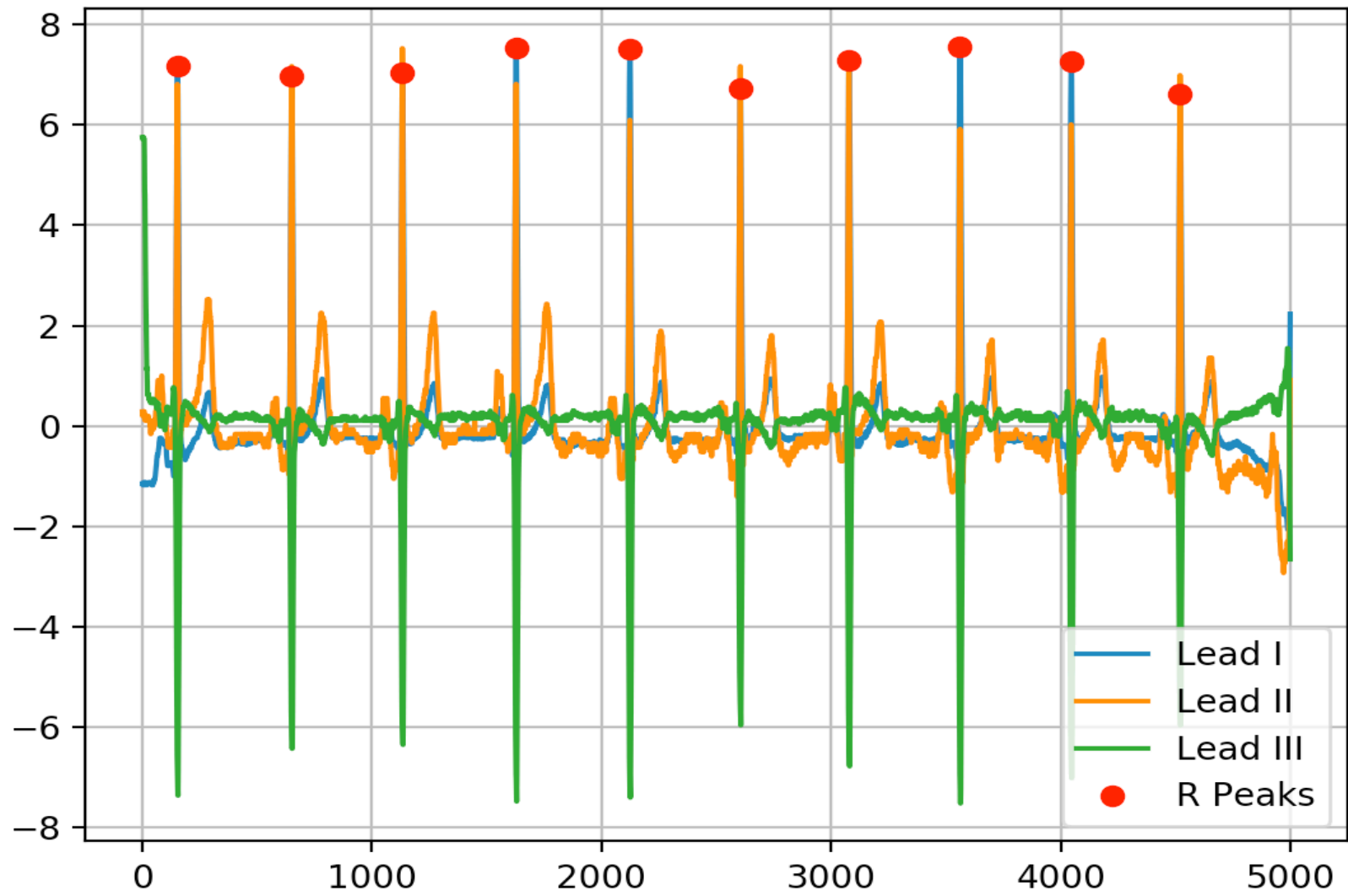
- Challenge in diagnosing and managing comorbidities in patients with HF
- Diabetes is one of the most common comorbidities
- Given the emergence of therapies that can aid in reducing the risk of outcomes of patients with diabetes, we need to increase our ability to screen for such disorders



Deep learning: ECG screening for diabetes



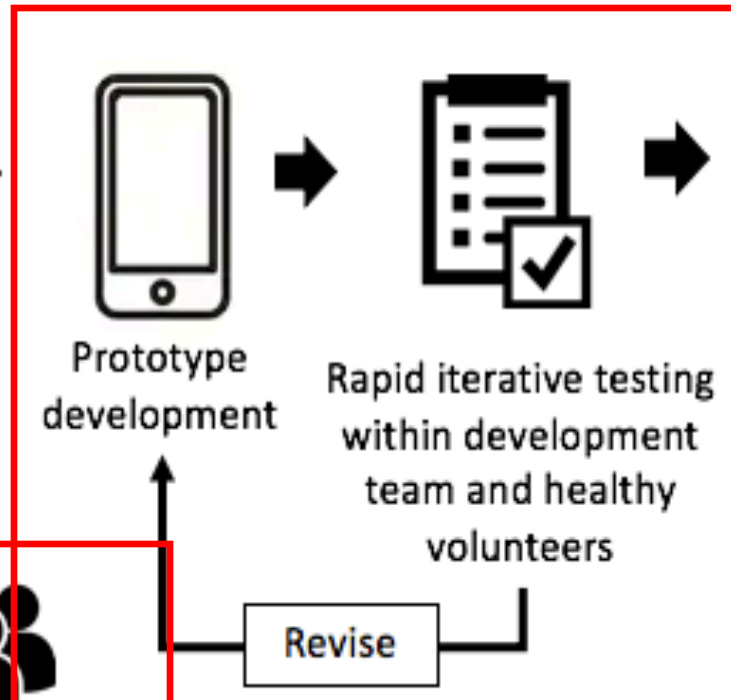
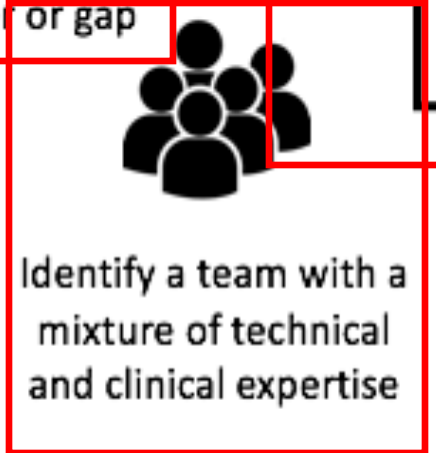
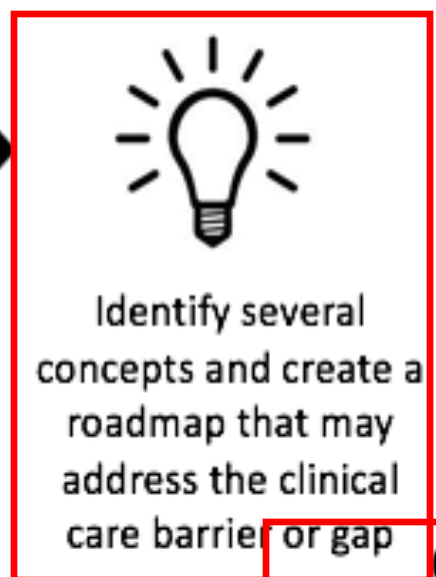
Index: 9 Probability: 0.07354885 HR: 62.11180124223603





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



Thank You!

Questions?

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