Digital Health Design Thinking Workshop for Behavioral Health and Substance Abuse

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Scripps Clinic & Research Institute

2 SAN DIEGO INTEGRATION INSTITUTE

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Educational Funding

Research Funding or Research Support

Board Advisor or Consultancy

Do you use a mHealth device?

A. Yes – all the time
B. Yes – but only when my spouse tells me to
C. No – I'm figuring it out
D. What's mHealth?

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Have You Prescribed an mHealth Device to a Patient?

A. Yes

B. Not yet

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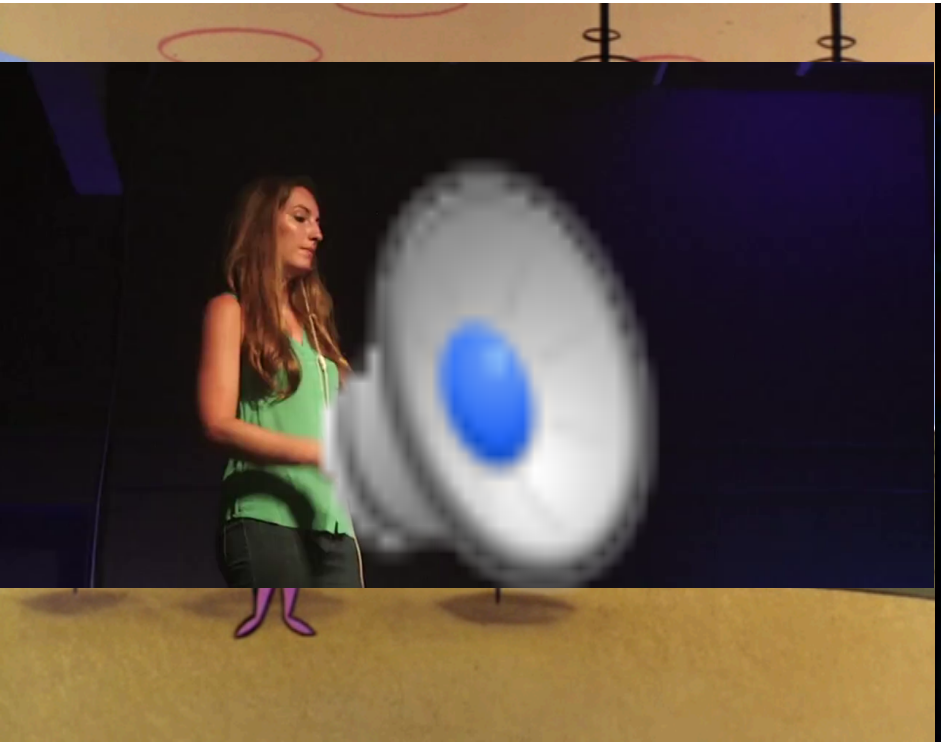
The Jetsons –Predicting the Doctor Patient Interaction 2062 in 1962



- Introduction in to Digital and Mobile Health
- Technologies for Behavioral Change, Addiction and Psychiatry
- Designing Thinking for Digital Health
- Try some Devices

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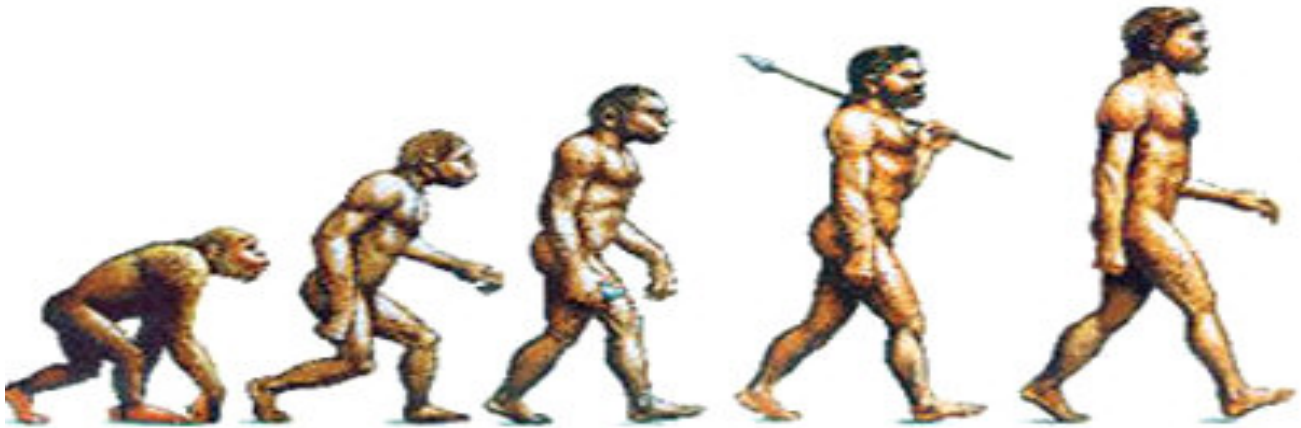
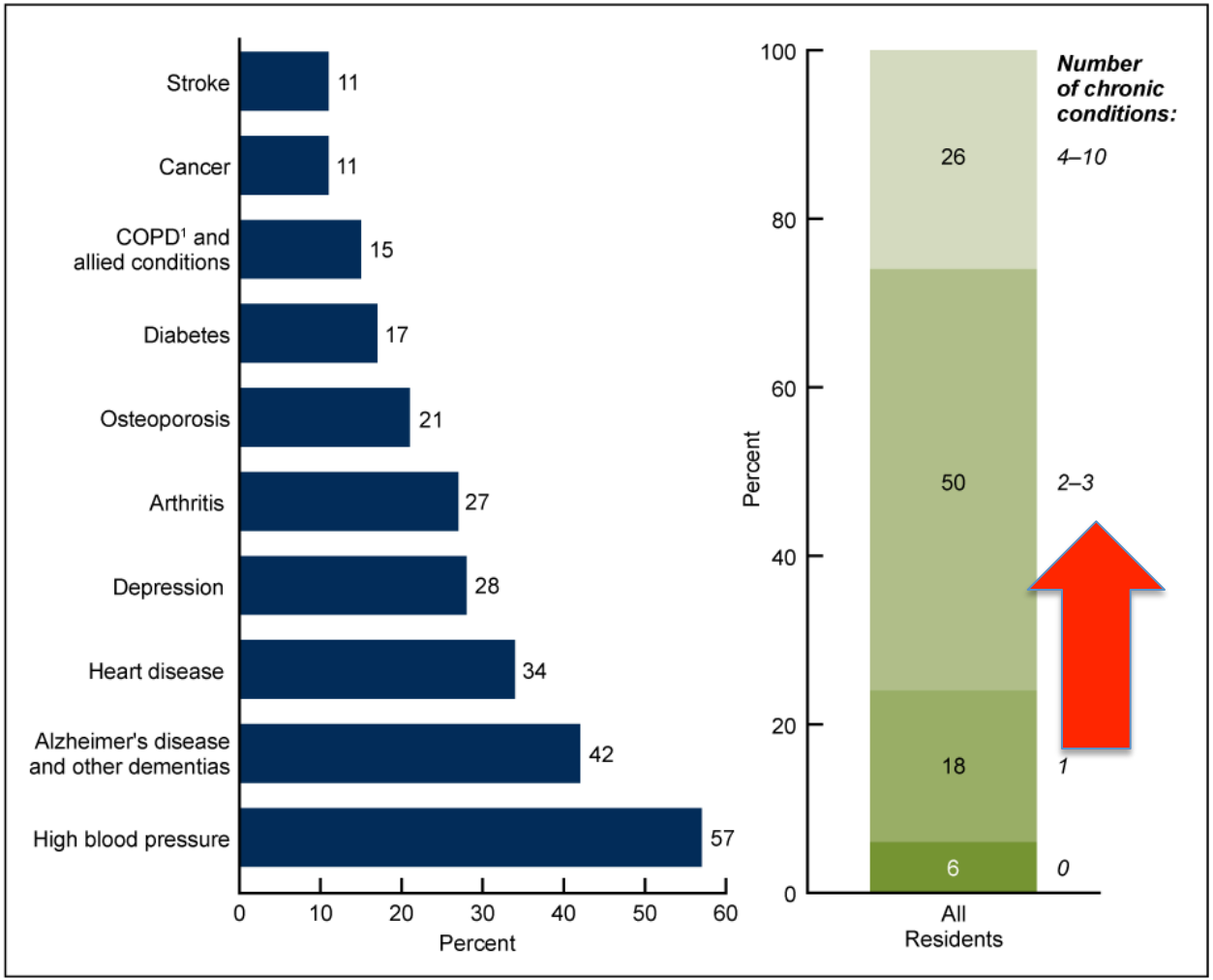
Why Mobile Health?





The Problems

- The average North American above the age of 50 has **2-3** chronic medical conditions
- Major contributor to mental health diseases
- This population will rise to **100 million** by 2030
- Cost of > **4 trillion** dollars per year

Rand Corporation 2014

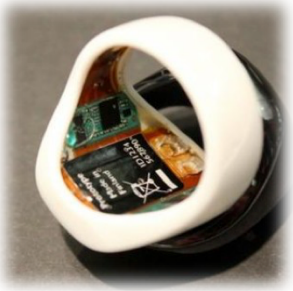
June 19, 2000

November 1, 2007

August 10, 2009

September 11, 2014

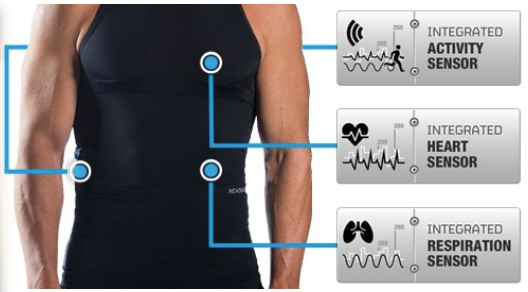
February 23, 2015



Smart Ring

Smart Tablet

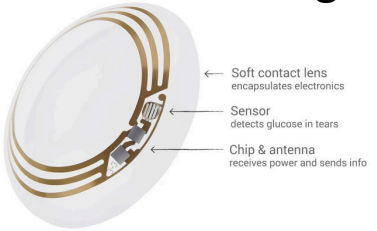
Smart Skin



Smart Clothing

Smartphone Exam

Smart Pills



Smart Contact Lens

Smartphone Ultrasound

Smart Necklace

Smartphone Lab Testing

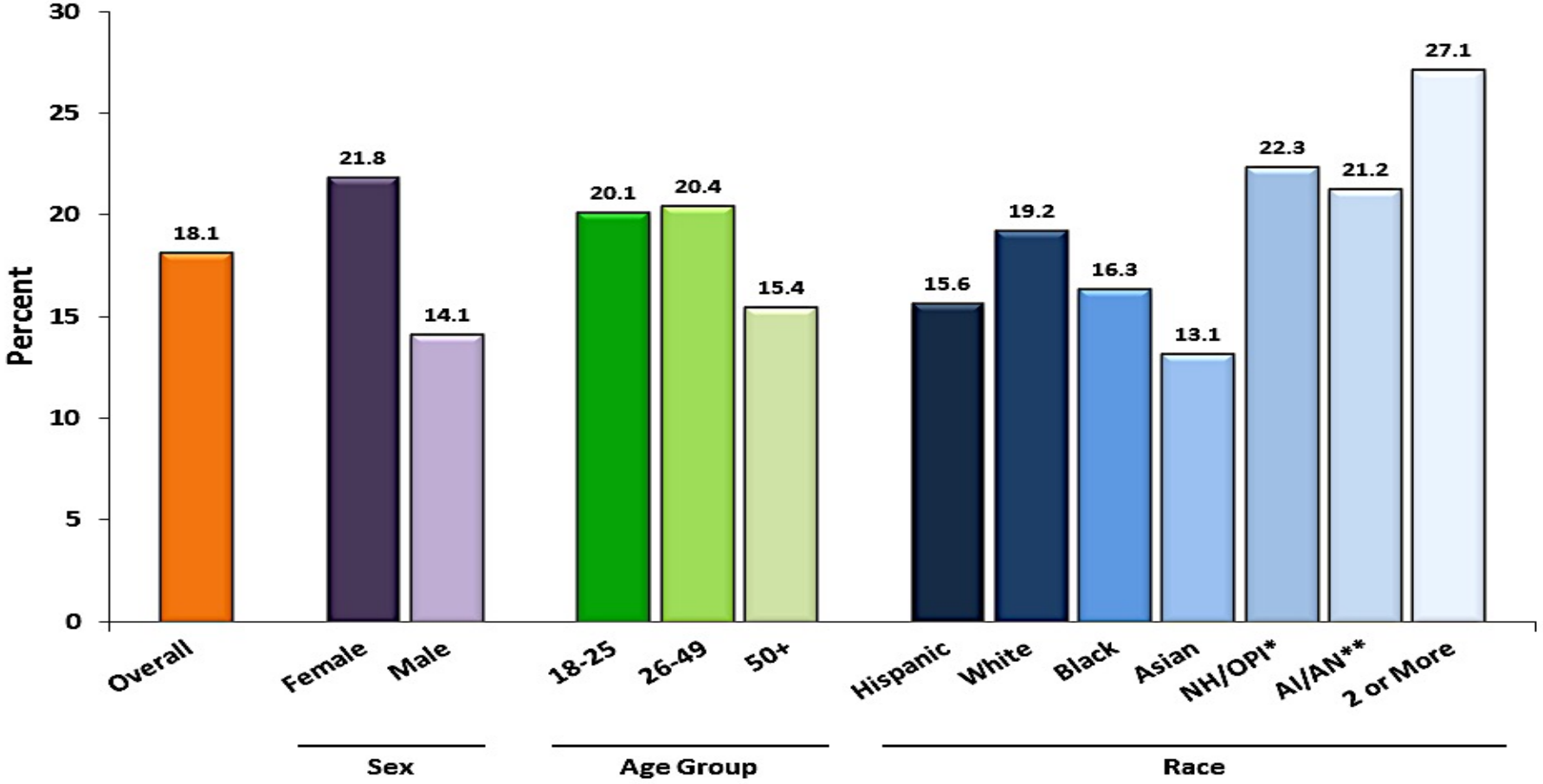
Smart Genome Sequencing

Seizure

Glucose

Smart Watch

Prevalence of Any Mental Illness Among U.S. Adults (2014)



Data courtesy of SAMHSA

*NH/OPI = Native Hawaiian/Other Pacific Islander
**AI/AN = American Indian/Alaska Native

Vital Signs: Demographic and Substance Use Trends Among Heroin Users — United States, 2002–2013

Christopher M. Jones, PharmD[1]; Joseph Logan, PhD[2]; R. Matthew Gladden, PhD[3]; Michele K. Bohm, MPH[3] (Author affiliations at end of text)

On July 7, 2015, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Abstract

Background: Heroin use and overdose deaths have increased significantly in the United States. Assessing trends in heroin use among demographic and particular substance-using groups can inform prevention efforts.

Methods: FDA and CDC analyzed data from the National Survey on Drug Use and Health and National Vital Statistics System reported during 2002–2013. Trends in heroin use among demographic and substance using groups were compared for 2002–2004, 2005–2007, 2008–2010, and 2011–2013. A multivariable logistic regression model was used to identify characteristics associated with heroin abuse or dependence.

Results: Annual average rates of past-year heroin use increased from 1.6 per 1,000 persons aged ≥12 years in 2002–2004 to 2.6 per 1,000 in 2011–2013. Rates of heroin abuse or dependence were strongly positively correlated with rates of heroin-related overdose deaths over time. For the combined data years 2011–2013, the odds of past-year heroin abuse or dependence were highest among those with past-year cocaine or opioid pain reliever abuse or dependence.

Conclusions: Heroin use has increased significantly across most demographic groups. The increase in heroin abuse or dependence parallels the increase in heroin-related overdose deaths. Heroin use is occurring in the context of broader poly-substance use.

Implications for Public Health Practice: Further implementation of a comprehensive response that targets the wider range of demographic groups using heroin and addresses the key risk factors for heroin abuse and dependence is needed. Specific response needs include reducing inappropriate prescribing and use of opioids through early identification of persons demonstrating problematic use, stronger prescription drug monitoring programs, and other clinical measures; improving access to, and insurance coverage for, evidence-based substance abuse treatment, including medication-assisted treatment for opioid use disorders; and expanding overdose recognition and response training and access to naloxone to treat opioid pain reliever and heroin overdoses.

The Promises of mHealth

TAKE TWO
WEARABLES
AND CALL ME
IN THE MORNING

BRIAN S HALL

Expectations

- Engagement
- Behavioral change
- Increased self-monitoring
- Cost efficient healthcare delivery

Rand Corporation 2014

Scripps

What are Your Technology Needs?

VIEWPOINT

Wearable Devices as Facilitators, Not Drivers, of Health Behavior Change

Mitesh S. Patel, MD, MBA, MS
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David A. Asch, MD, MBA
Philadelphia VA Medical Center, University of Pennsylvania, Philadelphia.

Kevin G. Volpp, MD, PhD
Philadelphia VA Medical Center, University of Pennsylvania, Philadelphia.

Author Reading at jama.com

Several large technology companies including Apple, Google, and Samsung are entering the expanding market of population health with the introduction of wearable devices. This technology, worn in clothing or accessories, is part of a larger movement often referred to as the "quantified self." The notion is that by recording and reporting information about behaviors such as physical activity or sleep patterns, these devices can educate and motivate individuals toward better habits and better health. The gap between recording information and changing behavior is substantial, however, and while these devices are increasing in popularity, little evidence suggests that they are bridging that gap.

Only 1% to 2% of individuals in the United States have used a wearable device, but annual sales are projected to increase to more than $50 billion by 2018.[1] Some of these devices aim at individuals already motivated to change their health behaviors. Others are being considered by health care organizations, employers, insurers, and clinicians who see promise in using these devices to better engage less motivated individuals. Some of these devices may justify that promise, but less because of their technology and more because of the behavioral change strategies that can be designed around them.

Medical News & Perspectives

Is There an App to Solve App Overload?

Bridget M. Kuehn, MSJ

Like many physicians, Suzanne Clough, MD, struggled to meet her patients' needs regarding their type 2 diabetes in a few 12-minute visits each year. But too often, patients' concerns about day-to-day condition management weren't fully addressed. Many were frustrated, and some didn't follow her guidance because they weren't seeing results.

The recommendations, she said, "didn't have value [for them]."

Clough wondered whether real-time, 24/7 diabetes management support would help. That question led her on a 10-year journey to develop the WellDoc BlueStar mobile app for patients with type 2 diabetes. It analyzes trends in patient-entered data on blood glucose level, carbohydrate consumption, medication use, and other information to provide real-time coaching for the patient. Patients can then securely share the data with their physician through a web portal.

The WellDoc BlueStar app is part of an exploding medical app market, with an estimated 660 million downloads of health-related apps in 2013 alone, according to a report by the IMS Institute for Healthcare

Electronic Health Records

EHR notification overload costs doctors an hour a workday, JAMA says

Primary care doctors are subject to twice as many notifications as specialists, researchers found, but both are facing information overload.

By Jack McCarthy | March 17, 2016 | 08:37 AM

Clinical update

Mobile technology and the digitization of healthcare

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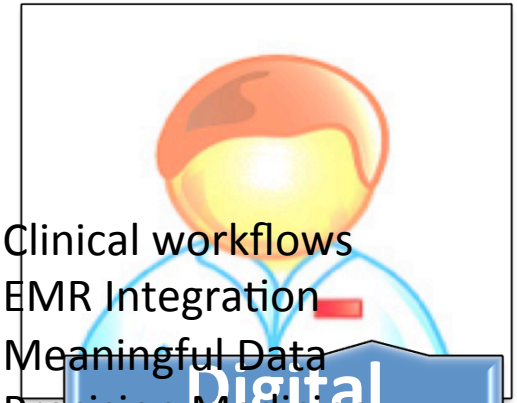
Received 20 October 2015; revised 9 December 2015; accepted 30 December 2015

The convergence of science and technology in our dynamic digital era has resulted in the development of innovative digital health devices that allow easy and accurate characterization in health and disease. Technological advancements and the miniaturization of diagnostic instruments to modern smartphone-connected and mobile health (mHealth) devices such as the iECG, handheld ultrasound, and lab-on-a-chip technologies have led to increasing enthusiasm for patient care with promises to decrease healthcare costs and to improve outcomes. This 'hype' for mHealth has recently intersected with the 'real world' and is providing important insights into how patients and practitioners are utilizing digital health technologies. It is also raising important questions regarding the evidence supporting widespread device use. In this state-of-the-art review, we assess the current literature of mHealth and aim to provide a framework for the advances in mHealth by understanding the various device, patient, and clinical factors as they relate to digital health from device designs and patient engagement, to clinical workflow and device regulation. We also outline new strategies for generation and analysis of mHealth data at the individual and population-based levels.

Keywords Digital health • mHealth • Medical technology • Sensors • Patient-generated data

The Digital Health Paradigm

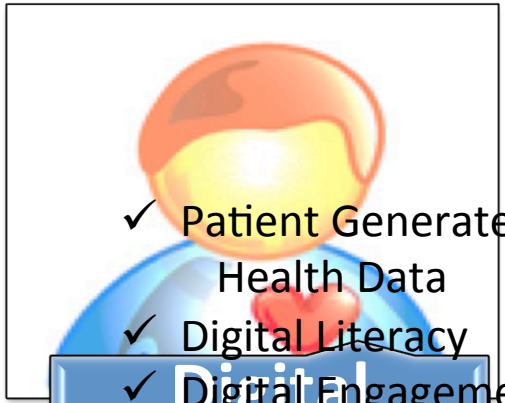


Digital Doctors

- ✓ Clinical workflows
- ✓ EMR Integration
- ✓ Meaningful Data
- ✓ Precision Medicine
- ✓ Population Medicine
- ✓ BigData & Informatics
- ✓ Regulation
- ✓ Reimbursement

Digital Devices

- ✓ Device Designs
- ✓ Apps
- ✓ Wearables
- ✓ Wireless Devices
- ✓ Sensors
- ✓ Robotics
- ✓ Implantables
- ✓ Handheld Imaging
- ✓ Interoperability



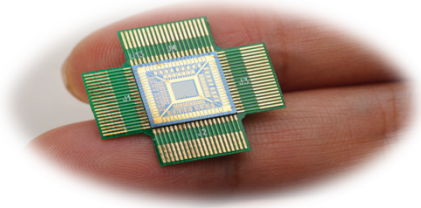
Digital Patients

- ✓ Patient Generated Health Data
- ✓ Digital Literacy
- ✓ Digital Engagement
- ✓ Digital Retention
- ✓ Social Media
- ✓ Senior Care

Bhavnani S. Mobile Technology and the Digitization of Healthcare. Eur J Heart 2016

Apps
Build Your Own

Smart Medications



Sensors

Online Platforms

Virtual Reality

New Technologies

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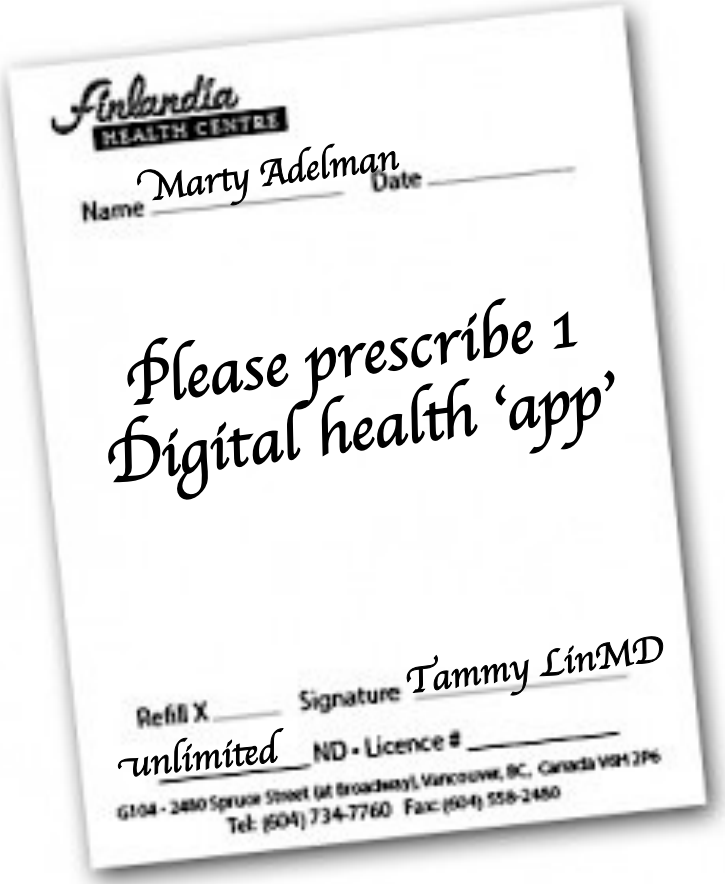
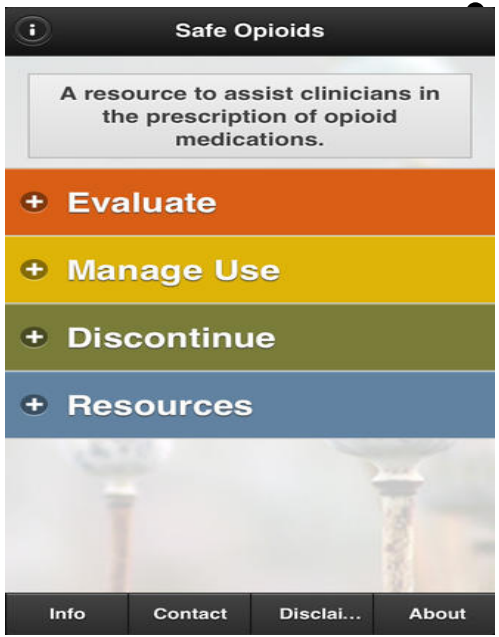

Anlandia
HEALTH CENTRE
Name Marty Adelman Date
Please prescribe 1
Digital health 'app'
Refill X unlimited Signature Tammy LinMD
ND • Licence #
6104 - 2480 Spruce Street (at Broadway), Vancouver, BC, Canada V6H 2P6
Tel: (604) 734-7760 Fax: (604) 558-2480

Smartphone Apps
Practitioner Prescription



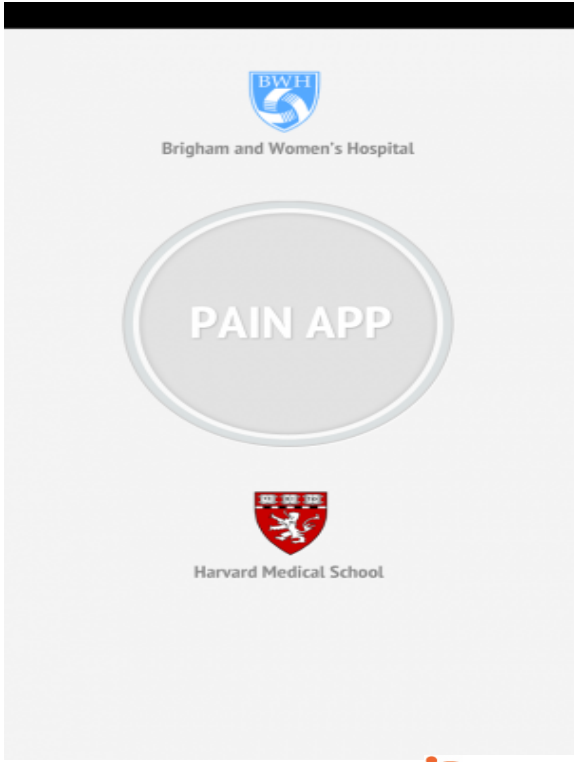
- Content derived app
- Resources
  - State prescription monitoring programs
  - Tools to evaluate substance abuse
  - Sample treatment agreements

A Life in the Community for Everyone
SAMHSA
Substance Abuse and Mental Health Services Administration
U.S Department of Health and Human Services

http://www.safeopioids.org

Smartphone Apps Monitoring Pain

- Under development at Brigham and Women's
- PMC320 (app store)
- Reduce opioid use in chronic pain suffers
- Monitors
  - Pain level
  - Mood
  - Pedometer to monitor activity
- Built in messaging service for questions to be sent to providers



http://www.drugfree.org/join-together/smartphone-app-measure-pain-might-impact-opioid-use-expert/

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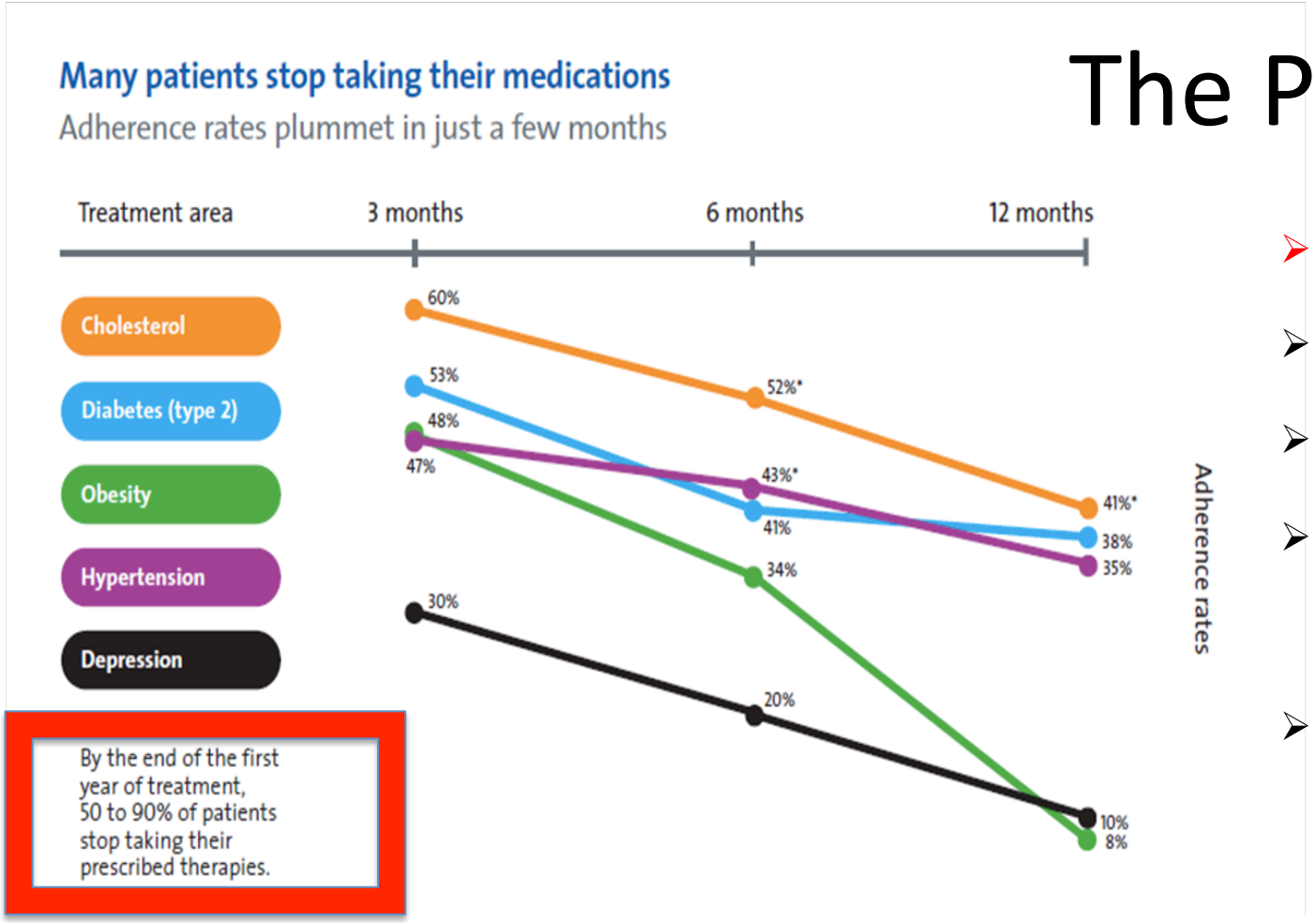
The Problem



- **High chronic disease burden - depression**
- 60% can not identify their medications
- 30-50% do not follow prescription instructions
- Directly responsible for >10% of healthcare costs
  (~$15 Billion)
- >2 Million serious adverse drug reactions

American Society of Family Practice Healthcare Statistics 2015

Artificial Intelligence

Specifications

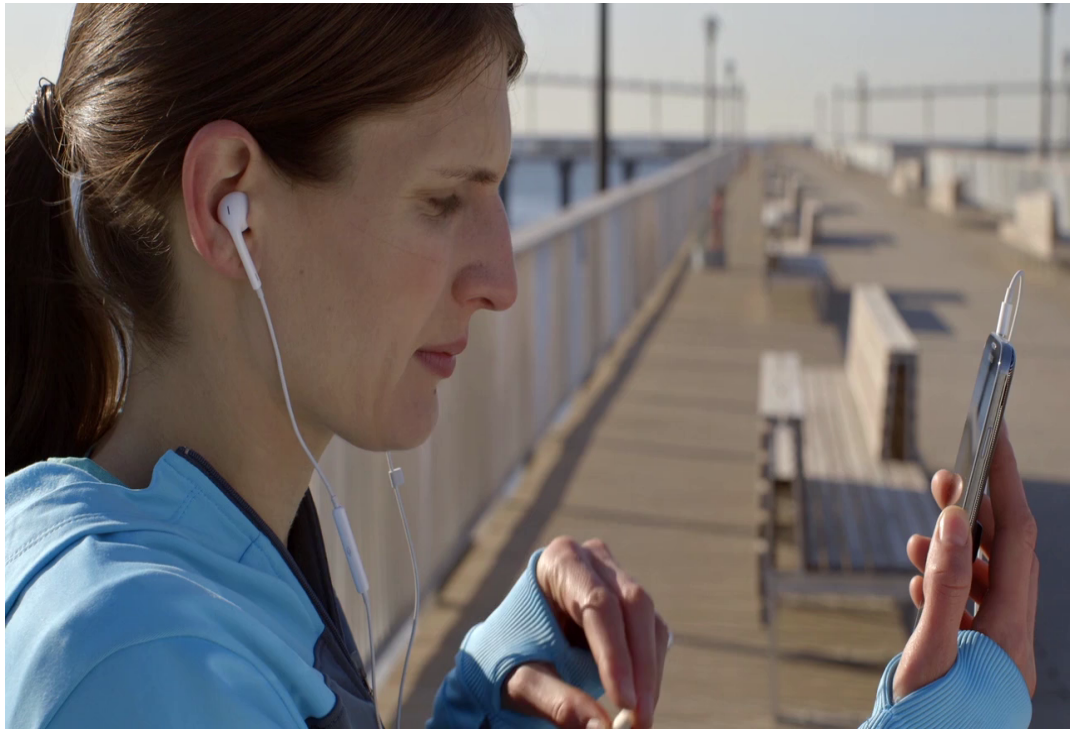
- Facial recognition
- Motion sensing
- Automated pill identification

Confirmation

- Patient
- Prescribed dose
- Date/Time/Place

Communication

- Patient ⟷ Provider



NIH National Institutes of Health INNOVATION AWARDS

AiCure

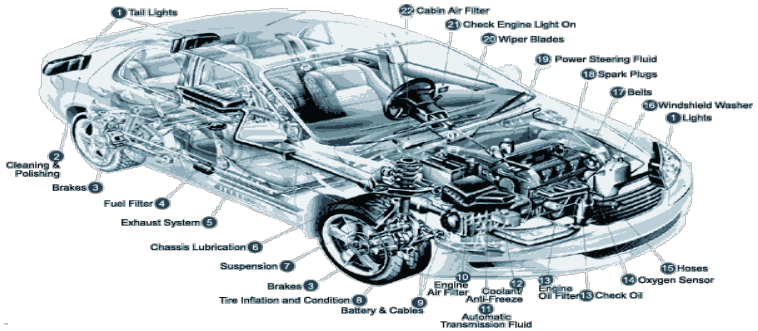
Smart Bottles

- Reminders
  - Text messages
  - Alarms
- Tamper proof
  - Time release
  - Compliance record once pill is dispensed
- Shares information with clinic and pharmacy

www.clevercap.org

Nanosensors

Car

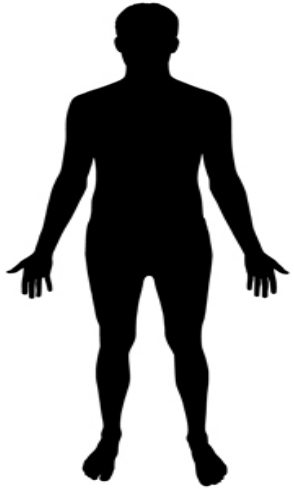


> 400 sensors

Smartphone

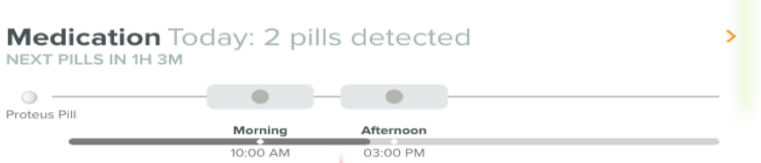
10 sensors

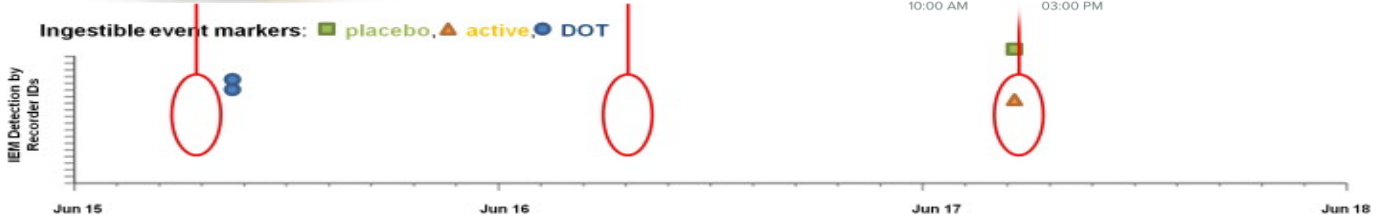
Human

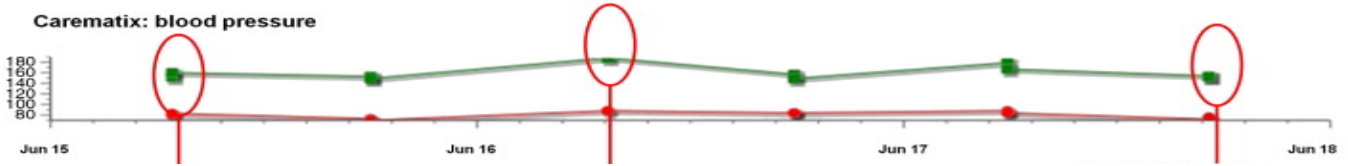


0 sensors

Edible Sensors
Wireless Observed Therapy



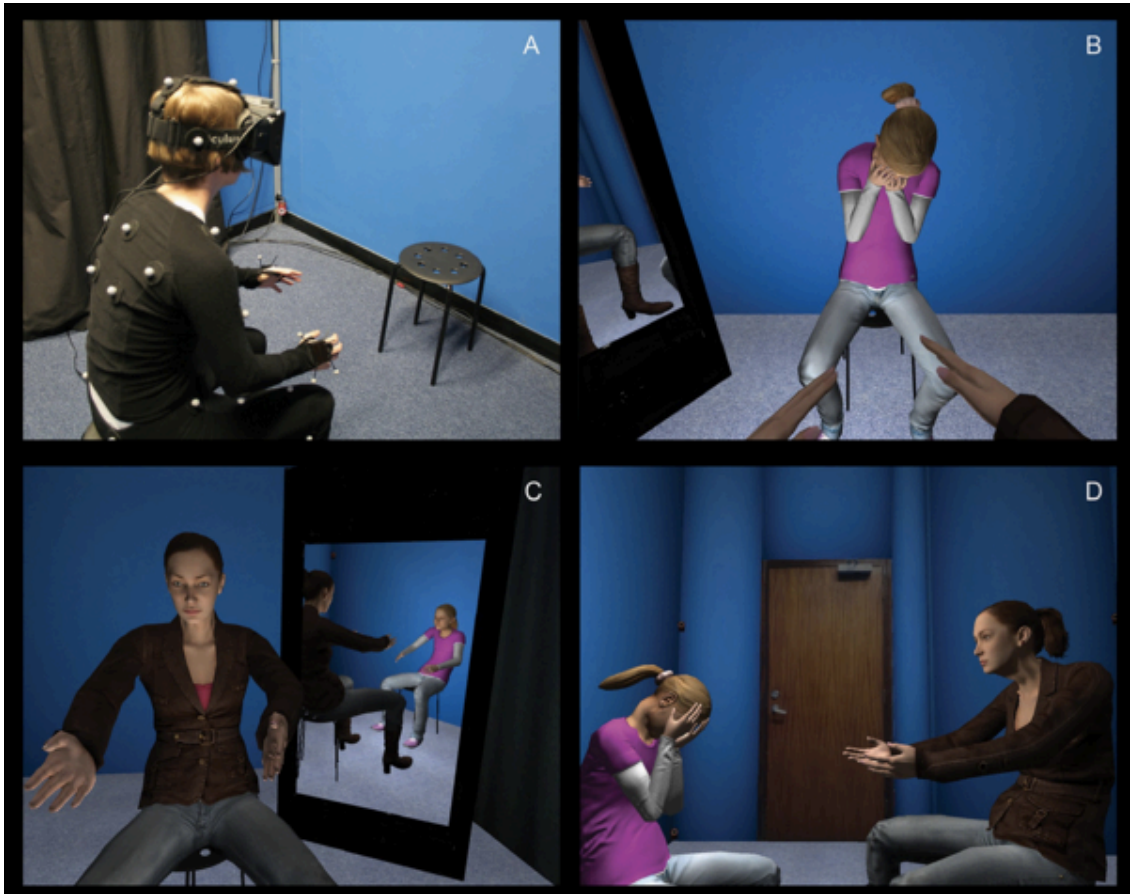


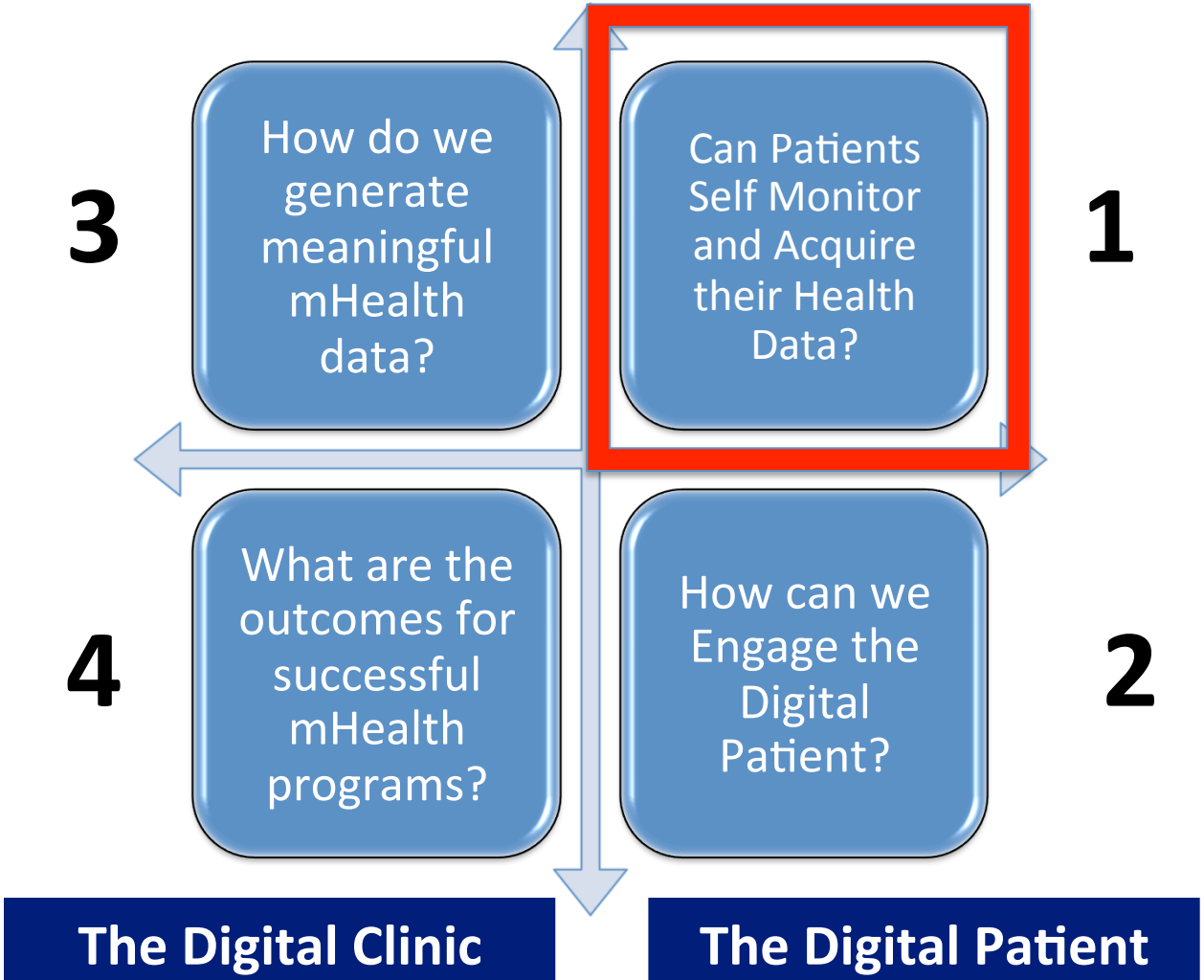


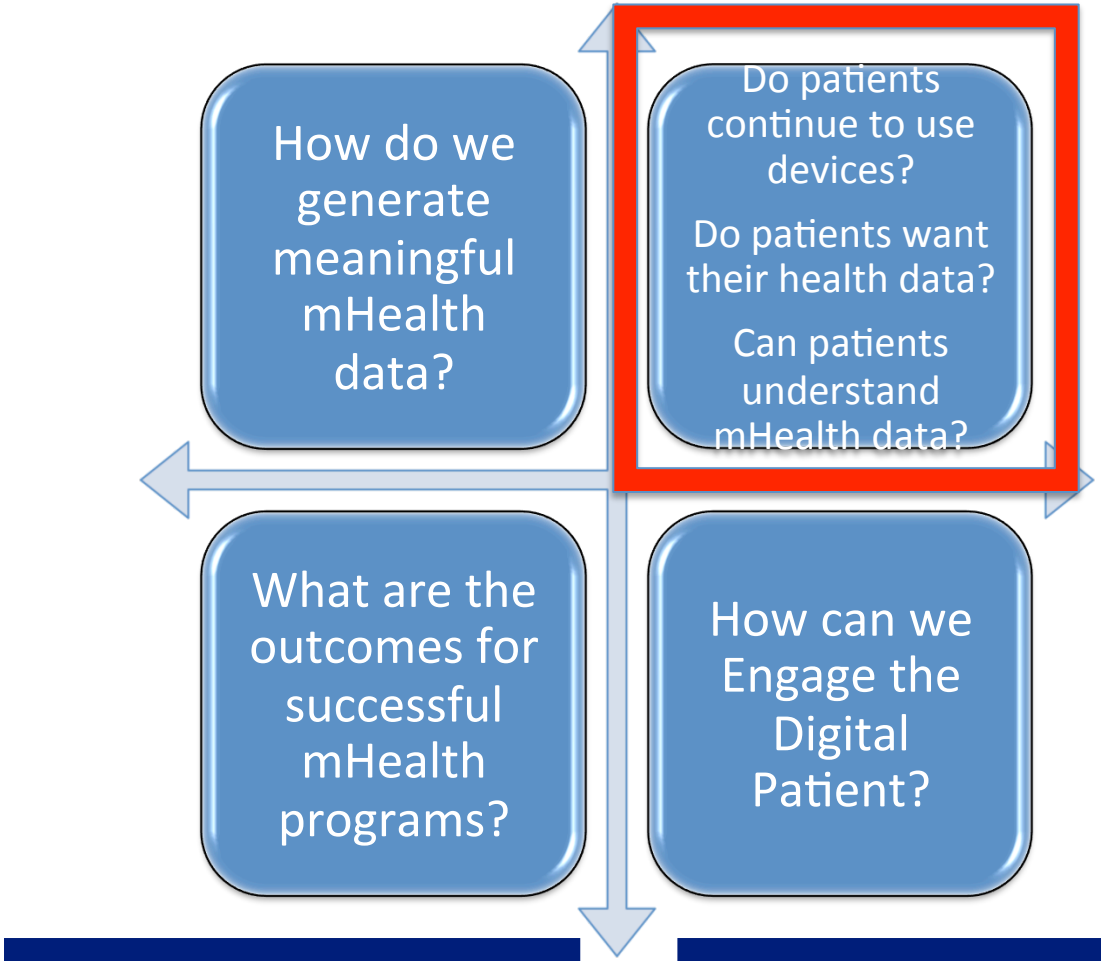
DiCarlo L. A digital health solution for using and managing medications: wirelessly observed therapy. IEEE Pulse. 2012. FDA Approved 2012

Tammy Technology/App slides

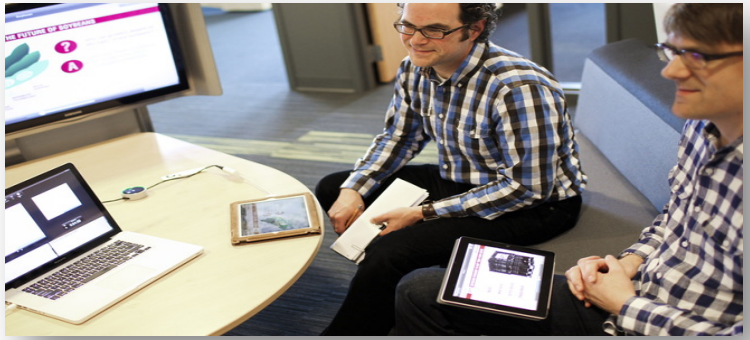
Immersion Therapy and Virtual Reality Video




3
How do we generate meaningful mHealth data?
1
Can Patients Self Monitor and Acquire their Health Data?
4
What are the outcomes for successful mHealth programs?
2
How can we Engage the Digital Patient?
The Digital Clinic
The Digital Patient


How do we generate meaningful mHealth data?
Do patients continue to use devices?
Do patients want their health data?
Can patients understand mHealth data?
What are the outcomes for successful mHealth programs?
How can we Engage the Digital Patient?
The Digital Clinic
The Digital Patient

These Are Not Our Patients …



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Our Patients are More Like This …

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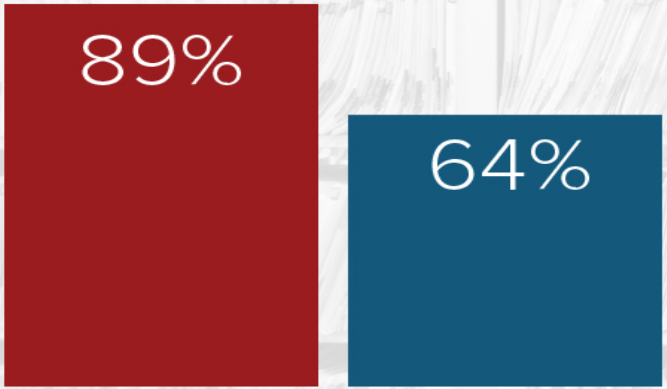
Docs Willing to Share Medical Practice with Patients? *Sort of*

A WebMD/Medscape Patient-Clinician Report

PHYSICIAN NOTES

Do patients have the right to see all of the notes taken by their physicians during an office visit?

YES



Doctors should share only the notes they deem appropriate.

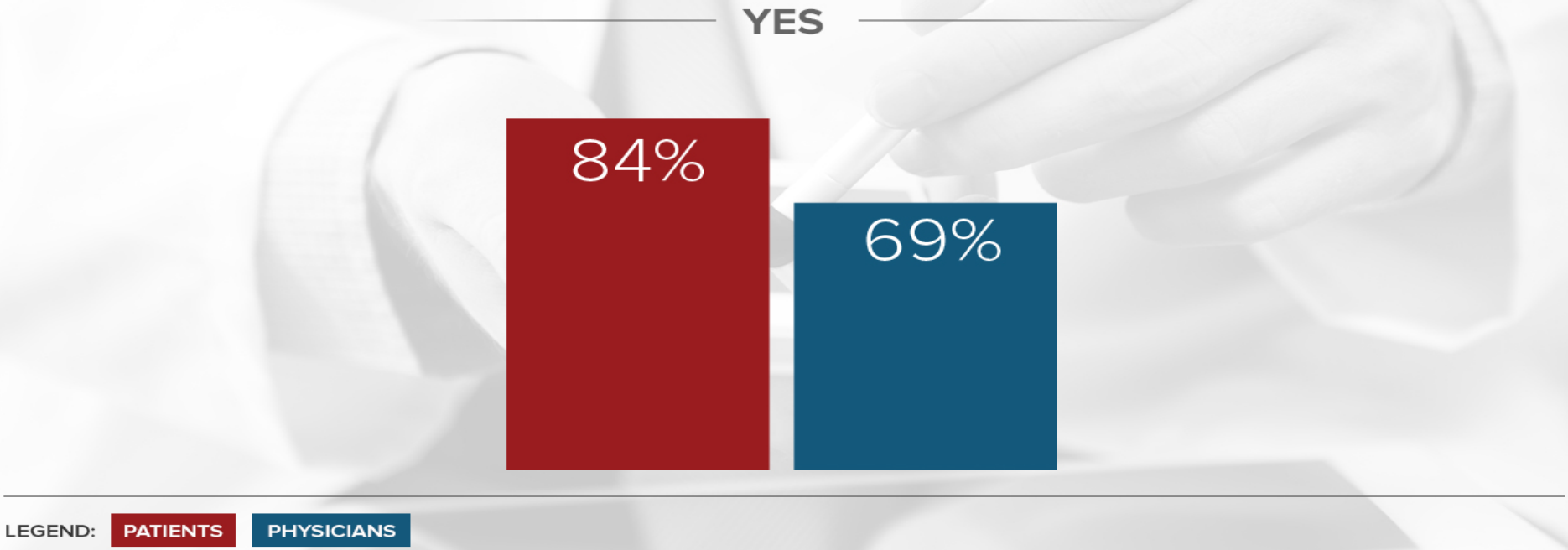
AGREE

LEGEND: PATIENTS PHYSICIANS

Bodlt D. J Med Internet Research 2015

PATIENTS' USE OF TECHNOLOGY

Should technology be used by patients to assist in the diagnostic process?



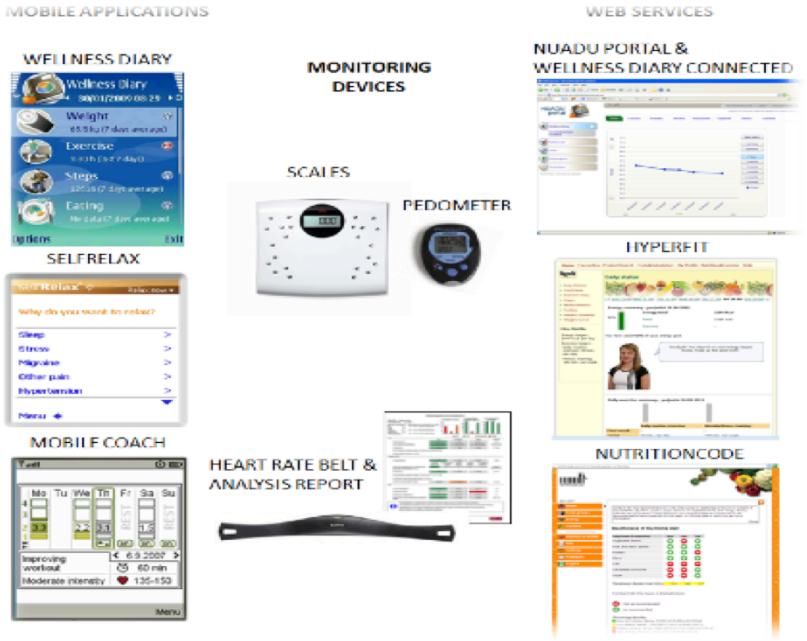
Bodlt D. J Med Internet Research 2015

Digital Patient
Digital Retention

Overview

- Employee health program
- 350 ‘Worried Well’ healthy people (Age 45)
  - At risk for
    - Diabetes
    - High blood pressure
    - Obesity
    - Unhealthy eating habits
  - Motivated for healthy lifestyle changes

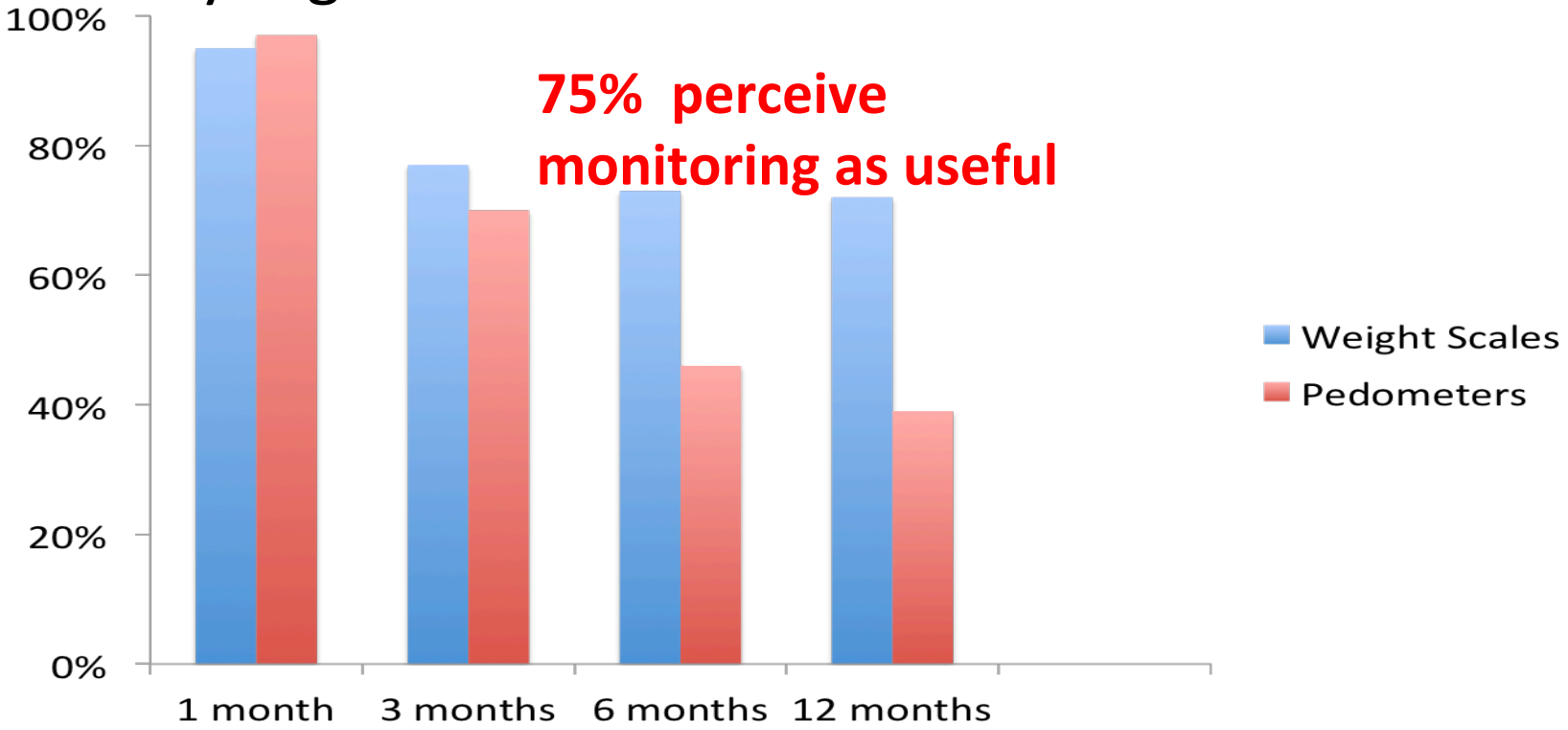
mHealth Toolbox



Mattila E. JMIR mHealth and uHealth 2013;1:16-34

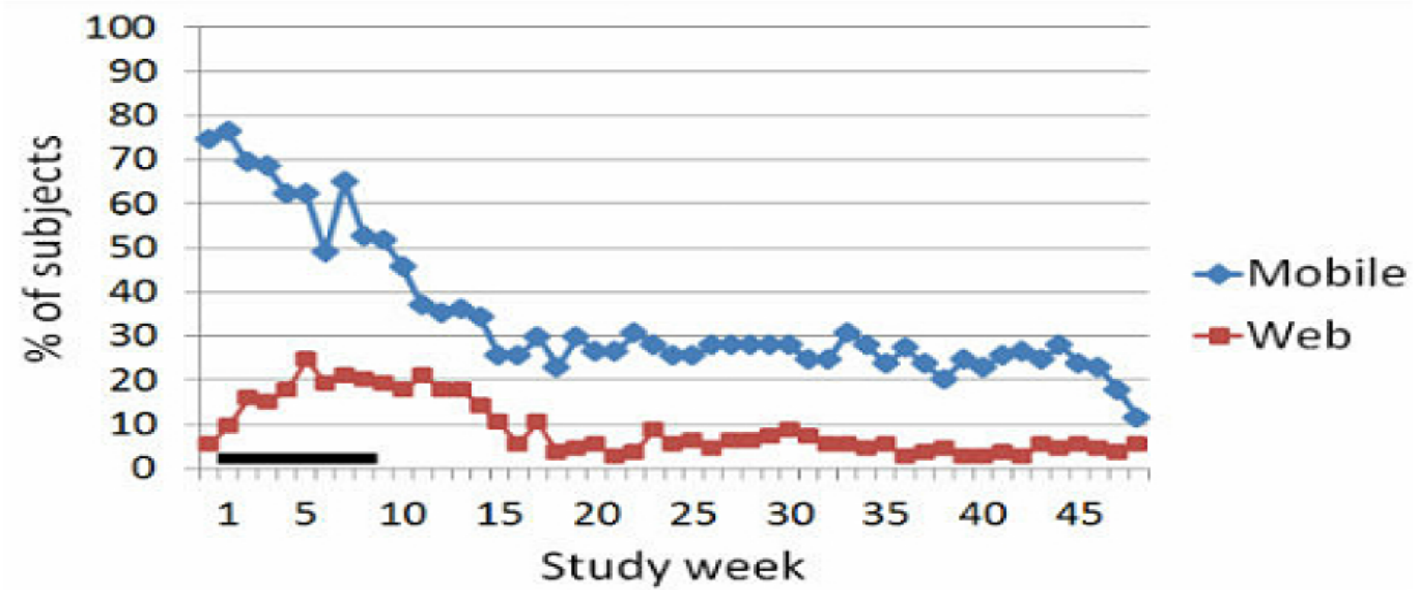
Modifying Behaviors

Very High Perceived Usefulness of mHealth



Mattila E. JMIR mHealth and uHealth 2013;1:16-34

Sustained mHealth Users



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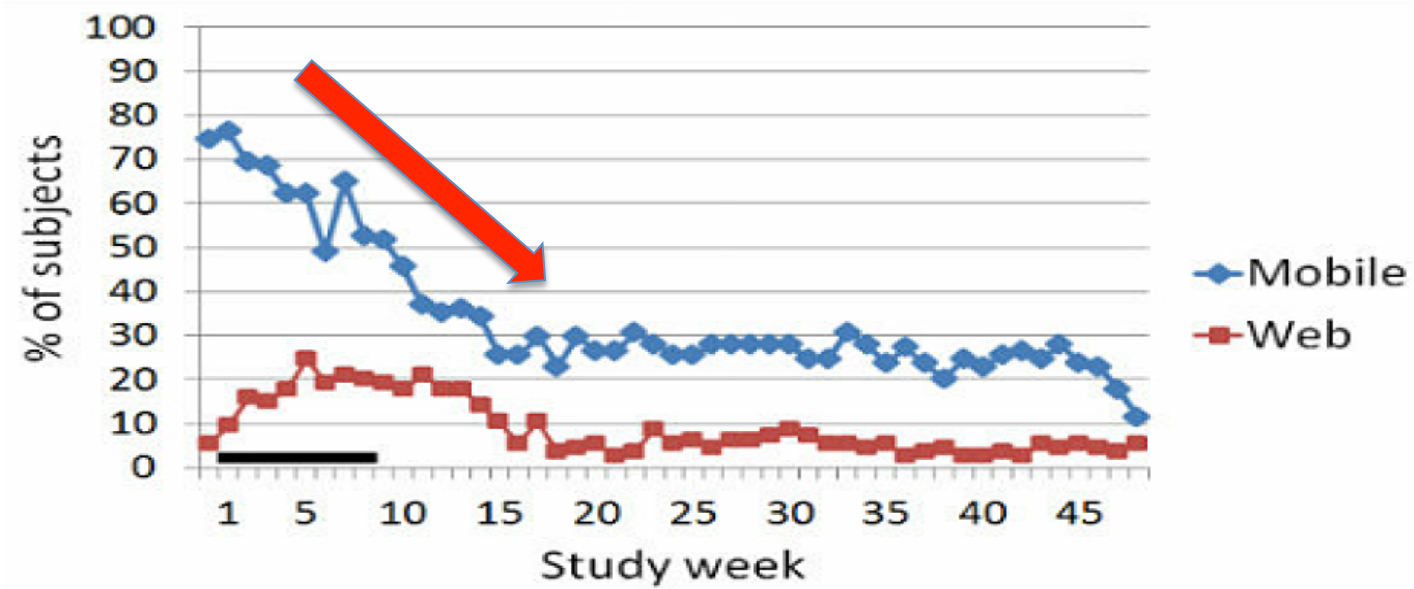
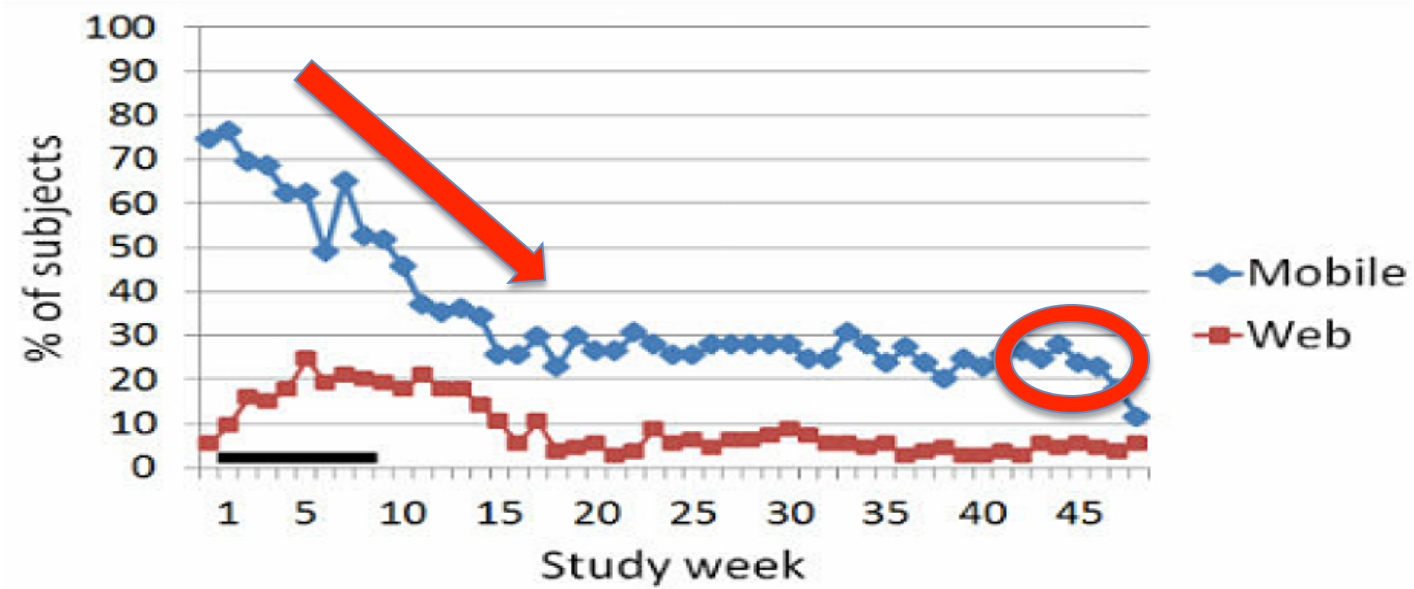


- Rapid attrition >50% reduction in use

Mattila E.. JMIR mHealth and uHealth 2013;1:16-34

Sustained mHealth Users



- Rapid attrition >50% reduction in use
- Low 30% sustained use at 4-6 months

Mattila E. JMIR mHealth and uHealth 2013;1:16-34

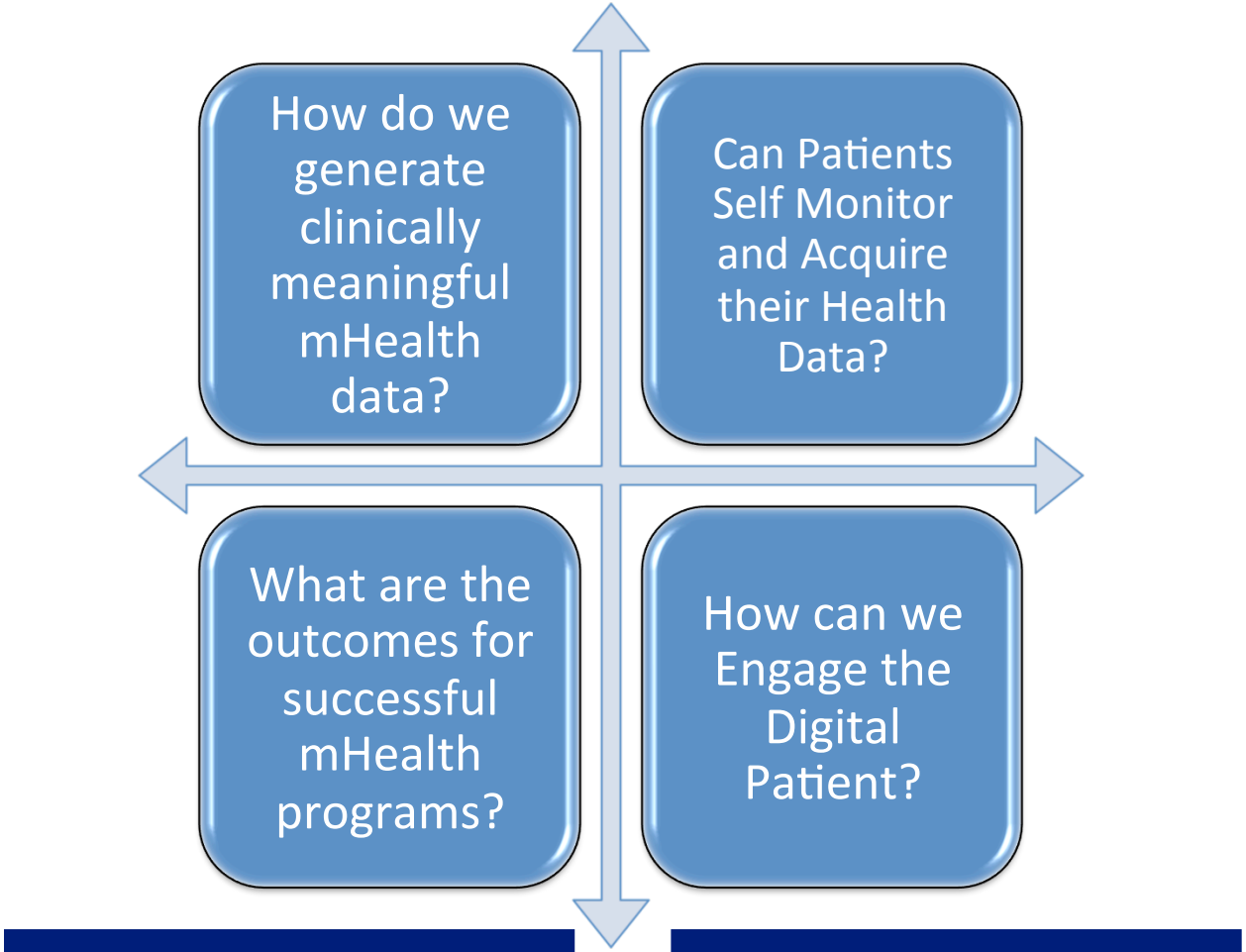
Barriers to Participation

- High Attrition

- Low Usage Rates

- Patients may not receive the indented effects
  - Clinical and cost effectiveness
  - Provoked anxiety
  - Generalizability of the intervention

Bashshur R. The empirical foundations of telemedicine interventions for chronic disease management. Telemed J E Health 2014;9:769-800
Kumar S. Mobile Health Technology Evaluation; the mHealth Evidence Workshop. Am J Prev Med 2013;42:228-236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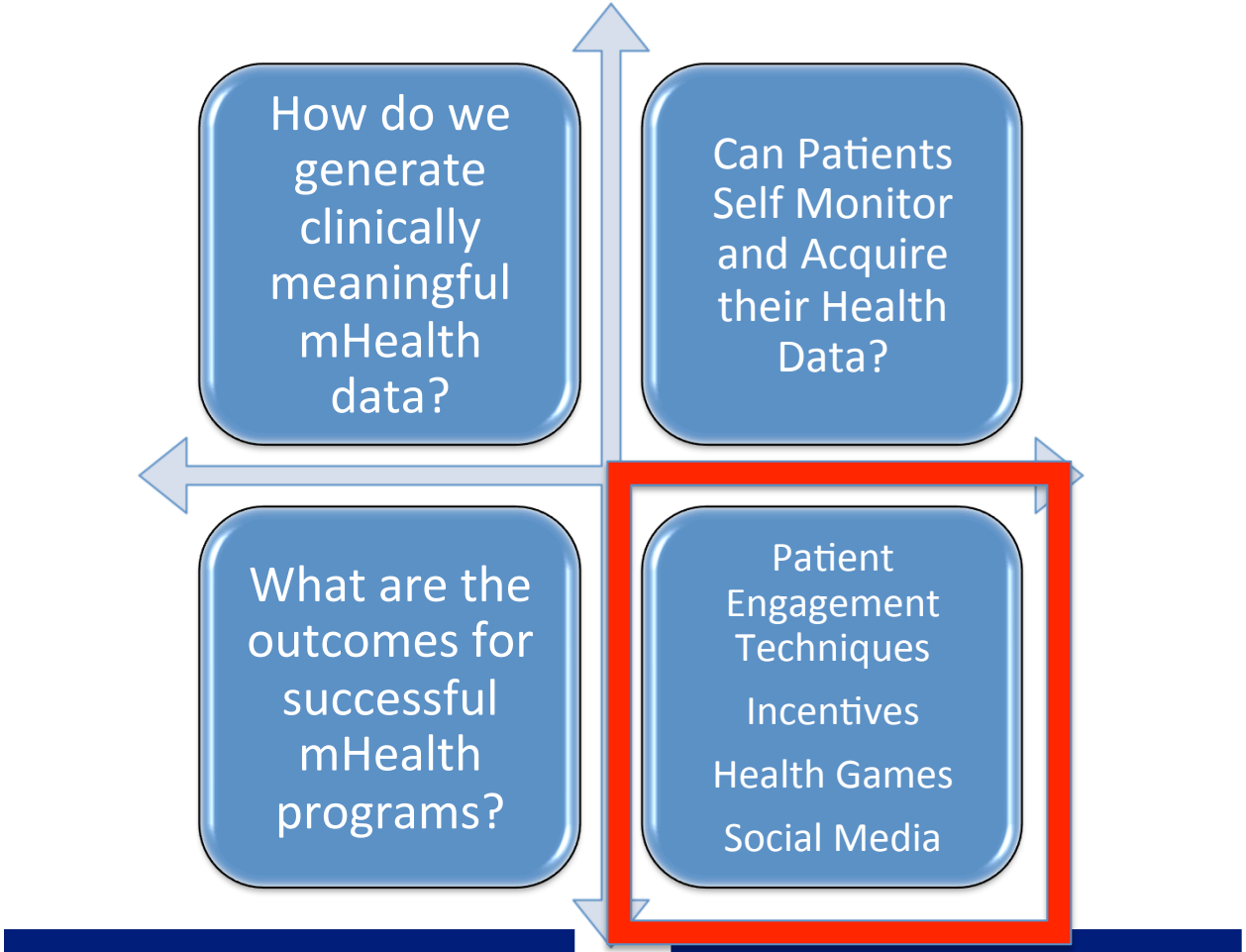
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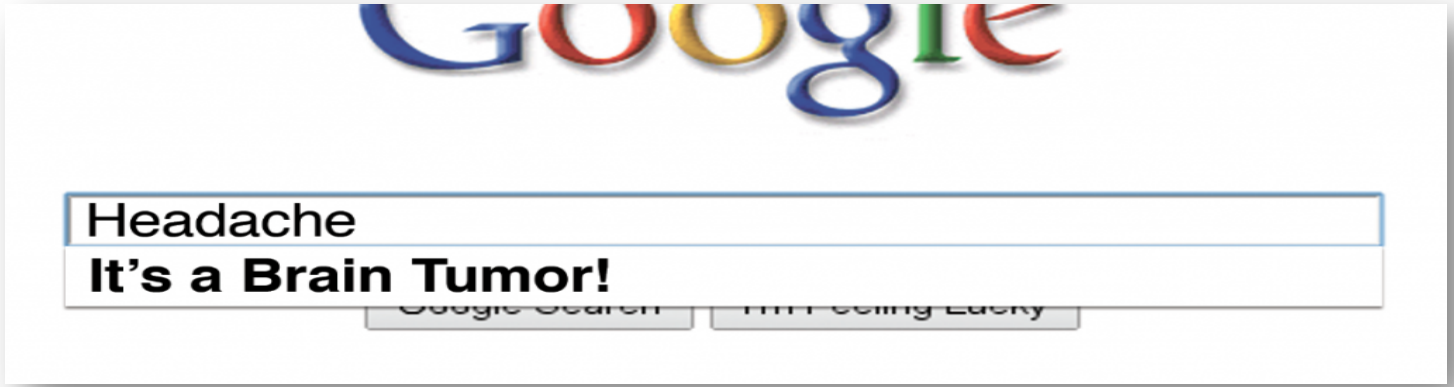
Patient Engagement Techniques
Incentives
Health Games
Social Media
The Digital Clinic
The Digital Patient


Google
Headache
It's a Brain Tumor!

Improving Digital Engagement

Behavioral science factors for long-term engagement

- Habit Formation
- Social Motivation
- Goal Reinforcement

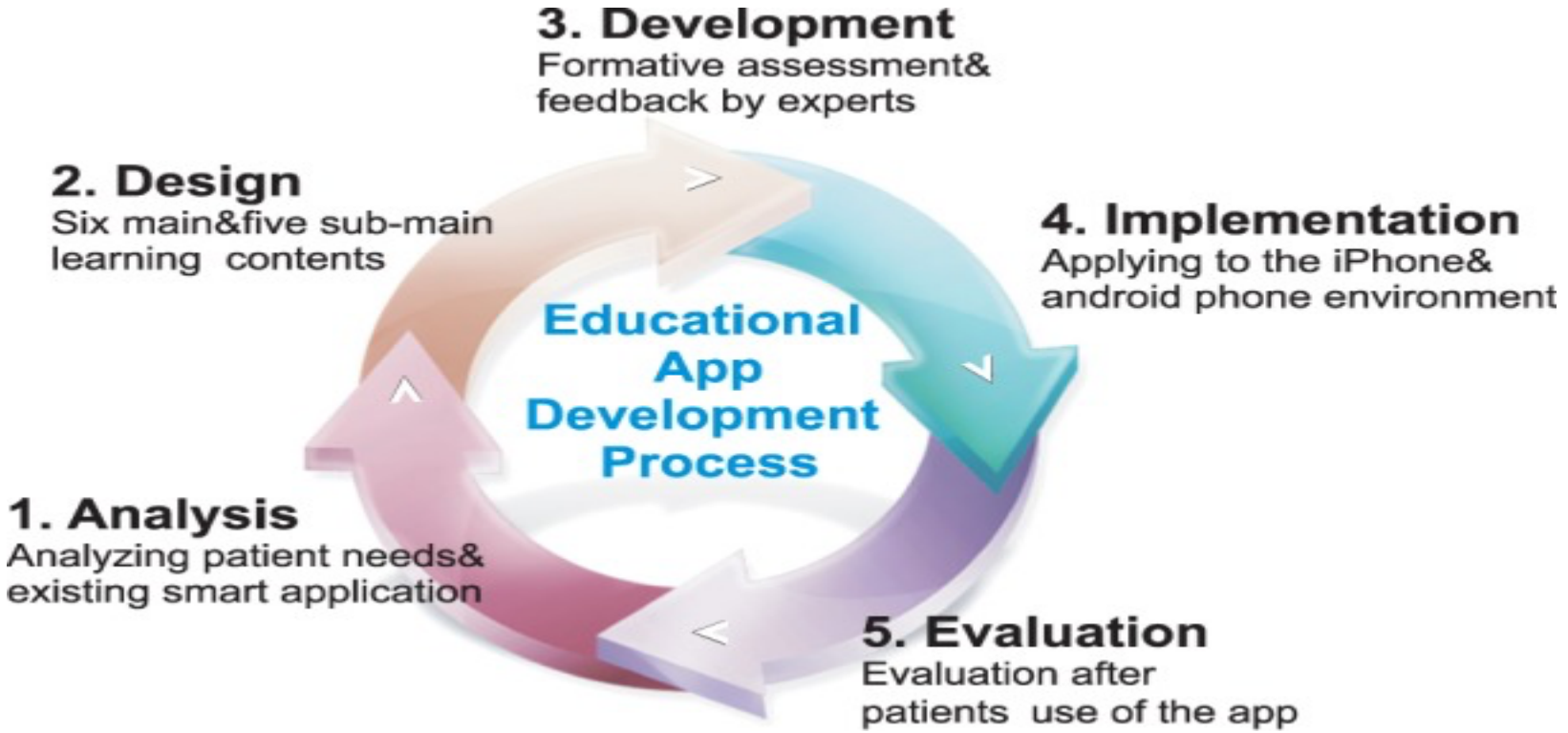
Device related factors

- Design, aesthetics, out-of-the box experience
- Fit and form factor
- User experience and lifestyle compatibility

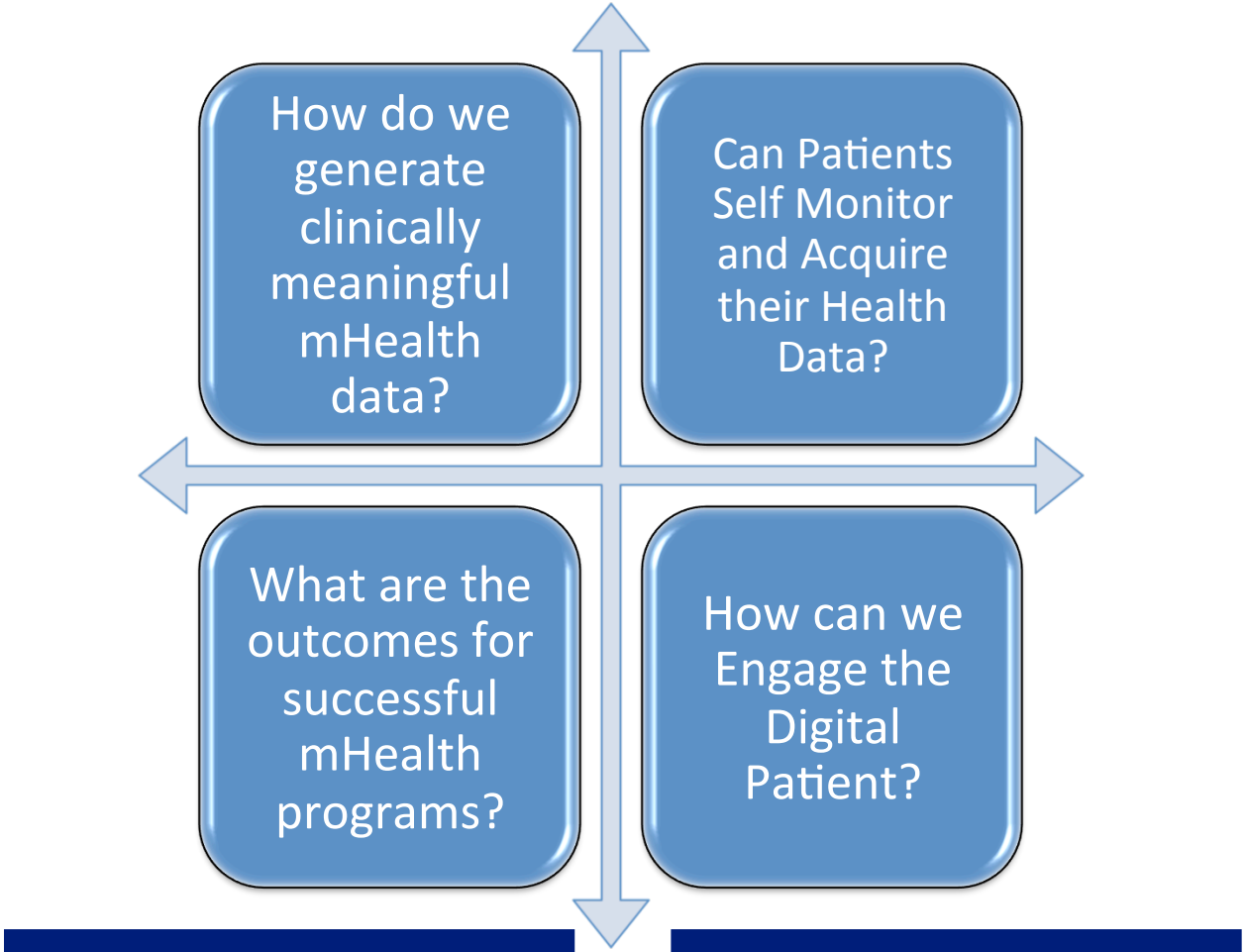
Kvedar J. Connected health: a review of technologies and strategies to improve patient care with telemedicine and telehealth. Health Aff 2014;33:194-9

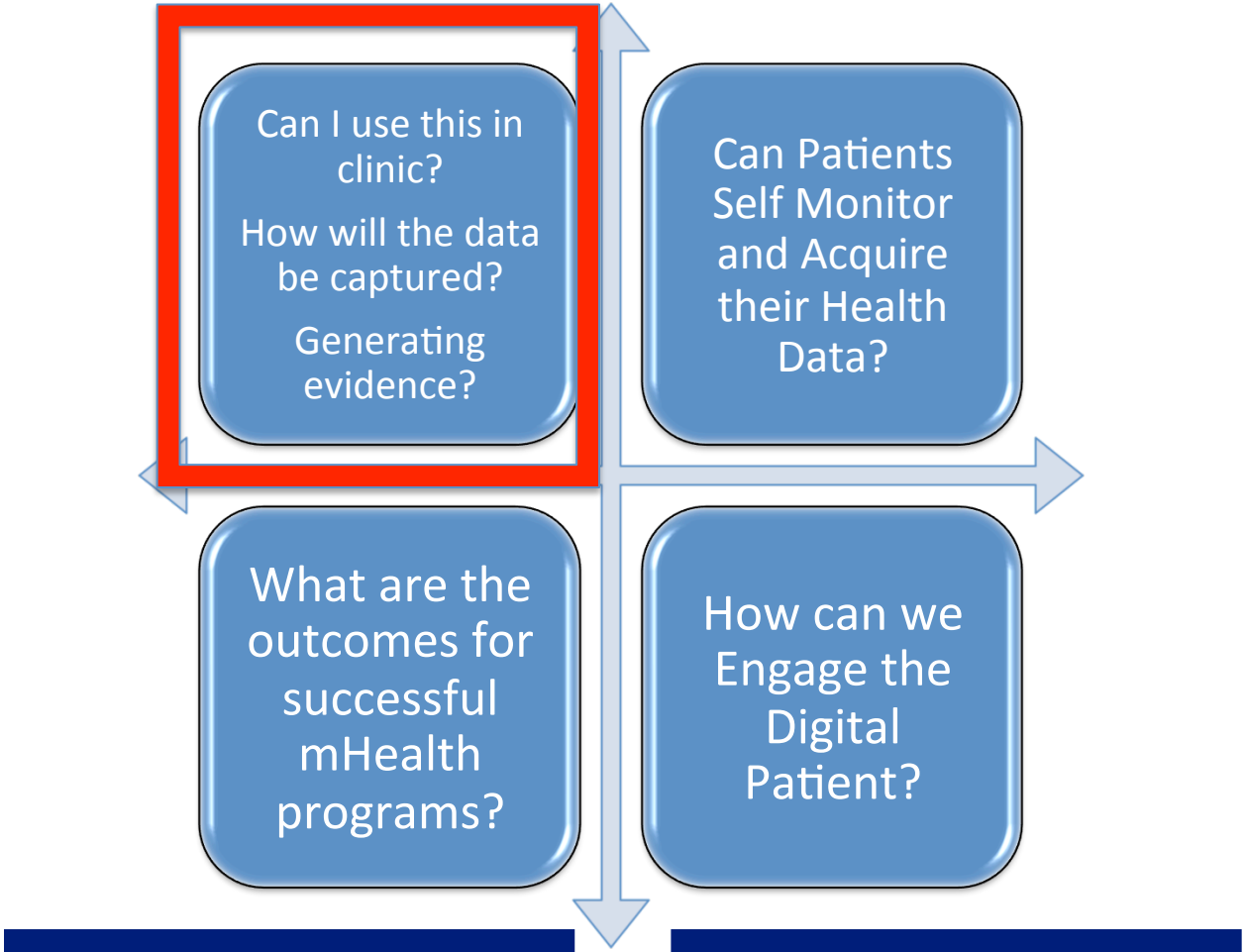
Digital Engagement
Know Your Patients Technology Needs

Digital Engagement
Patient Participation



Cho MJ. Healthc Inform Res 2014


How do we generate clinically meaningful mHealth data?
Can Patients Self Monitor and Acquire their Health Data?
What are the outcomes for successful mHealth programs?
How can we Engage the Digital Patient?
The Digital Clinic
The Digital Patient


Can I use this in clinic?
How will the data be captured?
Generating evidence?
Can Patients Self Monitor and Acquire their Health Data?
What are the outcomes for successful mHealth programs?
How can we Engage the Digital Patient?
The Digital Clinic
The Digital Patient

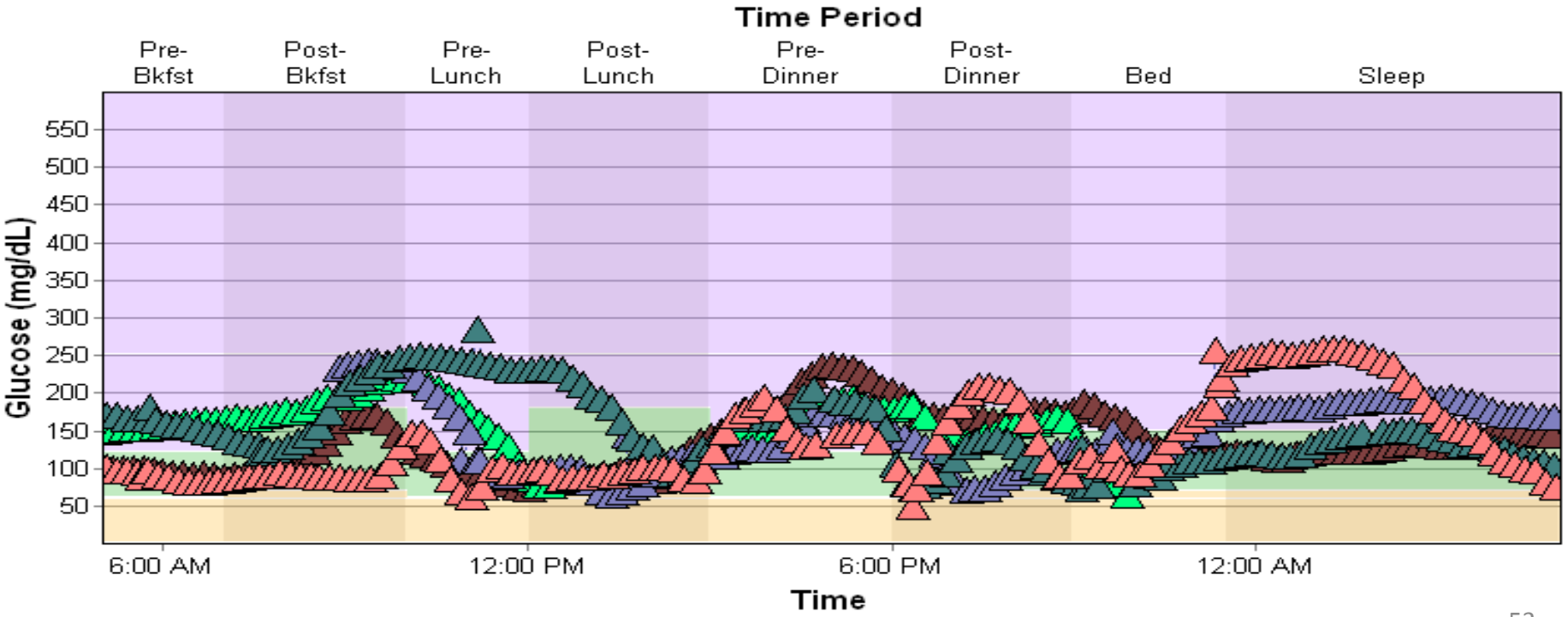
Continuous Glucose Monitoring

Case Study: Using Trend Graphs

- **Three Trend Graphs showing change over time:**
  - 28 year old with diabetes for 9.5 years
  - Starting HbA1c: 8.1% (uncontrolled)
  - Most recent HbA1c: 6.0%

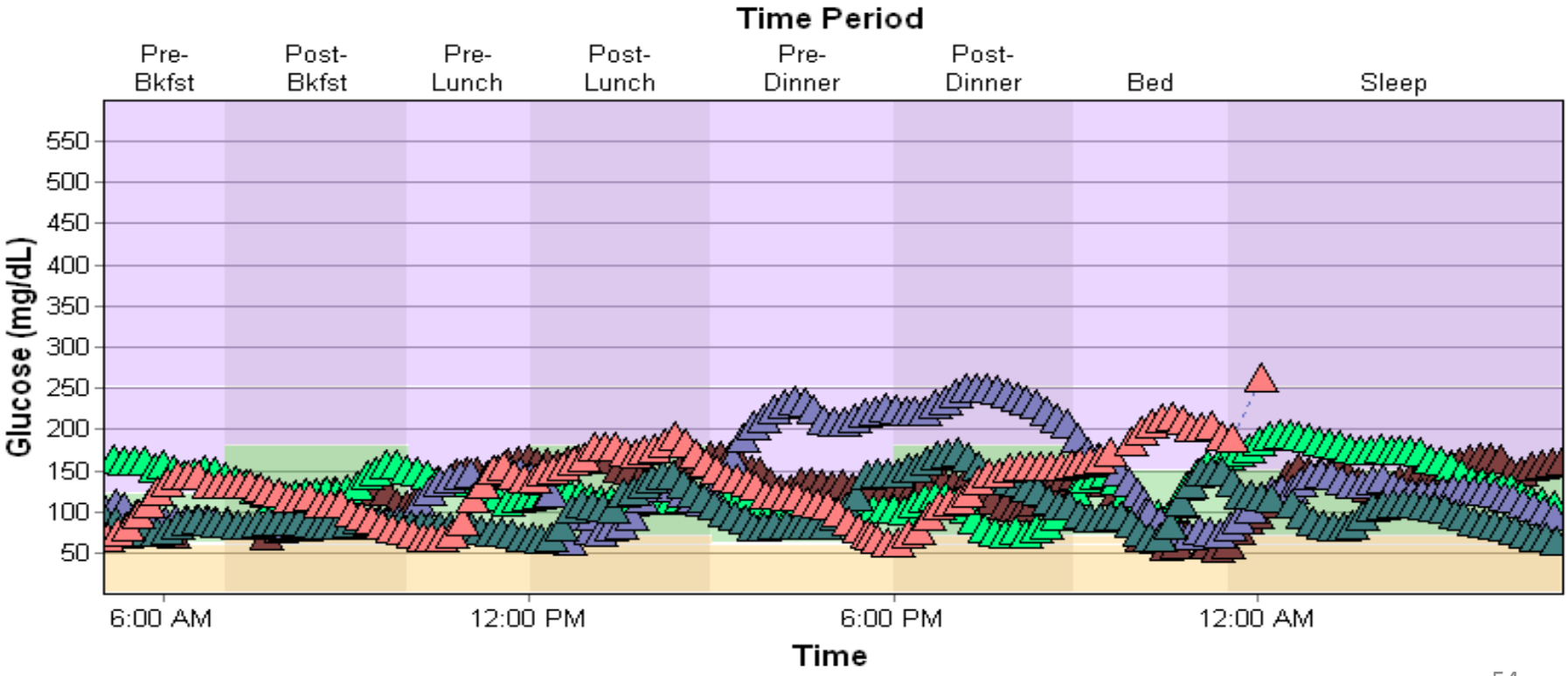
BASELINE GLUCOSE Trend Graph #1

Prior to CGM Use



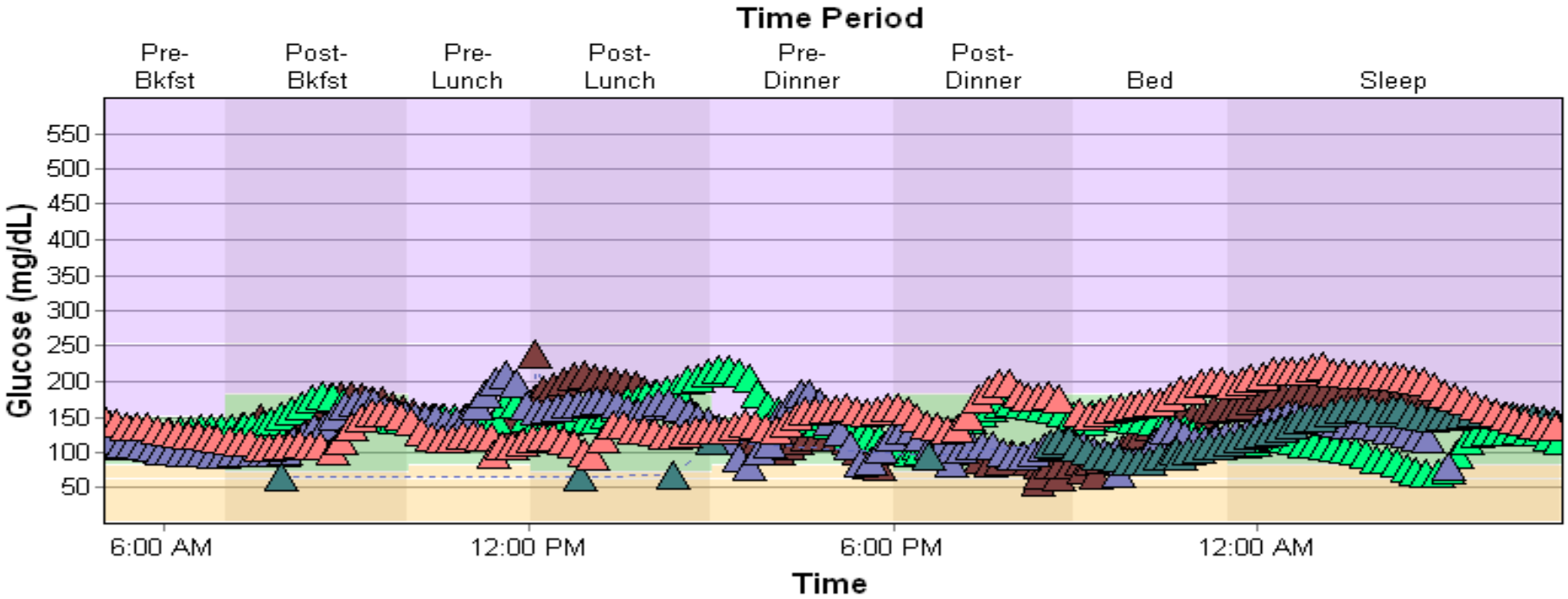
Glucose Trend Graph #2

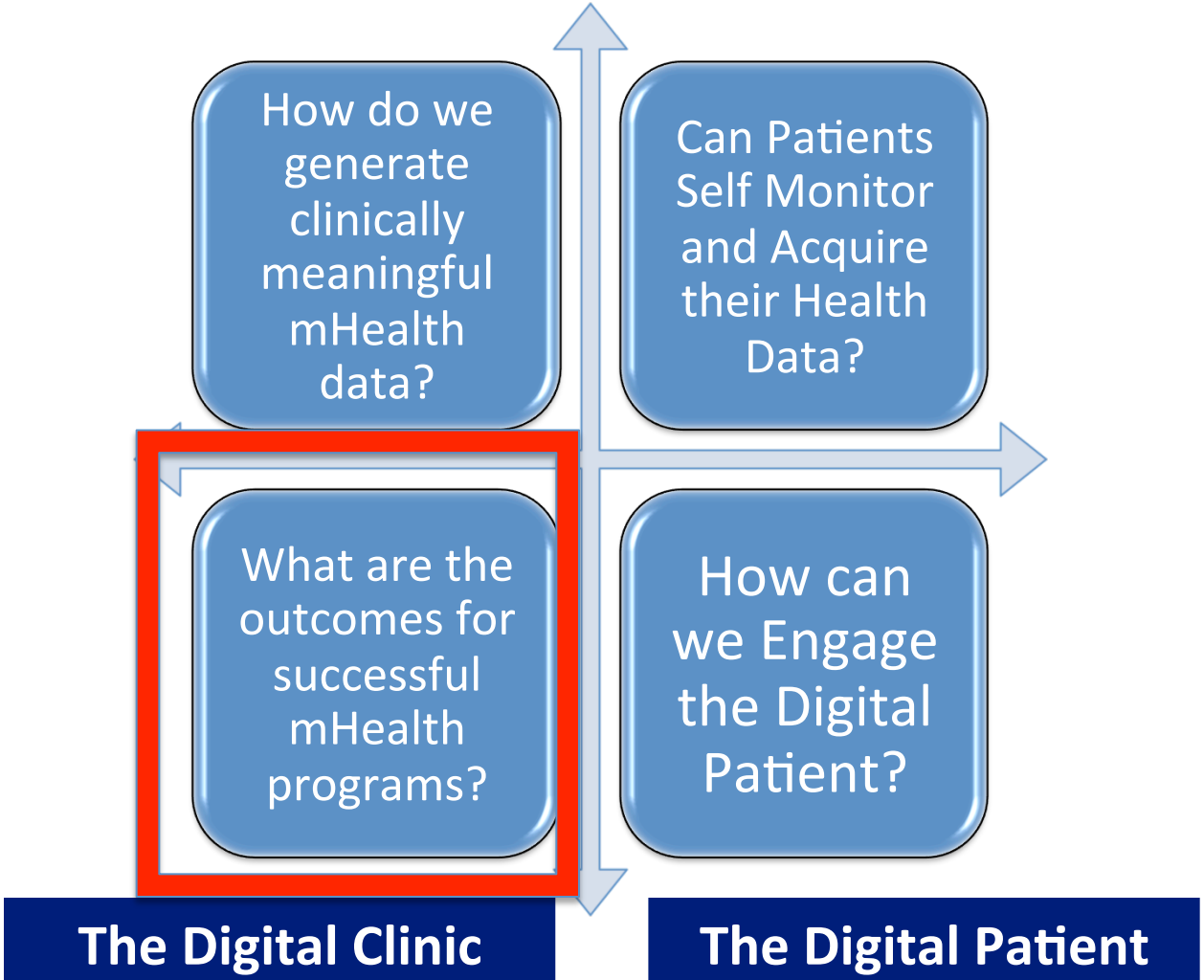
After three months of CGM use



GLUCOSE Trend Graph #3

Most recent CGM report

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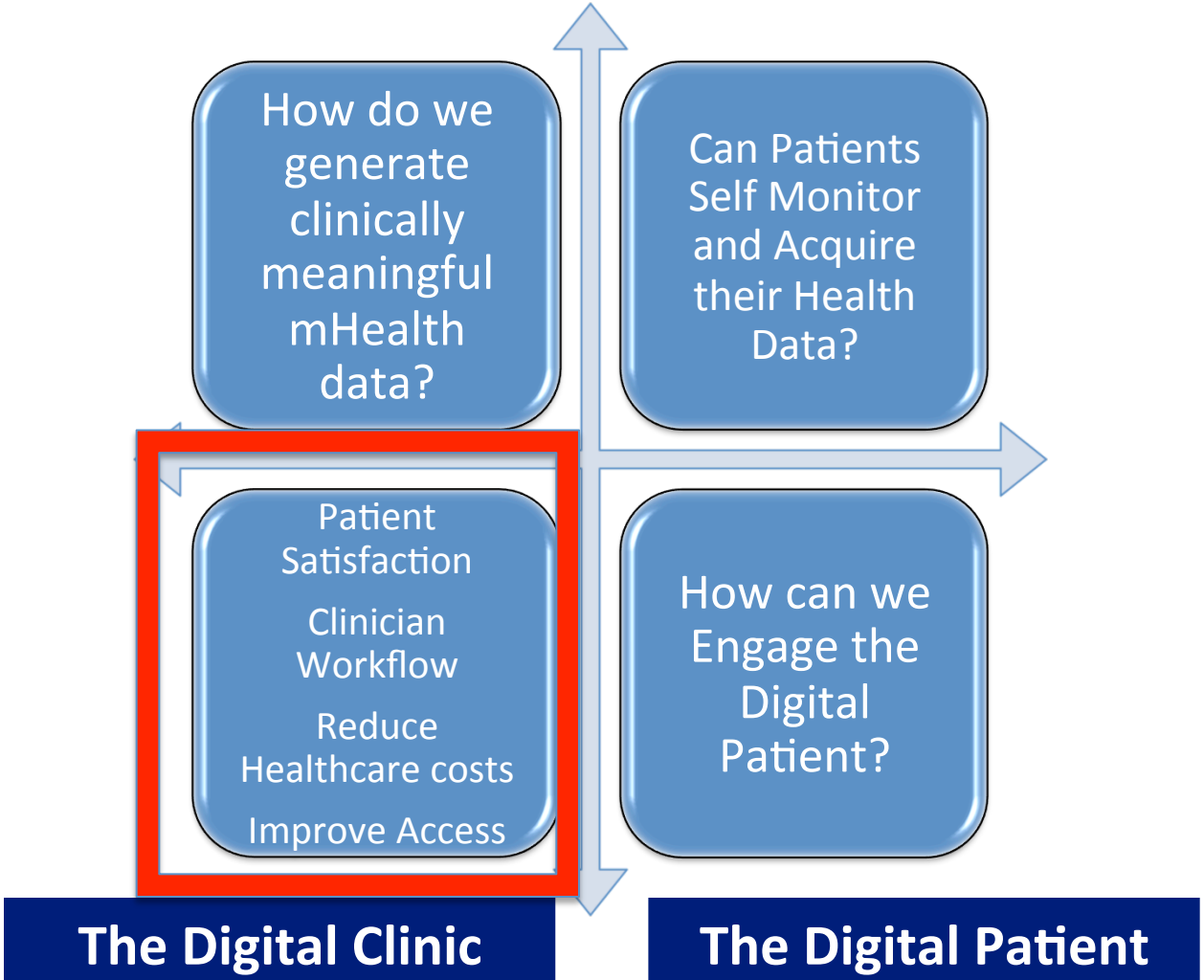
How do we generate clinically meaningful mHealth data?
Can Patients Self Monitor and Acquire their Health Data?
Patient Satisfaction
Clinician Workflow
Reduce Healthcare costs
Improve Access
How can we Engage the Digital Patient?
The Digital Clinic
The Digital Patient

RecycleHealth

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SDFF

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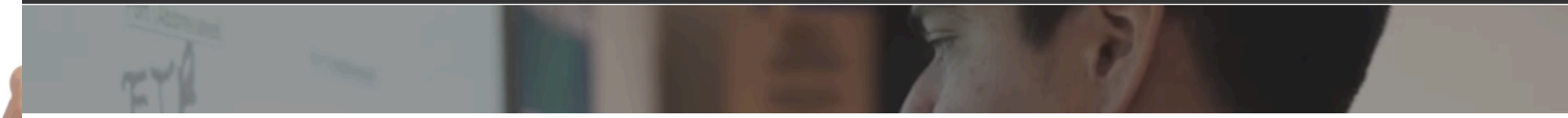


About us

Our mission at San Diego Futures Foundation is to improve lives in San Diego County by making information technology available to underserved populations by providing technology equipment, training, support, IT outsourcing, and digital media services to nonprofit organizations, disadvantaged small businesses, low-income households, people with disabilities, and seniors. SDFF is working hard to bridge the digital divide in our community.

History & Info | Staff & Leadership | Annual Report | Our Supporters | Job Opportunities

RecycleHealth.com San Diego Futures Foundation - sdfutures.org

SimCoach
the place to talk to someone

Veterans Crisis Line
1-800-273-8255 PRESS 1

Log
Regi
Registration is OPTIO
Learn more about profiles

Anything you wanna talk about?

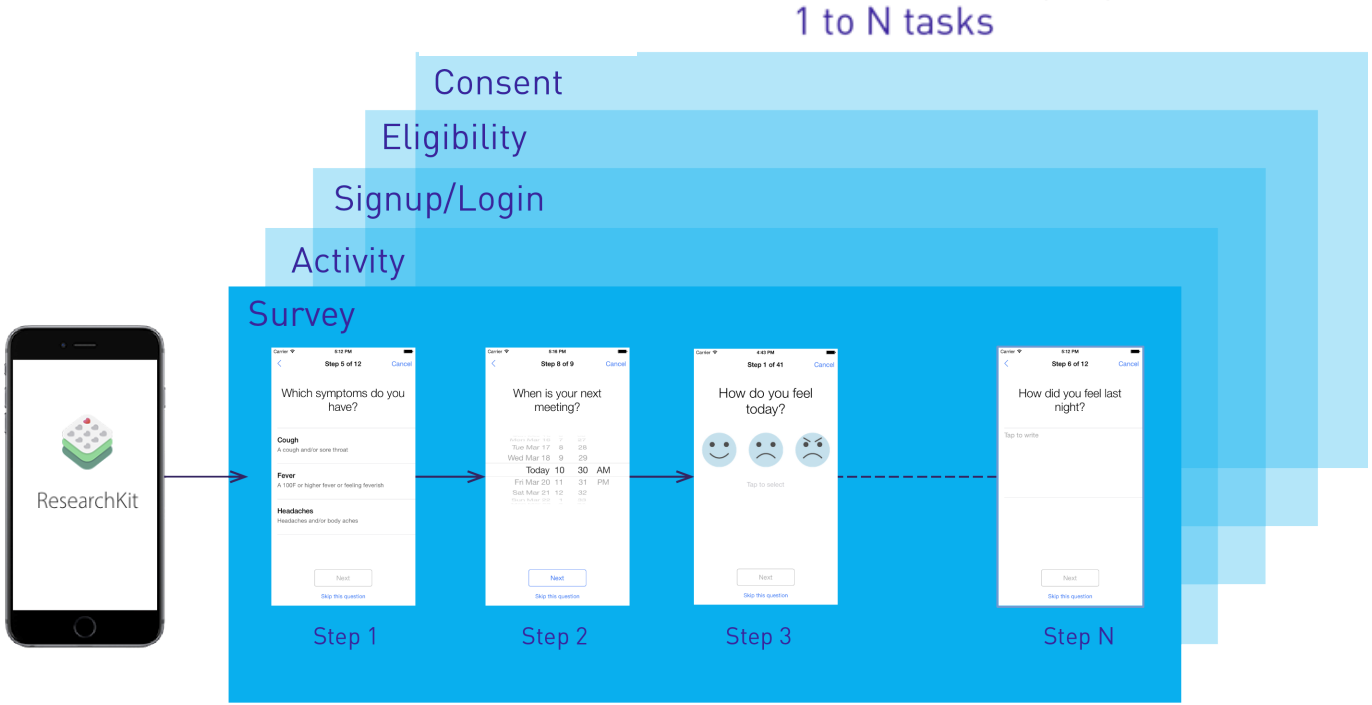
Talk to you? How do I do that?

Well, you're doing it right now. Just type in regular English.
Anything troubling you?

Send

Review

Create Your Own App



http://researchkit.org/docs/InformedConsent/InformedConsent.html
http://researchkit.org/docs/docs/Survey/CreatingSurveys.html
http://researchkit.org/docs/docs/ActiveTasks/Activetasks.html

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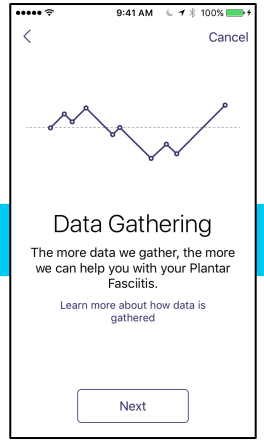
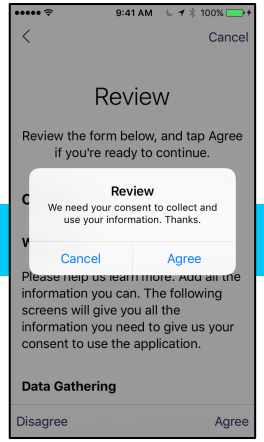
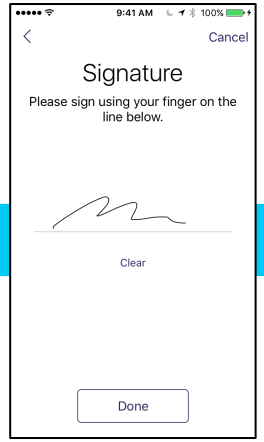
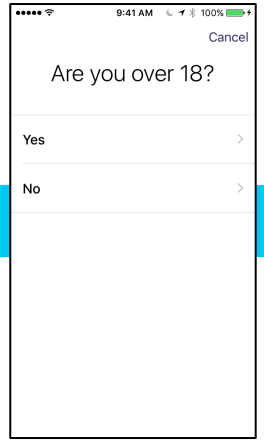
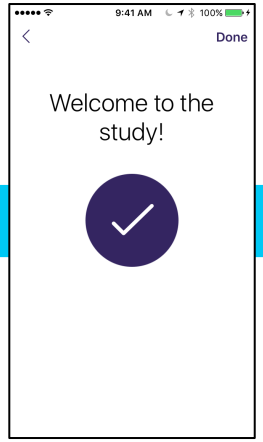




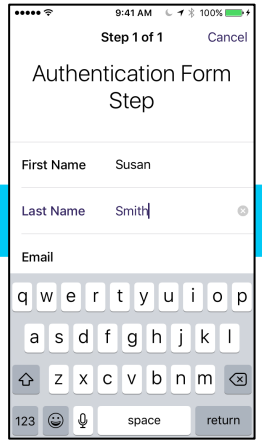


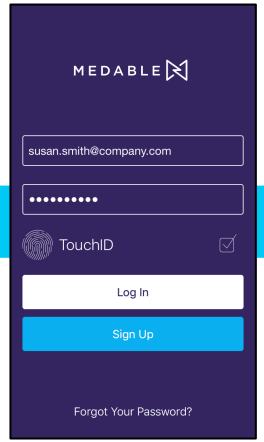
Eligibili



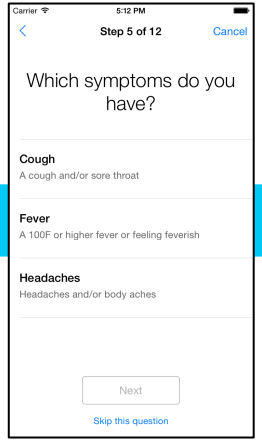


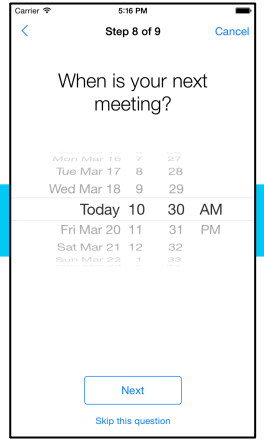
Signup/Login

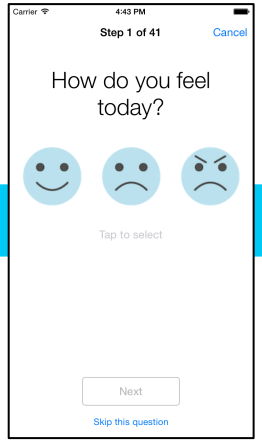




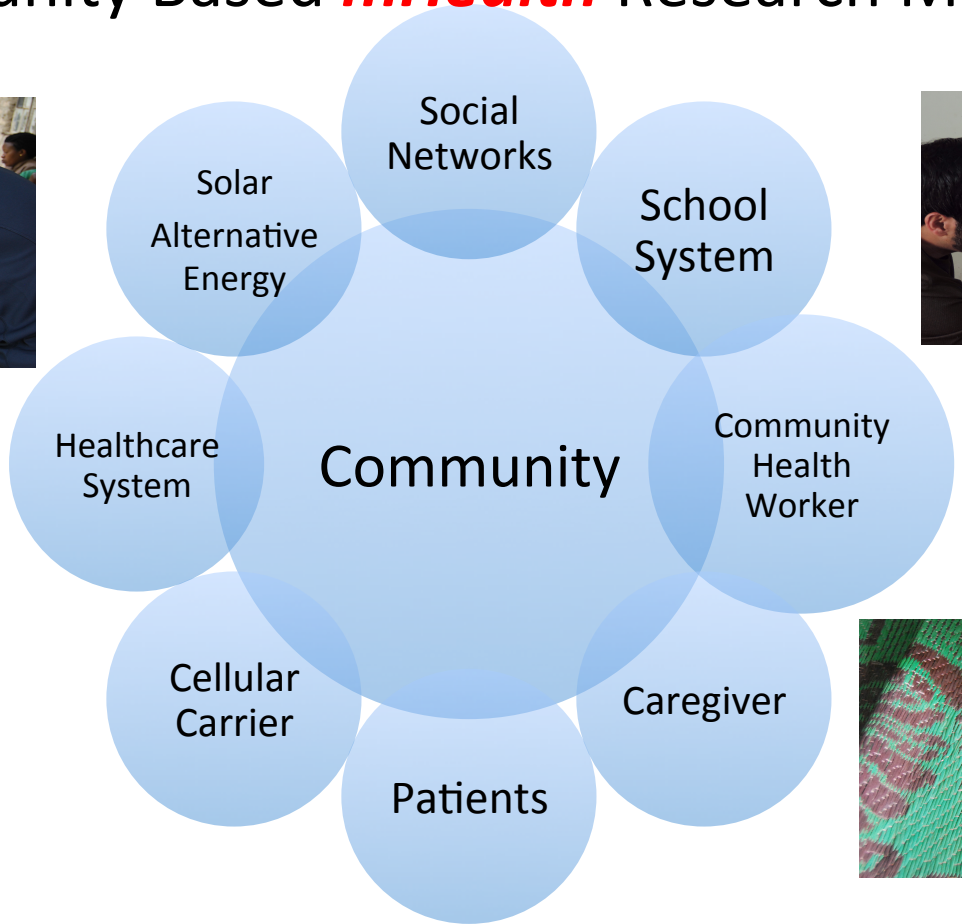
Survey







Community Based *mHealth* Research Model



Bhavnani S. Deploying mHealth (NIH)

Mobilizing Health in City Heights

Somali Family Services (n=1,200 participants)

Cardiovascular Disease
Hypertension
Diabetes
Obesity
Medications List

Mental Health
Depression PTSD
Nutrition – Activity
Autism – Vaccinations

Medical Clinics
City Heights
National City

Data
Aggregation
Platform

Pharmacy

Cultural
Linguistic
Design

Community Engagement

Community
Services
30K Population

Smartphone connected
Asthma
Chronic lung disease

Clinical Trial
Outcomes

Vision and Retinal Screening
Breast and Colon Cancer

Thank You

Bhavnani.sanjeev@scrippshealth.org

Digital Health Design Thinking Workshop for Behavioral Health and Substance Abuse

Tammy Lin MD & Sanjeev Bhavnani MD
Division of Cardiology – Mobile Health & Digital Medicine
Scripps Clinic & Research Institute

Scripps