

NODE.Health and Evidence Based Digital Medicine

Ashish Atreja, MD, MPH

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Assistant Professor and Director, Sinai AppLab

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Mount Sinai Health System



Founded in 1852

Not-for-profit Academic Medical Center

**7 Hospitals, 1 Medical School, 15
Institutes**

3500+ beds, 135 operating rooms

12+ Ambulatory Surgical Centers

200+ community location around New York

36,000 employees

6,200 physicians; 2,000 residents

2.6 million outpatient visits

500 thousand ER visits

170 thousand inpatient visits

This is our Burning Platform

Can Mount Sinai be serious? The answer is a resounding yes. In fact, we couldn't be more serious.

Mount Sinai's number one mission is to keep people out of the hospital. We're focused on population health management, as opposed to the traditional fee-for-service medicine. So instead of receiving care that's isolated and intermittent, patients receive care that's continuous and coordinated, much of it outside of the traditional hospital setting.

Thus the tremendous emphasis on wellness programs designed to help people stop smoking, lose weight and battle obesity, lower their blood pressure and reduce the risk of a heart attack. By being as proactive as possible, patients can better maintain their health and avoid disease.

Our Mobile Acute Care Team will treat patients at home who would otherwise require a hospital admission for certain conditions. The core team involves physicians, nurse practitioners,

registered nurses, social workers, community paramedics, care coaches, physical therapists, occupational therapists, speech therapists, and home health aides.

Meanwhile, Mount Sinai's Pre-Admission Care Team provides transitional care services to patients at high risk for readmission. After a comprehensive bedside assessment, social workers partner with patients, family caregivers and healthcare providers to identify known risks such as

problems with medication management and provide continuing support after discharge.

It's a sweeping change in the way that health care is delivered. And with the new system comes a new way to measure success. The number of empty beds.

1-800-MD-SINAI
mountsinaihealth.org



IF OUR BEDS
ARE FILLED,
IT MEANS WE'VE FAILED.



Value based healthcare is real!

FOR IMMEDIATE RELEASE

January 26, 2015

Contact: HHS Press Office

202-690-6343

Better, Smarter, Healthier: In historic announcement, HHS sets clear goals and timeline for shifting Medicare reimbursements from volume to value

In a meeting with nearly two dozen leaders representing consumers, insurers, providers, and business leaders, Health and Human Services Secretary Sylvia M. Burwell today announced measurable goals and a timeline to move the Medicare program, and the health care system at large, toward paying providers based on the quality, rather than the quantity of care they give patients.

HHS has set a goal of tying 30 percent of traditional, or fee-for-service, Medicare payments to quality or value through alternative payment models, such as Accountable Care Organizations (ACOs) or bundled payment arrangements by the end of 2016, and tying 50 percent of payments to these models by the end of 2018. HHS also set a goal of tying 85 percent of all traditional Medicare payments to quality or value by 2016 and 90 percent by 2018 through programs such as the Hospital Value Based Purchasing and the Hospital Readmissions Reduction Programs. This is the first time in the history of the Medicare program that HHS has set explicit goals for

Health Systems Unprepared for Value Based Care



Value based care has arrived



76% of hospitals face readmissions penalties



50% of unprepared for bundles and MACRA

<http://khn.org/>

Mount Sinai Readmission penalties

The Mount Sinai Medical Center - 330024

2015 2016 2017 2018

Summary P4P Impact

Actions ▾

A summary of your hospital's final pay for performance impact is below. These results are based on the finalized adjustments published by CMS for the VBP, Readmissions and HAC programs. You can view more detailed performance information for each program below.

Estimated Readmissions
Penalty Percentage

-0.6%

Readmissions Percentile
Rank



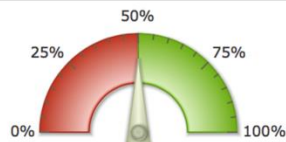
Estimated Readmissions
Penalty

\$-1,287,530

VBP Estimated Net
Percent Change

0.03%

VBP Percentile
Rank



Estimated VBP Net
Change

\$63,472

Poor healthcare apps could cost hospitals \$100 million a year, Accenture says

While 66 of the 100 largest hospitals in the United States offer consumers mobile health apps, only 2 percent of patients are using them, new report finds.

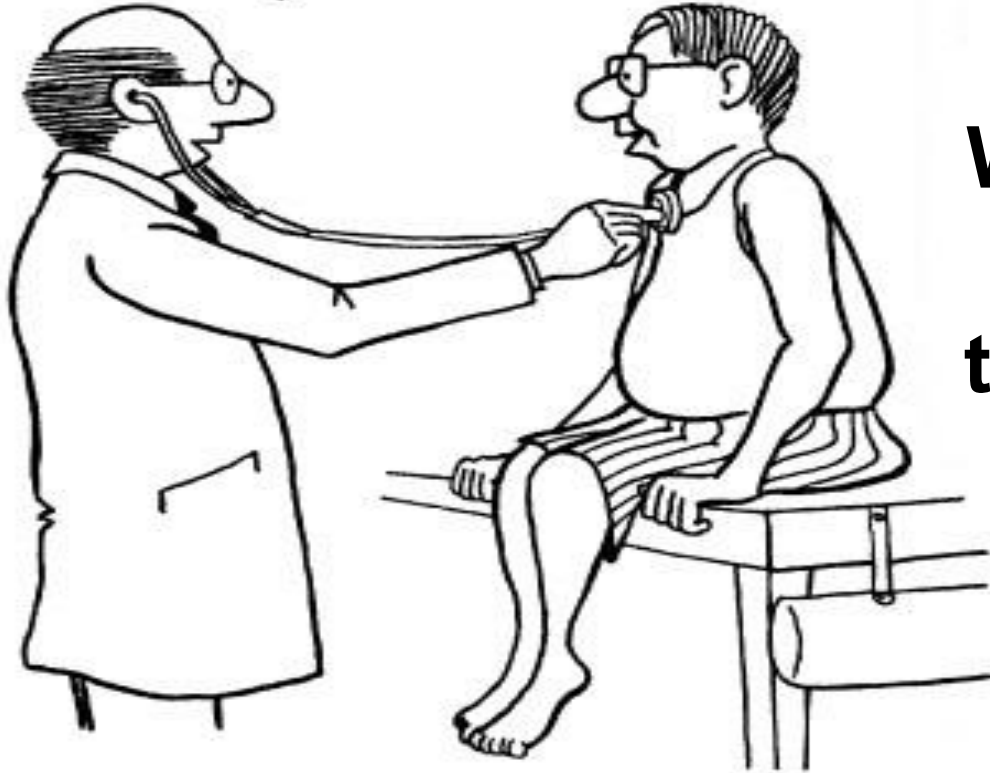
By [Bill Siwicki](#) | January 06, 2016 | 07:37 PM

SHARE 644



ACTUALLY, I'M NOT
A DOCTOR... I'M
THE HEALTH-CARE
ADMINISTRATOR.

THAT'S OKAY. I'M
NOT THE PATIENT...
I'M HIS ATTORNEY.



**We need tools to
address
triple whammy!!!**

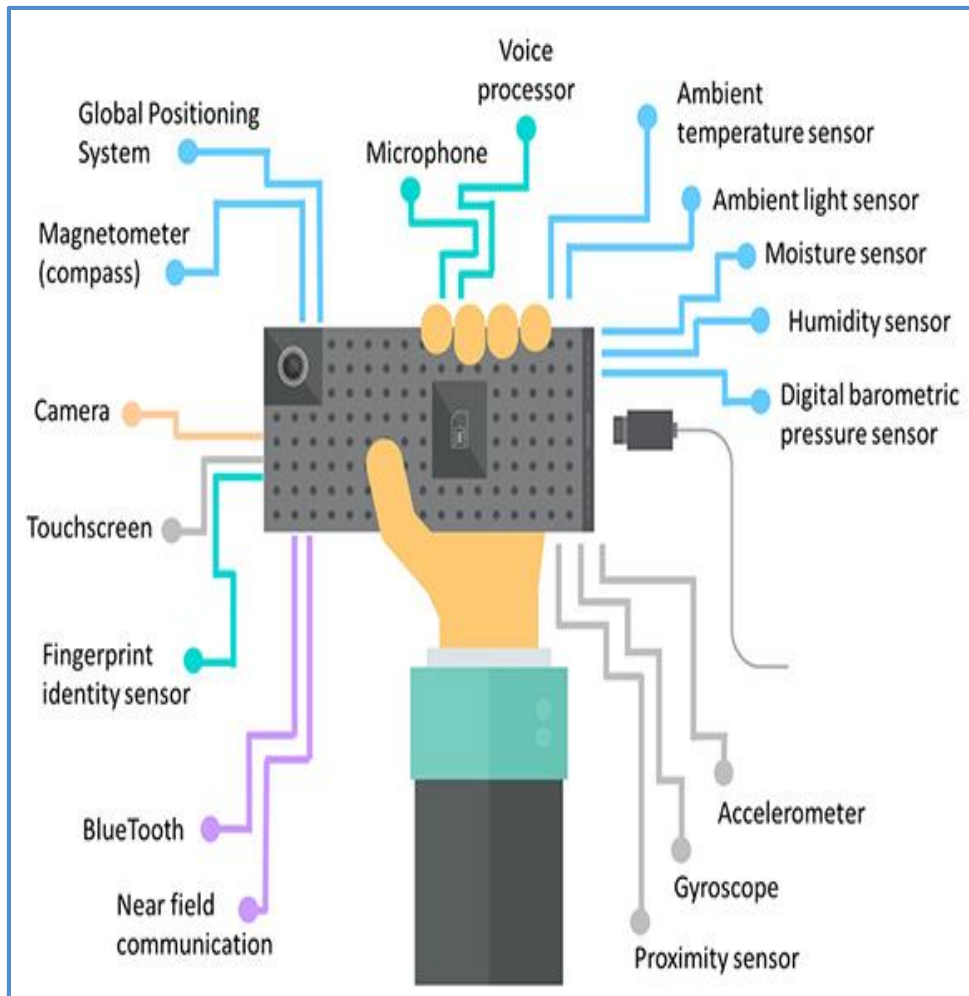
Going beyond the EHRs to find an Answer to Value-Based HealthCare

Computers are like a bicycle for the mind..



I think one of the things that really separates us from the high primates is that we're tool builders. Humans are one of least efficient species when it comes to using energy to move a kilometer. But, a human on a bicycle, blew the comparison away, completely off the top of the charts- **Steve Jobs**

Emergence of the new field of Digital Medicine



265,000 Mhealth Apps

Telemedicine

Linked Wearables

AI/Machine Learning

Secure Messaging

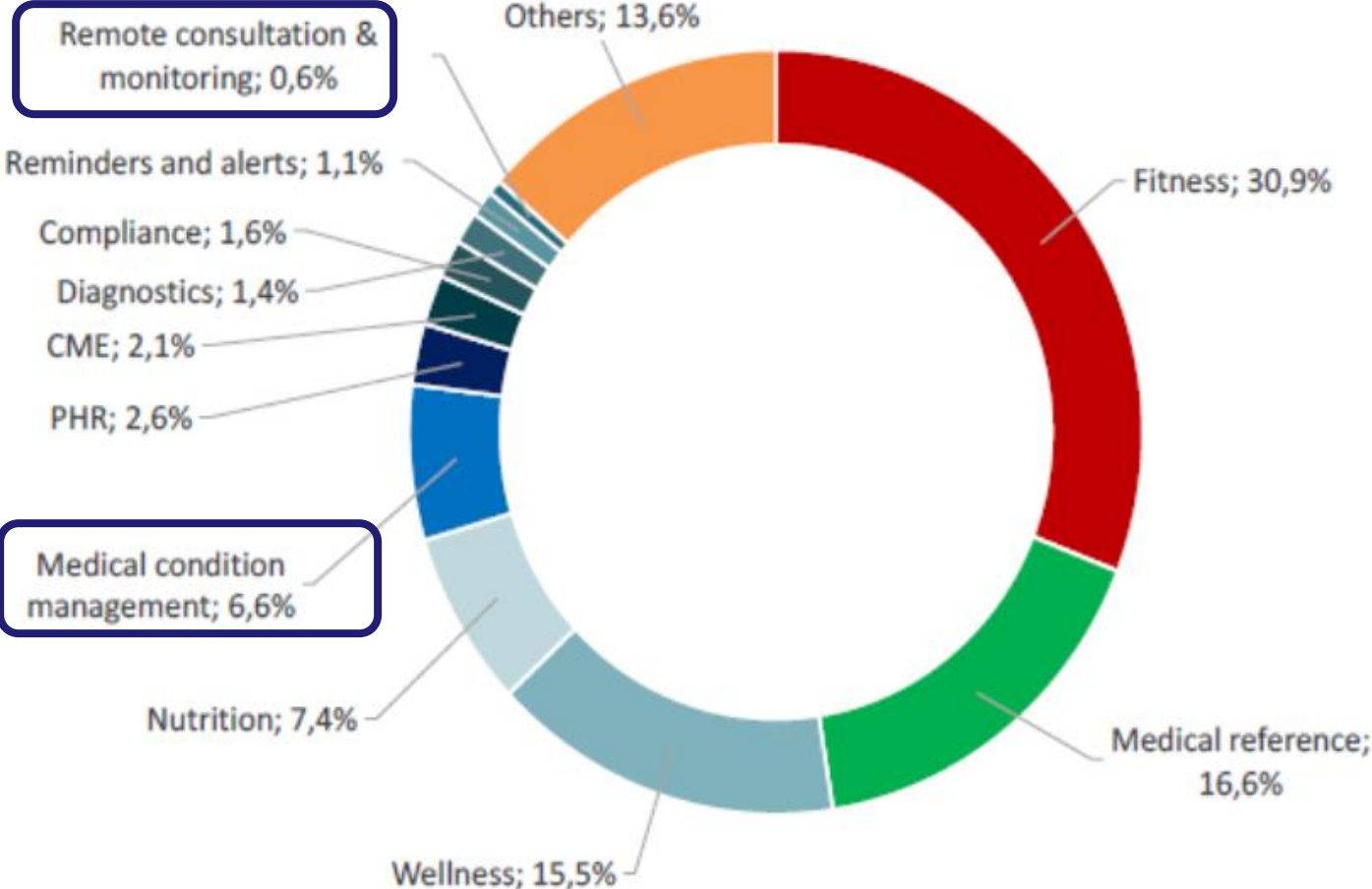
Augmentic/ Virtual Reality

Voice commands/ Alexa

Chat Bots

Exposome

Digital Medicine App Landscape



Forbes

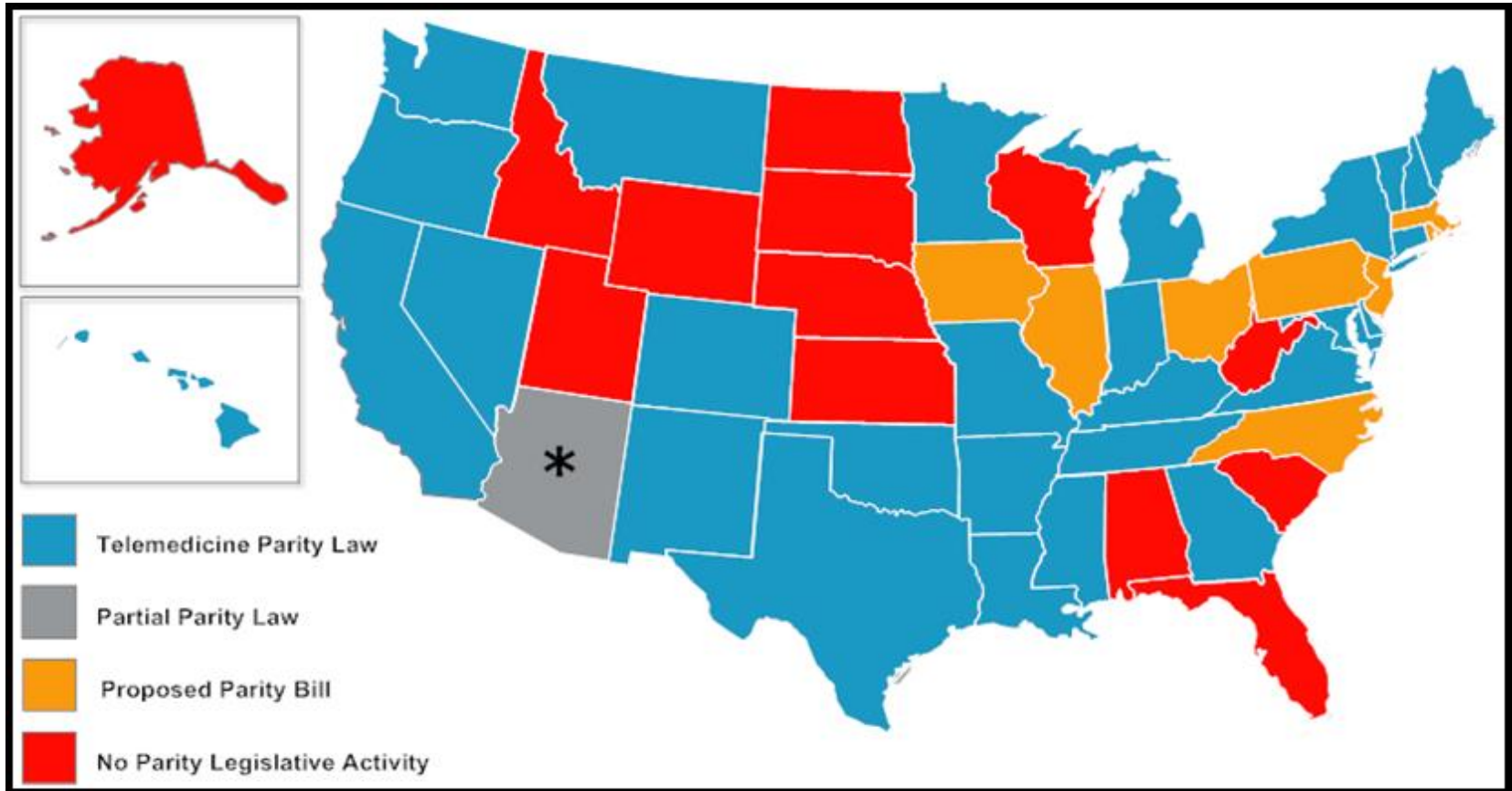
Trailblazer WellDoc to Sell First Mobile Prescription Therapy

[Read the Article](#)



In RCT, patients using BlueStar saw a greater mean A1c decline than those receiving usual care: 1.2% (1.9% vs 0.7%) over a 12 month period

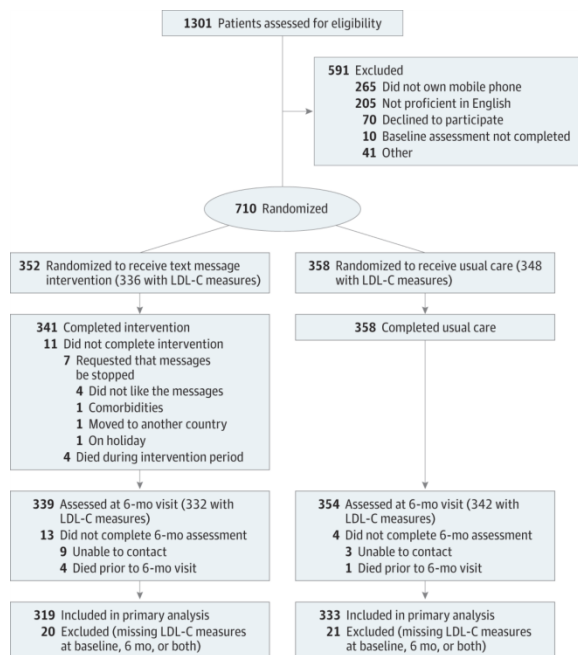
Telemedicine becomes mainstream: 46 states now have some sort of Parity Law



A significant reduction in emergency department visits (OR = 0.27) and hospitalization (OR = 0.46) was reported with telehealth care in COPD patients

From: **Effect of Lifestyle-Focused Text Messaging on Risk Factor Modification in Patients With Coronary Heart Disease: A Randomized Clinical Trial**

JAMA. 2015;314(12):1255-1263. doi:10.1001/jama.2015.10945



At 6 months, levels of LDL-C were significantly lower in intervention participants (mean difference, -5 mg/dL with reductions in systolic blood pressure (-7.6 mm Hg) and BMI (-1.3),, and a significant reduction in smoking (26% vs 44%; **relative risk, 0.61** [95% CI, 0.48 to 0.76]; $P < .001$).

The majority reported the text-message program to be useful (91%), easy to understand (97%), and appropriate in frequency (86%).

Figure Legend:

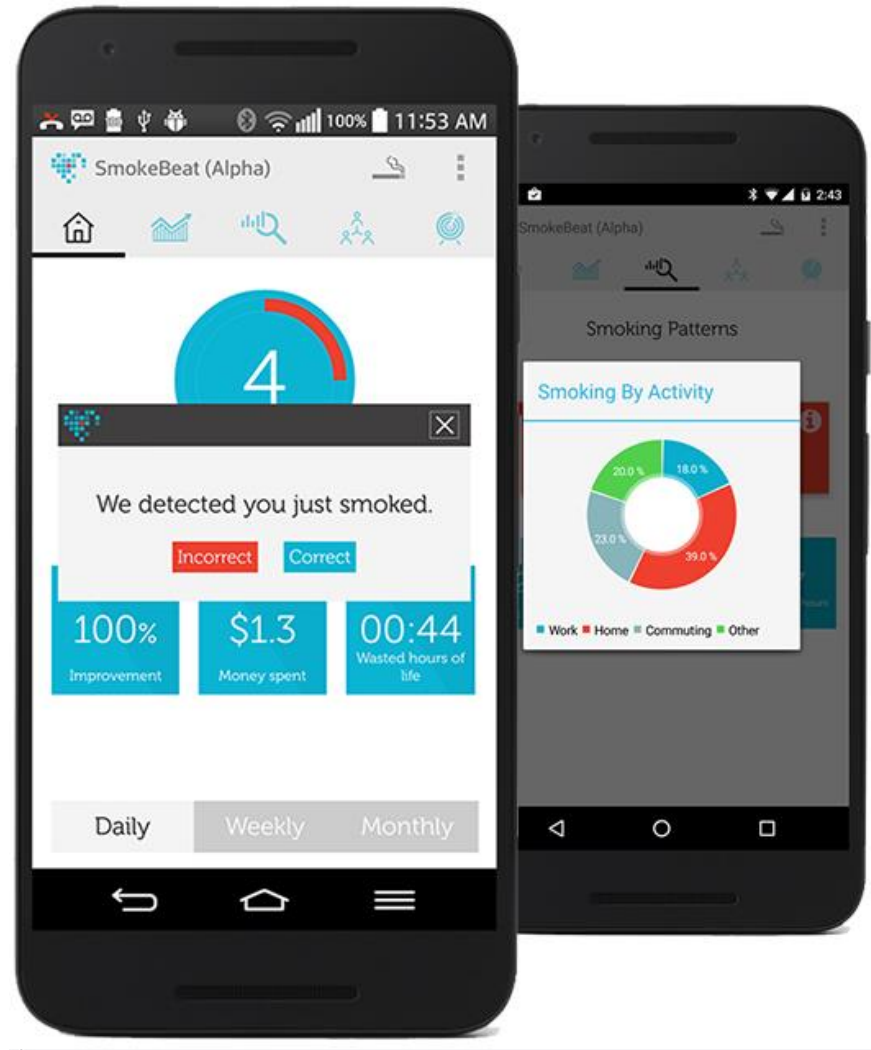
Enrollment of Participants in the TEXT-ME Randomized Clinical Trial LDL-C indicates low-density lipoprotein cholesterol.

2016: Year of Wearables / Implantables / digestibles

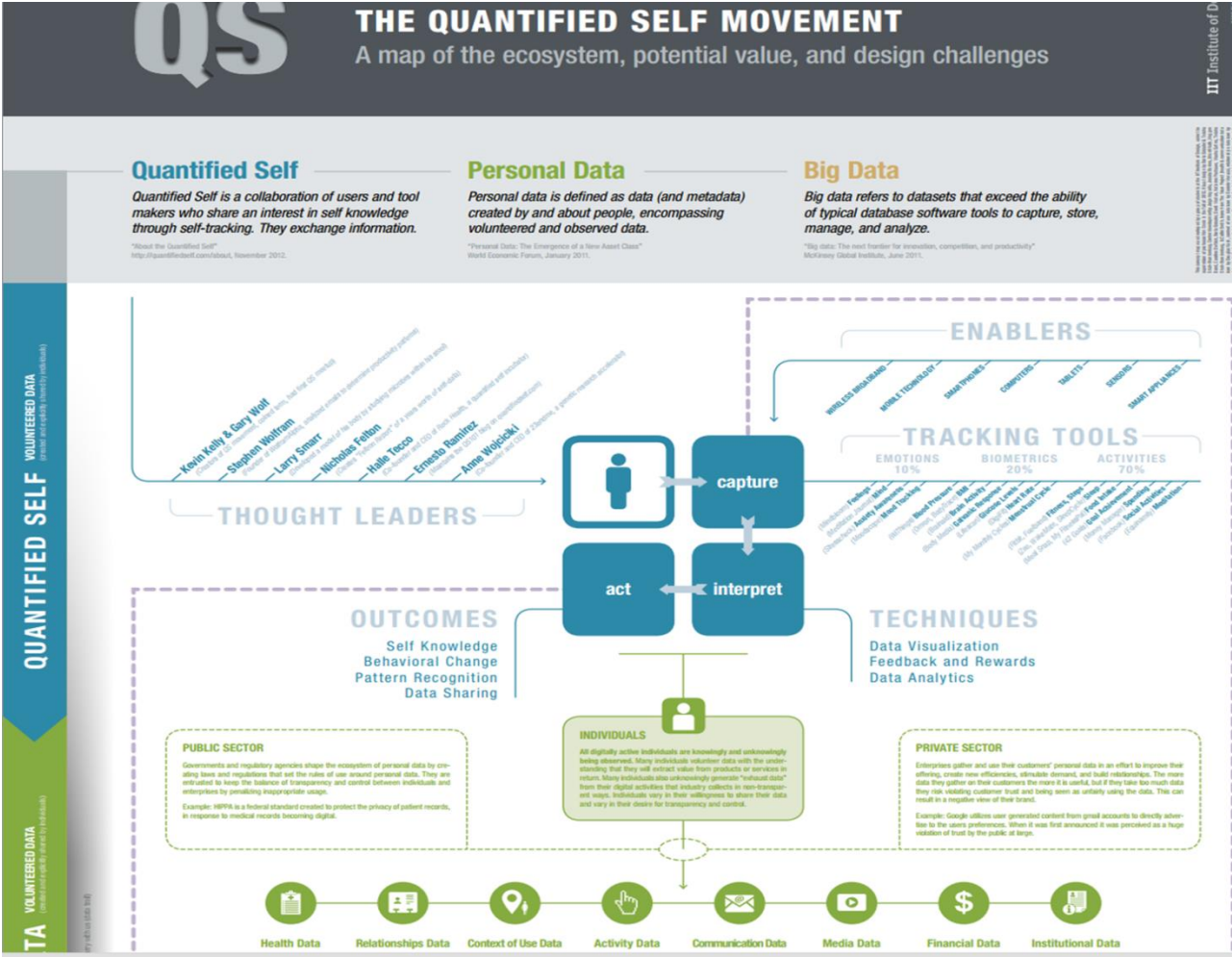


Somatix (Wearables)

Somatix is a behavioral medication software platform, utilizing real-time interventions based on data gathered from standard wearables. Its first product, SmokeBeat is addressing the global smoking cessation market; its customers include corporate employers, health insurance companies and clinics



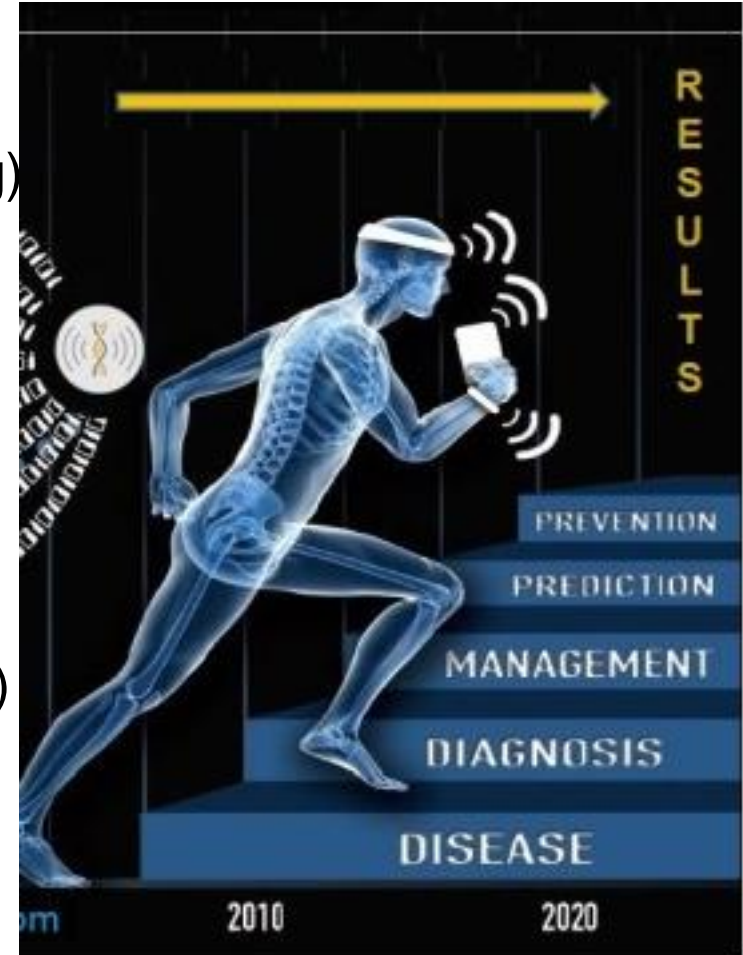
From Quantified Self to Quantified Population Health



Angarita et al. Quantified Self
Swan M, Big Data, 2013

Envisioning digital care in year 2020

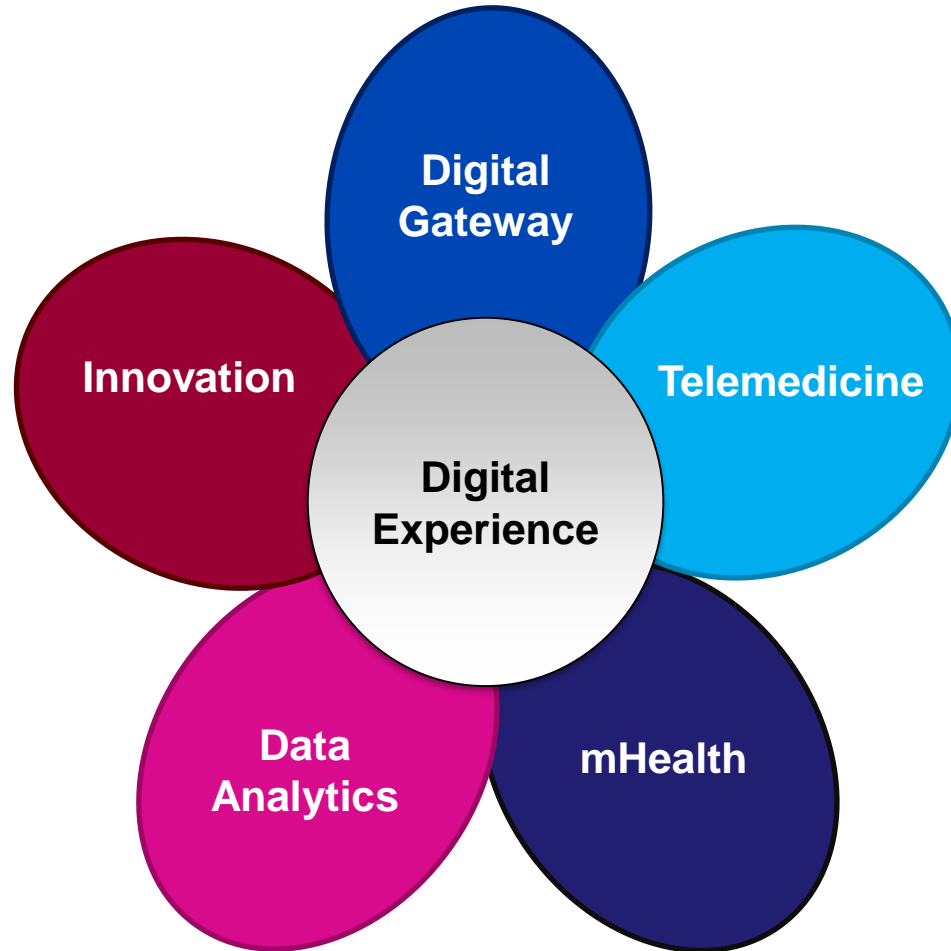
- ✓ Virtual care (**telemedicine and messaging**)
- ✓ 24/7 tracking (**remote monitoring**)
- ✓ Population health (**predictive analytics**)
- ✓ Empowerment (**SDH, peer networking**)
- ✓ Prescribing Apps (**AR/digital therapeutics**)



How do we get there?

Build Capacity for Digital Transformation

“The Digital Daisy”



Courtesy Bruce Darrow and Digital
Medicine Advisory Team

MISSION



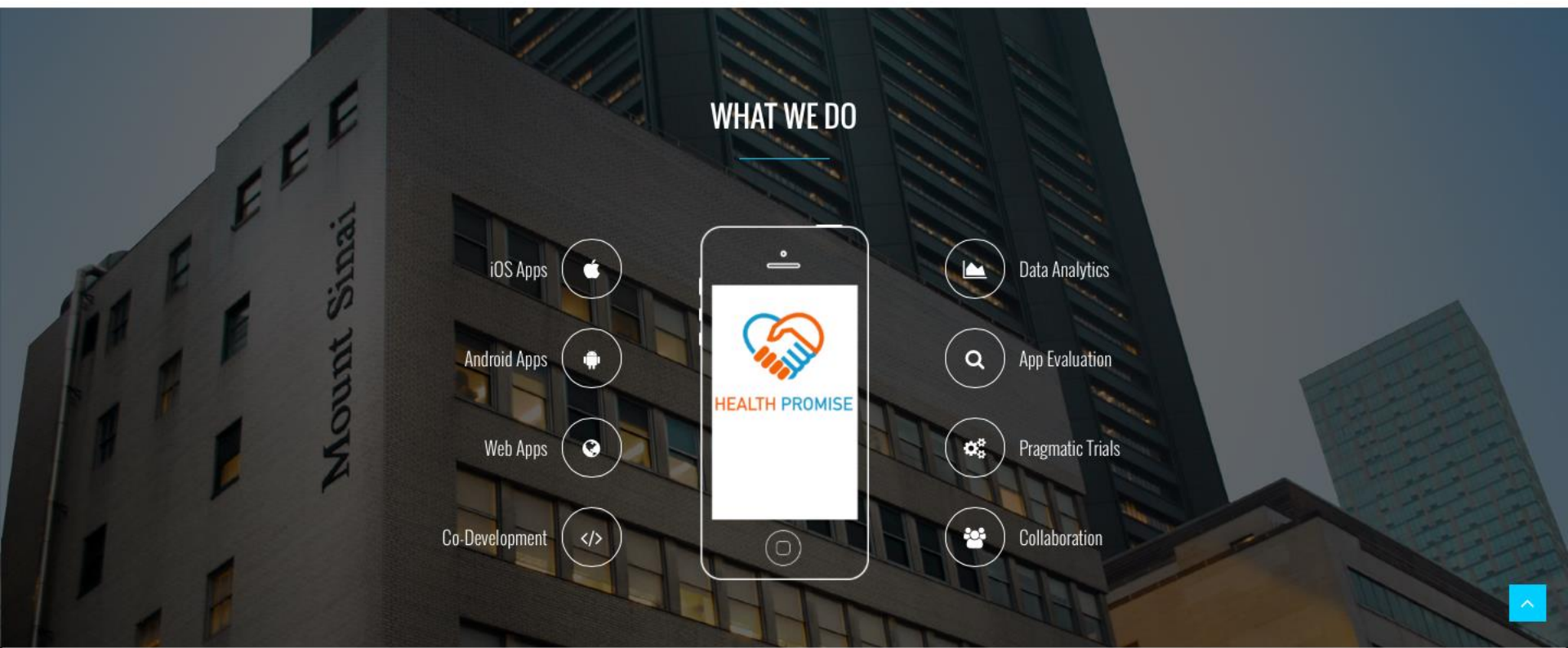
APPS



ANALYTICS



AWESOME
OUTCOMES



AppLab: Academic Research Organization in Digital Medicine

Providers

The Multiplier Effect

Patients



The Team



Collaborators

Pop Health
& ACO

MSIP

IT

DOM

CTSA



Researchers

25 funded Projects, 100 investigators served, Digital Medicine Community created

Remote Monitoring in IBD: HealthPROMISE



Item	Status
Colonoscopy	Unmet
Steroid sparing medications	Unmet
Normal Mucosa on Endoscopy	Unmet
Hepatitis B Screening	Unmet
Injectable Drug Adherence	Unmet
TPMT Testing	Unmet
Normal Inflammatory Markers	Unmet
Skin Cancer Protection	Unmet
Bone Density Test 01-15-2016	Met
Vaccination for Flu 11-15-2015	Met

Realtime population health dashboard w/ app data

Mount Sinai Medical Center

Health Promise

Health Care Provider: Mount Sinai Medical

Disease: IBD

Patient Population Resources Communication

< Patient List

Patient Detail

Name : Milan Patel UserId : mpatel99 MRN : 0 DOB : 1/1/1960 12:00:00 AM Contact # : 2016680785 Email : mpatel.bap

CheckList of Care				Recent QOL Score					
CheckList	Status	Action Date							
Bone Density Test	Met	08-18-2014		Fatigue	5	3	3	2	6
Colonoscopy	Met	09-03-2014		Social	7	6	6	4	6
Hepatitis B Screening	Met	07-29-2014		Leisure	5	2	6	5	6
Injectible Drug Adherence	Met	10-07-2014		Abdomen Pain	5	5	2	3	7
Normal Inflammatory Markers	Met	07-22-2014		Depressed	7	5	6	5	3
Normal Mucosa on Endoscopy	Met	10-03-2014		Gas	3	6	6	5	6
Oral Medication Adherence	Don't Know	07-31-2014		Maintain Weight	7	6	4	4	5
Skin Cancer Protection	Met	09-04-2014		Tense	5	6	7	2	5
Smoking Cessation Advice	Don't Know	07-30-2014		Bowel Issue	7	6	3	1	2
Smoking Screening	Met	08-18-2014		Anger	7	6	5	1	6
Steroid sparing medications	Met	09-05-2014		Total	58.00	45.00	45.00	26.67	58.00
TPMT Testing	Met	09-27-2014							
Tuberculosis Test	Met	08-27-2014							
Vaccination for Flu	Met	11-14-2014							
Vaccination for Pneumonia	Met	07-19-2014							

Registration: ClinicalTrials.gov NCT02322307

© Icahn School of Medicine at Mount Sinai

Improvement in QOL and Quality Indicators in IBD with HealthPROMISE

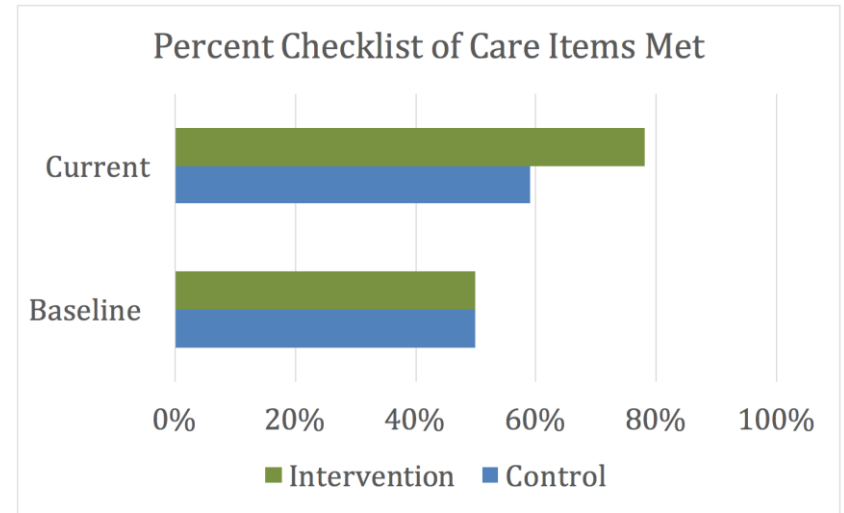
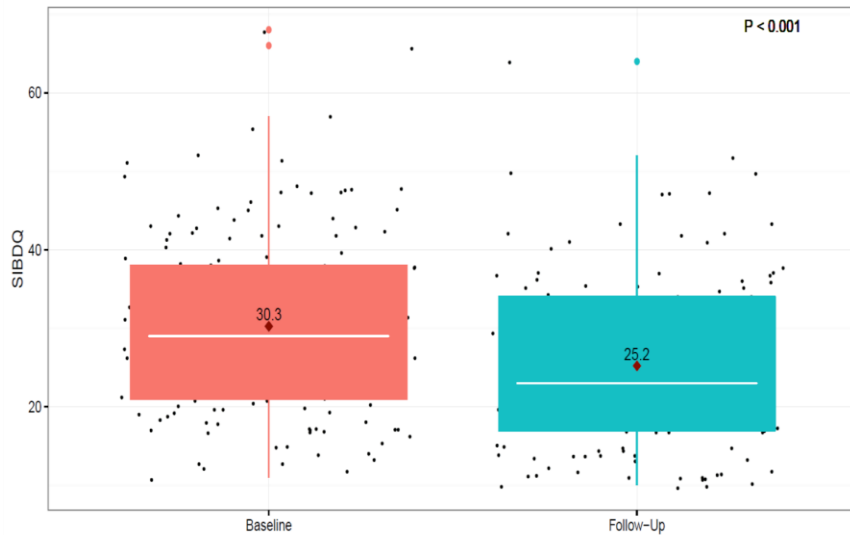


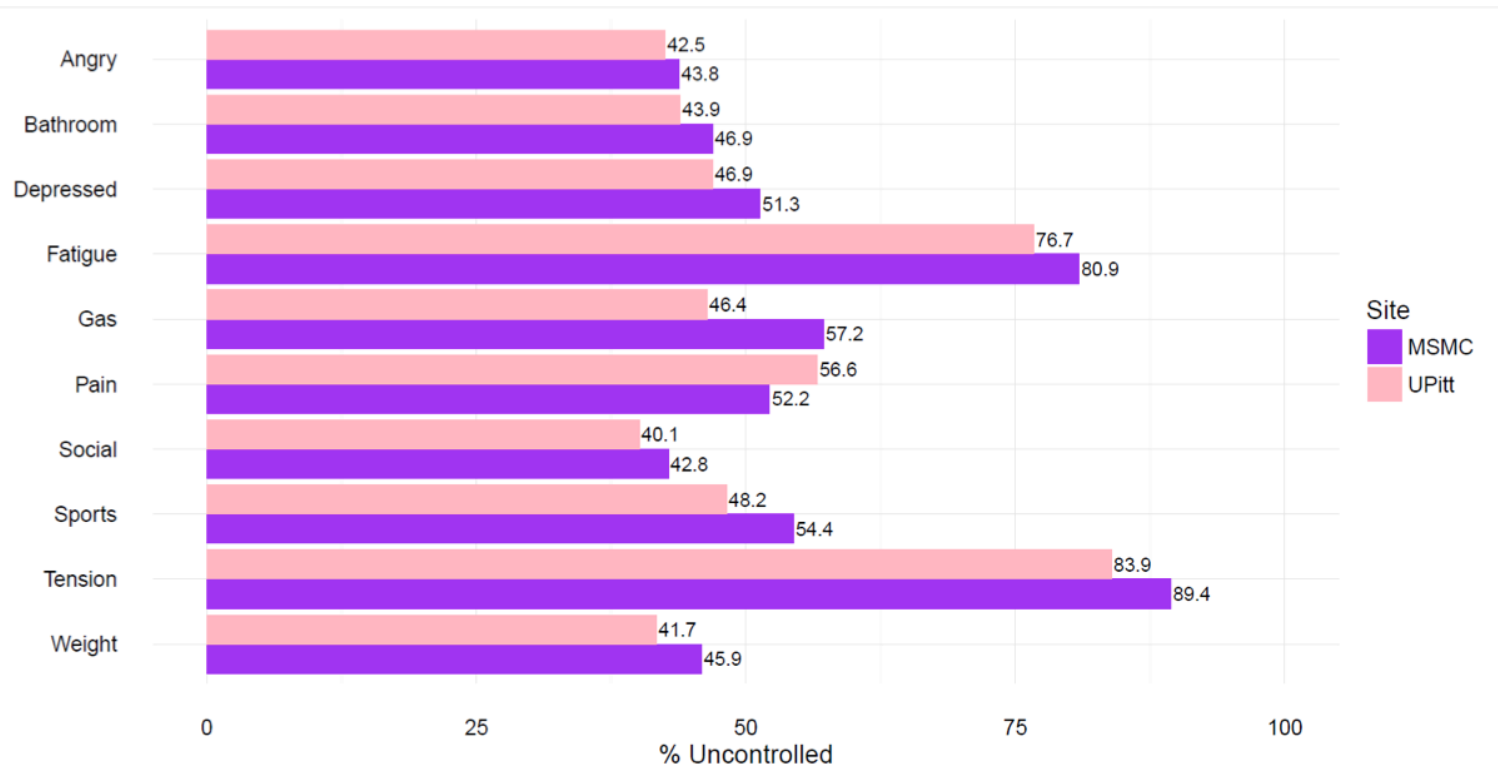
Figure 2. Improvement in Percentage of Patients meeting eligible Quality of Care metrics in control (9%) versus Intervention (28%), $P < 0.01$



Atreja A, DDW, San Diego. 2016

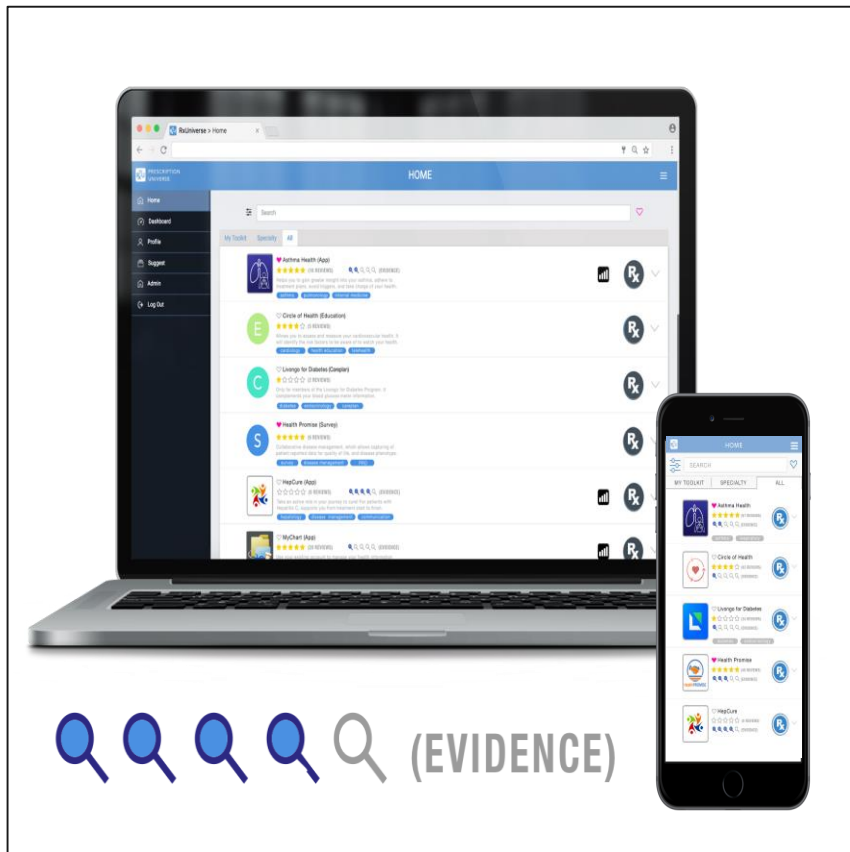
Fatigue and Tension as major drivers of poor quality of life in more than 75% of IBD patients

Mount Sinai patients with app and UPMC patients with paper based survey



Singular Platform for Digital Transformation

Specialty Specific customized solutions for patient care and research



Health Education Content, Videos, Webinars



Survey and Feedback



Tracking Apps, Websites



Wearables



Telemedicine



Appointment Scheduling



Social Patient Engagement



Clinical Trials

<https://www.youtube.com/watch?v=1Ax926yrEQc>

The Time for Prescribing Apps has Come!!



Five clinical sites at Mount Sinai Health System took part in initial pilot aiming to prescribe apps to 100 patients

We achieved 20x our goal and ended up prescribing apps to over 2000 patients!

[Watch video](#) or [click here for details](#)

NPR Marketplace: An App to Prescribe other Healthcare Apps!!

RxUniverse: Usability and Learnability

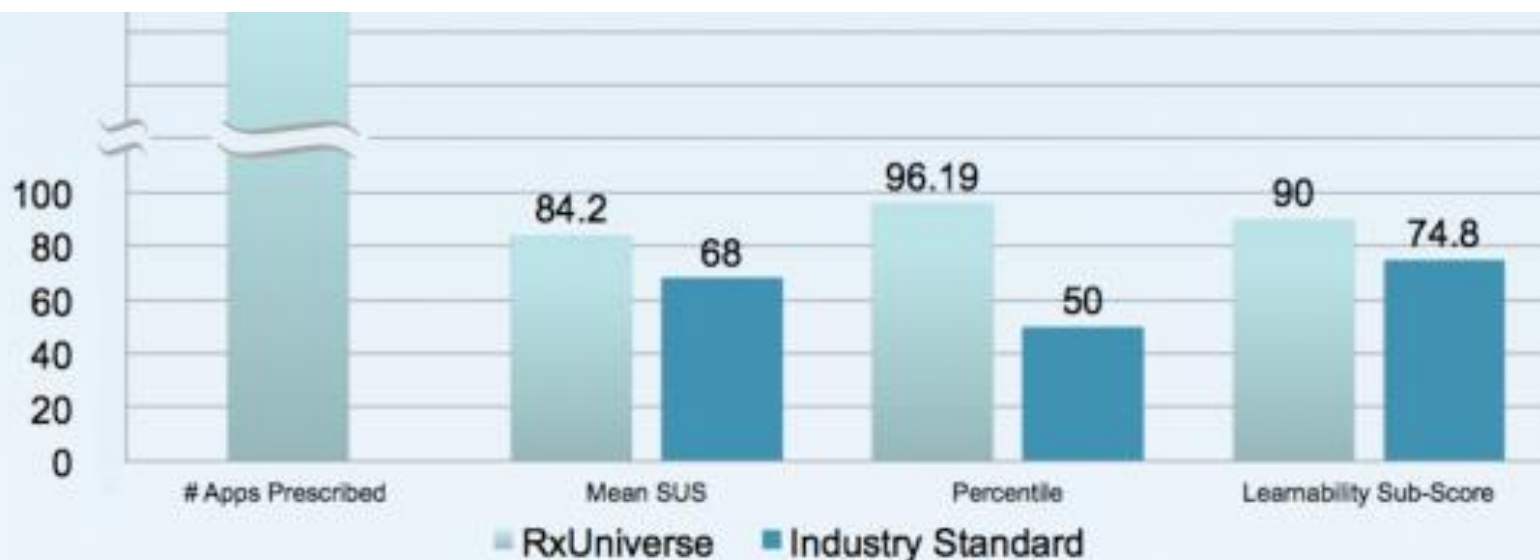
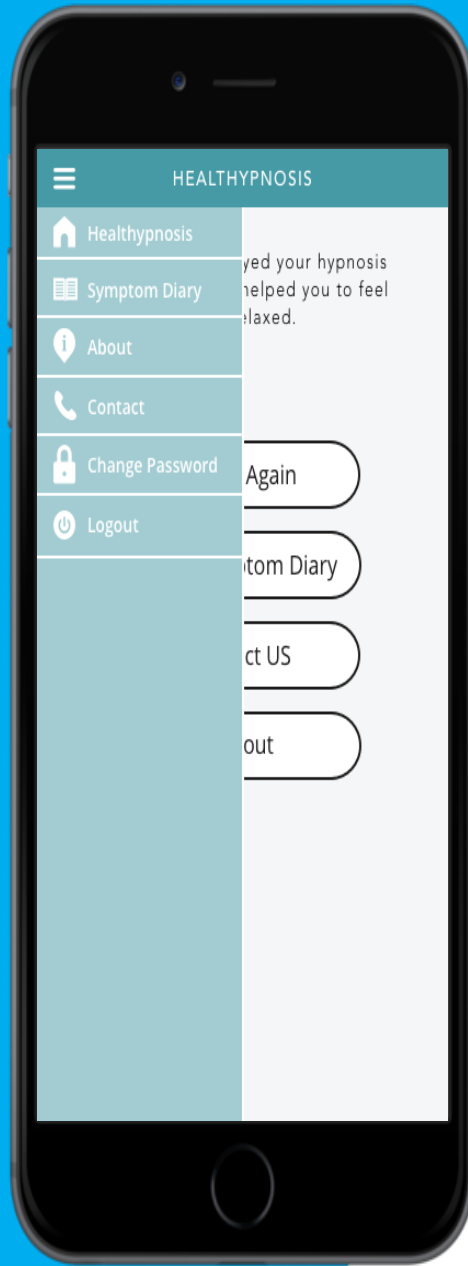
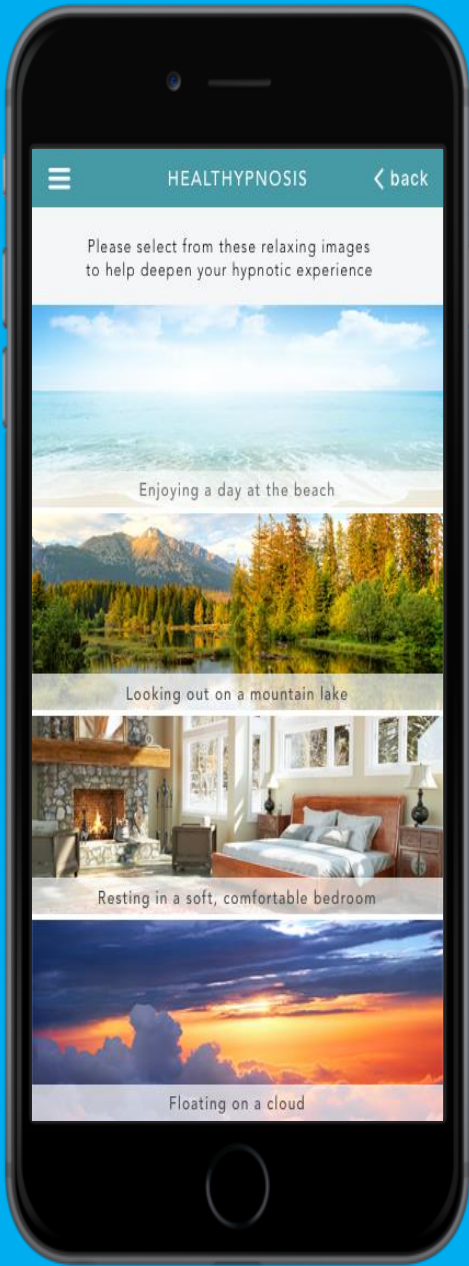


Figure 5. Adoption, Usability, and Learnability of RxUniverse vs. Industry Standards.

System Usability Score Items			
Q1	I think that I would like to use RxUniverse frequently.	Q6	I thought there was too much inconsistency in the RxUniverse platform.
Q2	I found RxUniverse unnecessarily complex.	Q7	I would imagine that most people would learn to use RxUniverse very quickly.
Q3	I thought RxUniverse was easy to use.	Q8	I found the RxUniverse platform very cumbersome to use.
Q4	I think I would need the support of a technical person to be able to use	Q9	I felt very confident using RxUniverse.

Descriptive Scoring for the SUS		
Adjective	Mean SUS	SD
Worst Imaginable	12.5	13.1
Awful	20.3	11.3
Poor	35.7	12.6
Okay	50.9	13.8
Good	71.4	11.6



HEALTHYPNOSIS

PI: Guy Montgomery
Julie Schnur



Mount
Sinai

AdhereTech

**Patented Smart Pill Bottles
to Track & Improve Adherence**



Validated Use-Case

Readmission Reduction



Through the use of the mobile application, HeartHealth, healthcare providers are able to remotely monitor their patients' blood pressure and weight in the 30 day high risk period post discharge.



Patient Satisfaction

Increased positive health outcomes due to high patient satisfaction with the platform

50%

Readmission Rate Reduction

10% readmission rate compared to the national rates of >20% readmission within 30 days of discharge

73%

Activated Patients

Who continue to use the mobile apps and smart devices to track BP and weight

Enterprise-wide SDoH Assessment

Hyperspace - Mount Sinai - Production - FPA GASTROENTEROLOGY - FARAH FASHIHUDDIN

Epic Home Schedule In Basket Printer Status Chart Patient Lists Patient Station Apts Schedules Templates Print Secure Log Out

Sulaiman, Khazana Test, Veronica

Test, Veronica 2864630 Allergies No Known All... PCP: None Insurance: None MyCh... Cod... FYI... HM Alert: Health Maintena... Resear... Program: --, --, --

Grand Central Search CSN... Native Kidney...

RxUniverse

My GI Health (1 Review)

Description: MyGIHealth was developed to help you feel better by putting the power of information in your hands! Created by leading gastroenterologists, the app helps you assess and monitor your GI...

Tactic Health: My Connected Health Logbook (1 Review)

Tactic Health App can retrieve data from HealthKit on your iPhone if authorized. Tactic Health App helps you track your health from a wide range of connected health data sources such as FitBit, Garmin...

InformaHealth (2 Review)

InformaHealth is a free patient education tool that provides current best knowledge. It should not take the place of direct medical advice. Please contact your physician for any urgent matters.

The Circle of Health (1 Review)

"THE CIRCLE OF HEALTH: the app that helps you to improve your cardiovascular health" WHAT IS IT? The Circle of Health is an initiative created by the Foundation for the Circle of Health for the day-to-day...

InformaHealth FMT (1 Review)

InformaHealth FMT is a free patient education tool that provides current best knowledge on Fecal Microbiota Transplantation. It should not take the place of direct medical advice. Please contact your p...

HepCure (2 Review)

Take an active role in your journey to cure! HepCure is an innovative app for

Profile

NAME
BIRTHDATE
CONTACT INFO

Social Determinant Worries

Money Transport Access Shelter Food Safety

Digital Engagement Score

Survey Results

Dashboards

Bifurcaid RxUniverse HealthPROMISE e-Motivate

HEALTHYPNOSIS Get! HealthFlo HealthFlo Messenger

Farah Fashihuddin Future/Standing Orders 12:39 PM

Real Time Patient Experience Survey and Service Recovery (MIPS)

Patient Satisfaction Survey

Please select the number of stars on a scale of 1-5, with 1 being the worst, and 5 being the best, please rate the following:

4 How well your doctor communicated your medical plan with you.



5 How well your nurse communicated your medical plan with you.



6 How well the staff explained the purpose and side effects of new medications.



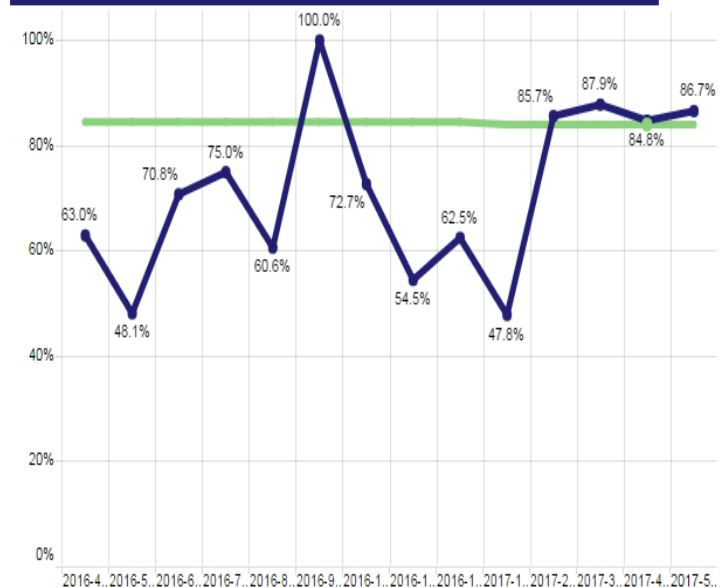
7 How well the staff is preparing you for leaving the hospital (discharge).



8 How would you rate your experience in the hospital thus far?



Doctor Communication Over Time: 10 West



CLINICAL DECISION AID: BLADDER CANCER RISK TOOL (OCM)

Disclaimer Prediction Tool Results Summary About

Muscle-Invasive Bladder Cancer Prediction Tool

Disclaimer • Prediction Tool • Results Summary

Print

Your Results

Edit Information

Cystectomy



5 years after diagnosis of muscle-invasive bladder cancer

- approximately 60 out of 100 patients will remain alive
- approximately 7 out of 100 patients will die of causes unrelated to bladder cancer
- approximately 33 out of 100 patients will die due to bladder cancer

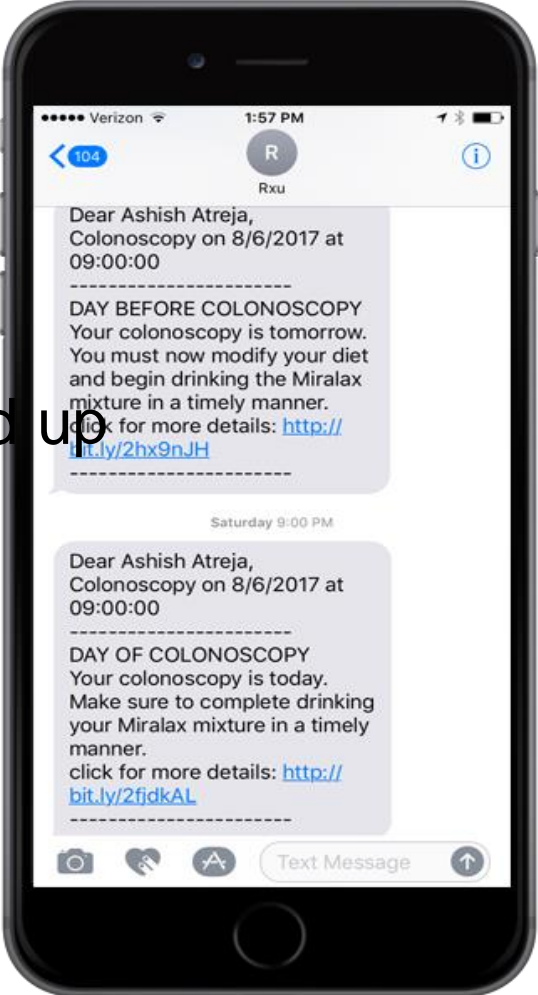
Neoadjuvant chemotherapy followed by cystectomy



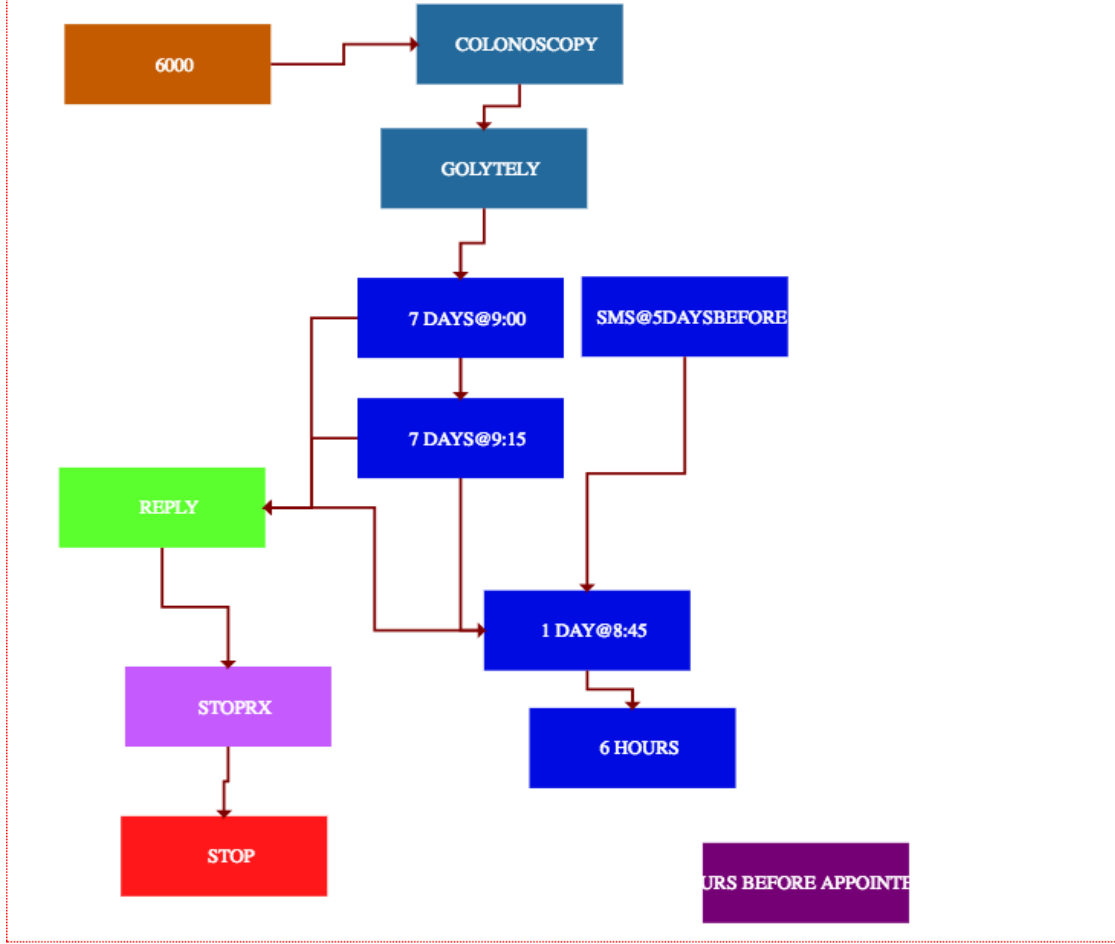
5 years after diagnosis of muscle-invasive bladder cancer

- approximately 68 out of 100 patients will remain alive
- approximately 8 out of 100 patients will die of causes unrelated to bladder cancer
- approximately 24 out of 100 patients will die due to bladder cancer

Peri-procedural Support for Bundles



cleaned up



Exponential ROI

One Stop Shop for Multiple Transformation Use-Cases

EHR Integrated
Platform

Curated by Academic
Centers

Transforming
Organizations within
90 days

Increased Patient and
Provider Engagement

Improved Patient
Outcomes

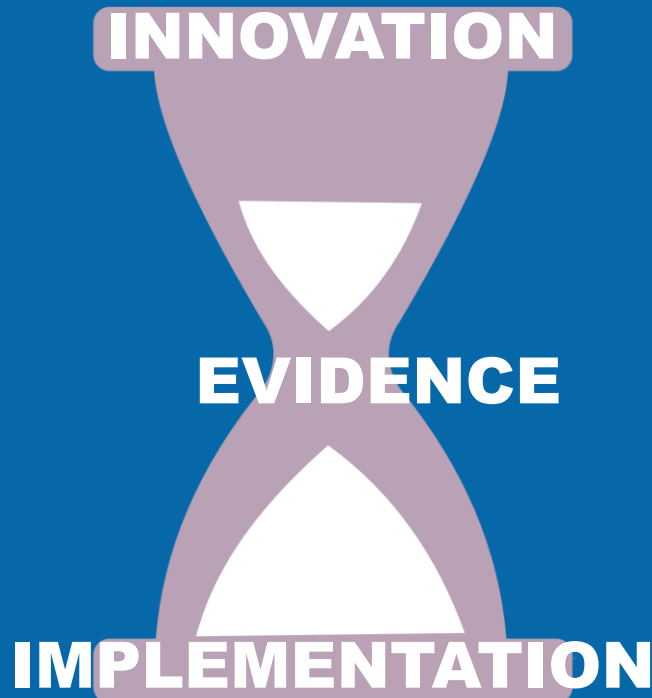
Ongoing Use-cases

- Providing PHR access to populations at scale
- Behavioral health apps
- Pre and Post Surgery Engagement
- Transitions of Care
- Remote Monitoring of 5 high cost diseases
- Employee Engagement and Wellness
- Assess Social Determinants
- Readmission Reduction
- Patient Reported Outcomes

ROI through

Leveraging investments made (PHR)
Improving peri-op throughput
Remote monitoring and CCM Codes
Patient experience survey and
Real time service recovery
Reducing readmission penalties
MACRA-Increased score- QI activities
CIN and Pop Health (Top 5 diseases)
At-risk contracts and ACO

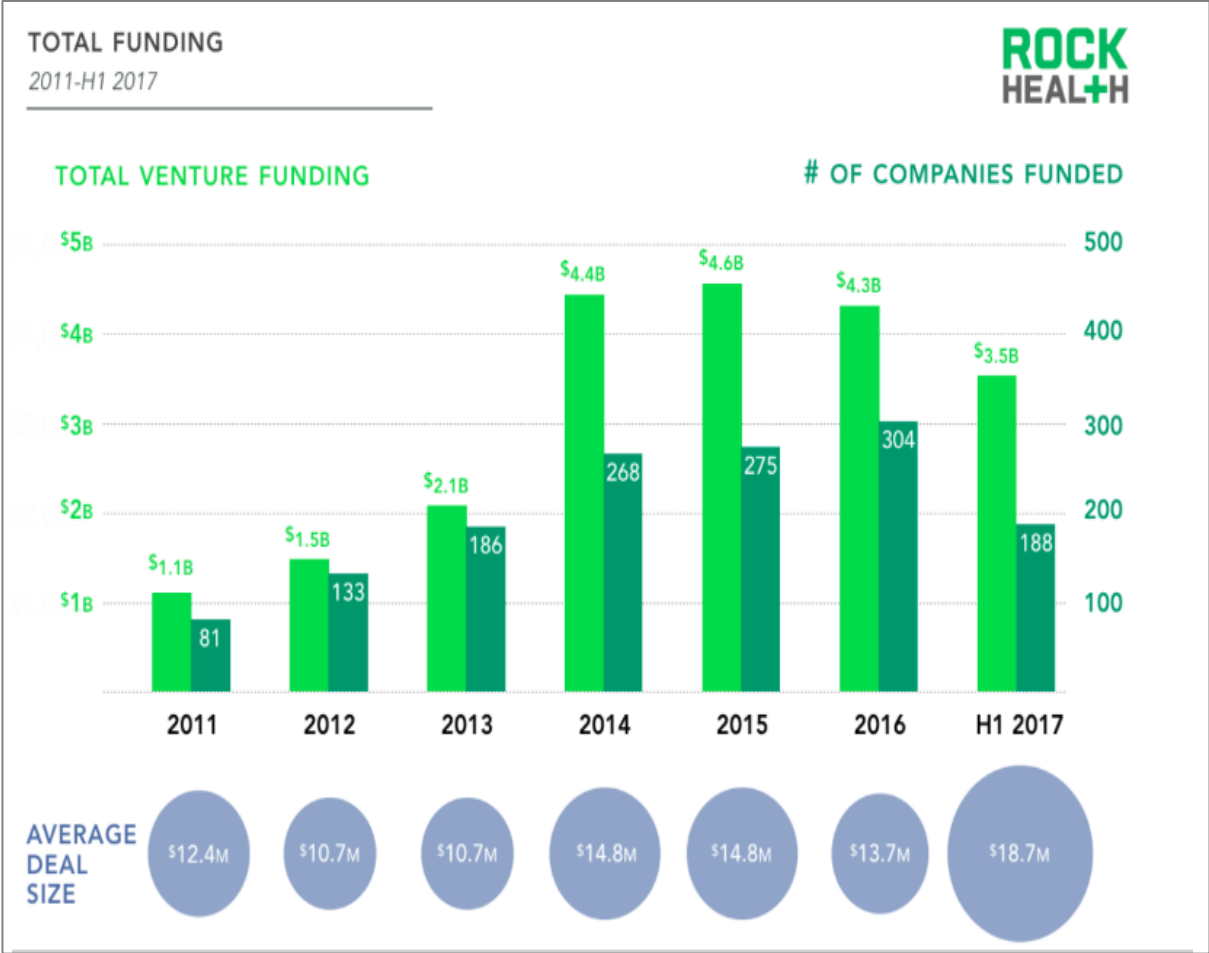
BOTTLENECK : Creating Evidence for Digital Medicine



mHealth Lacks Evidence:
Takes “scatter shot” approach

--World Bank

Digital Health Investment fueled by Innovation Economy



Problem of Plenty



The 'Burden of Proof'

From \$4.5 Billion To Nothing: Forbes Revises Estimated Net Worth Of Theranos Founder Elizabeth Holmes



Future generations of startup founders should ensure they are working with venture capital firms that have ***ample experience in health care***. These investors will understand that it takes time to build a successful and long-lasting company.”

- Christina Farr, *Fast Company*

Scripps Wired for Health study results show no clinical or economic benefit from digital health monitoring

By **Jonah Comstock** | January 19, 2016

SHARE 2767



PeerJ

✓ PEER-REVIEWED

A prospective randomized trial examining health care utilization in individuals using multiple smartphone-enabled biosensors

The results are in for the Scripps Translational Science Institute's **Wired For Health study**, and there's no sugar-coating it: they're disappointing for those working in digital health. The **six-month randomized control trial** found no short-term benefit in health costs or outcomes for patients monitoring their health with connected devices.

"It was a bit disappointing, but remember, this was the first multisensor trial that's ever been reported, so in that respect it was a pioneering effort," study author and STSI Director Dr. Eric Topol told MobiHealthNews. "And you know, it was very difficult because we had these three different sensors, glucose, blood pressure, and heart rhythm, and a lot of patients had all three problems or two of them, and had to have a dashboard created. There are a lot of logistical challenges there."



July 12, 2016

WHY POKÉMON GO IS SECRETLY THE WORLD'S NEWEST FITNESS PHENOMENON

Legions of eager Pokémon masters are suddenly realizing what FitBit wearers have long known: Walking around all day is actually one hell of a workout.



BY **MICHAEL RODIO**

Follow

Pin it



Tess Koman

@tessie_the_mess

Follow

True Life: I Abandoned My Fitness Tracker in Favor of Catching Pokemon All Over the City and I'm in the Best Shape of My Life

12:25 PM - 10 Jul 2016

115 268

INNOVATION
Digital Technologies



RIGOR
Evidence-based Medicine

Evidence-Based Digital Medicine (EBDM)

NODE Health: Guiding Principles

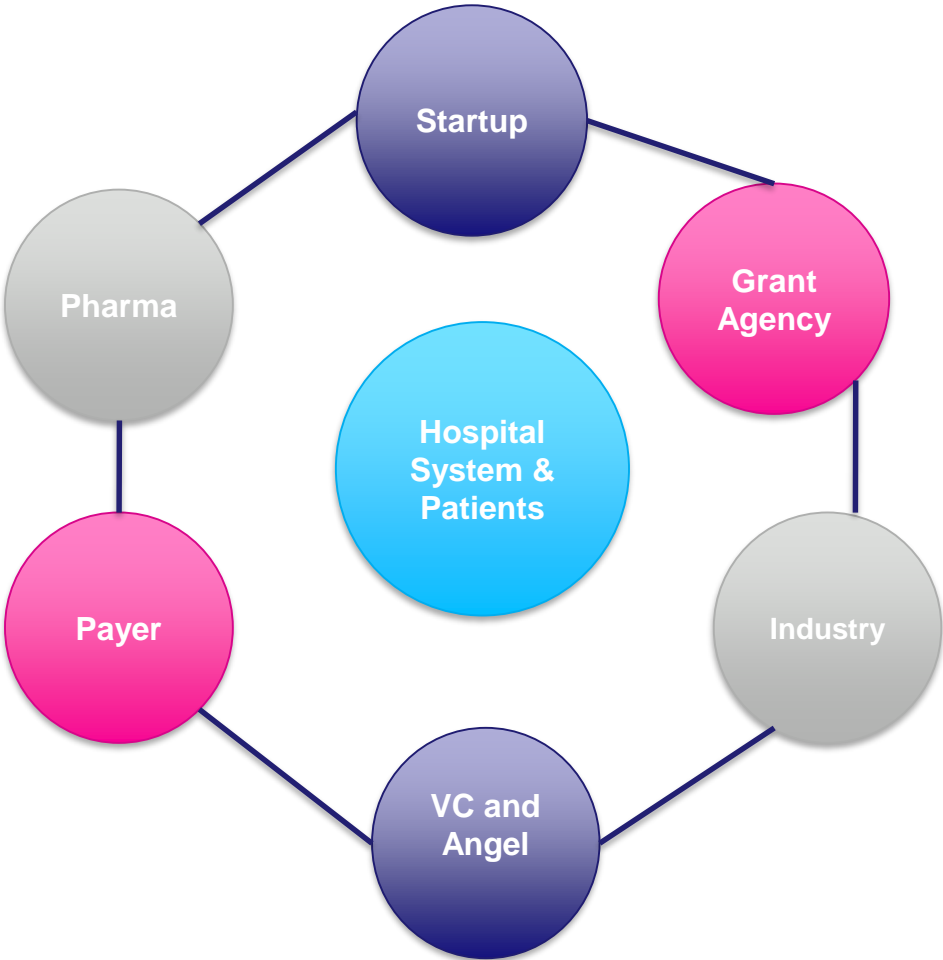
1. **Share** information about ongoing innovation and single site trials
2. **Standardize** existing governance, regulatory and best practices
3. **Support** multi-site digital medicine trials and implementations

1. Evidence Challenge

2. Transformation Challenge



NODE Health Foundation



Launched Feb 2016



Executive Board



Megan
HealthIm



Brian
LifeBridge Health



Dr. Jeet Barmecha
SBH
Health



Jay
Modus



Sameer
Badlani
Sutter



Moiz
Kasubhai
Lincoln
Hospital



Vickie



Dr. Yauheni Solad
Yale New Haven



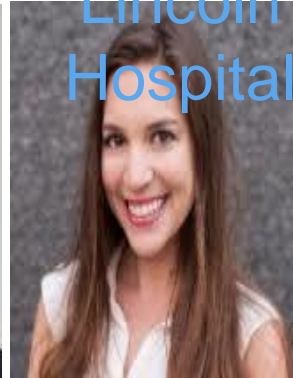
Dr Aenor Sawyer
UCSF



Dr. Amy

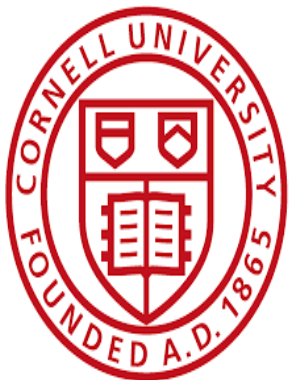


John



Sarah

Consortium Members



Eco-System Members and Partners





The Network of Digital Medicine Evidence PULSE

Your Recommended Dose of Peer-Reviewed
#DigMedEvidence Issue No. 4, 2016

Evidence PULSE is curated and critiqued by thought leaders in academic medicine. Our mission is to make [#DigMedEvidence](#) universally available to all academic and industry partners.

Know someone who should be getting Evidence Pulse? -> [Sign them up!](#)

Join NODE



Initiatives

[The White House's Million Person Precision Medicine Project](#)

TWEET | *New York Times*

"This exciting initiative could change the conversation at home and in the clinic about what "healthy" actually means for the individual. Genetic information can be associated with the real life phenotypes and lifestyles at immense scale, so we can get a sense not just of what genes are there but perhaps how and when genes get switched on or off. This could be the key to modern medicine's Renaissance."-[Mike Hoaglin](#), MD, Duke University Health System, [@medmike](#)

[Telehealth: Mapping The Evidence For Patient Outcomes From Systematic Reviews](#)

TWEET | *Agency For Healthcare Research and Quality*

Sharing Evidence

Peer Reviewed EBDM
Newsletter

Curated by thought
leaders

Initiatives, reviews, key
publications

7000+ members

[#digmedevidence](#)

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- > Congress Announcements
- > Alerts and RSS

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www.karger.com/DIB

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Information about Openaccess



Digital Biomarkers

Editor(s): Dorsey E.R. (Rochester, N.Y.)

Editorial Board

Contents: all years



Year	Vol.	Issue	pp.	Issue Release Date
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JOURNAL Partnership

Digital Medicine Conference 2017

[REGISTER](#)

When

DECEMBER 4TH - 5TH, 2017

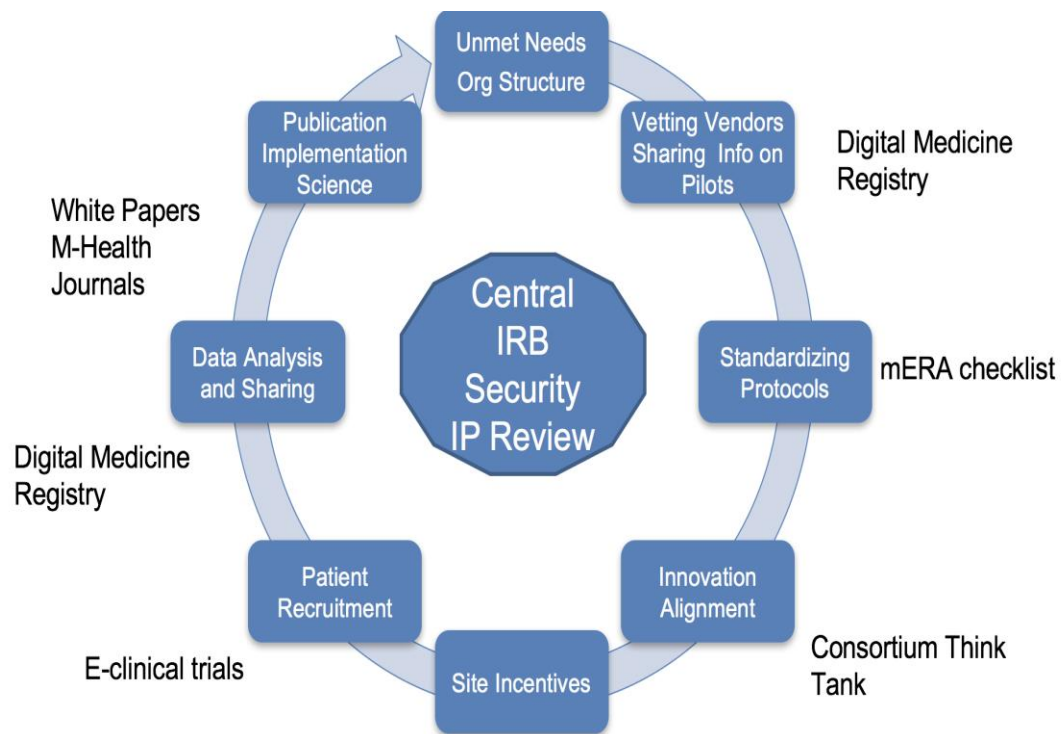
Where

TIMES SQUARE, NEW YORK CITY

**From Innovation to Transformation - Forging the pathway to
Evidence-Driven Digital Medicine**

2018 Focus Areas

- I. Meaningfully Engaging Underserved Population
- I. Successful transformation examples from payers and health systems
- I. Enabling clinical trials and evidence generation



[Click here](#)

Collaborators

TEAMS

DOM: Office of Innovation: Noel Rijo
Mount Sinai Innovation Champions
Clinical Informatics: Bruce Darrow
ehealth Team: Sudipto Srivastava
Big Data Team- Robbie Freeman
Telemedicine: Niyum, Sudipto, Nick Genes
MSIP: Scott Friedman, Erik Lium
CTSA: Janice Gabrilove, Carol Horowitz

EXTERNAL Collaborators

Gett- New York State- Mark Thompson
Canada PACE sites: Neeraj Narula
Mc Gill University: Waqqas Afeef
Baystate Health: Rohit Singhania
Yale: Yoeheni Solad
UPMC: Eva Szigethy
Northwestern-Stephen Hanauer

Executive Sponsors: Bruce Sands, Barbara Murphy, Bruce Darrow, Kumar Chatani

INTERNAL Collaborators

HealthPROMISE: IBD Center
IBD Home- Laurie Keefer
Heart Health: Sean Pinney, Robbie Freeman
Hepcure: Ponni Perumalswami, Jeff Weiss
HP Survey: Roxanna Mehran
HealthFlo: Beth Raucher, Andrew Dunn, Julie
HP Allergy: Scott Sicherer
Bladder Cancer: Matt Galsky
Health Hypnosis: Guy Montgomery
Patient Satisfaction: Mona Krouss
eMotivate: Sarah Miller
Bifurcate: Annapoorna Kini
Procedure Bundle: David Greenspan, Brett Bernstein
Care Management: Lisa
Clinical Operations: Abbie Schwartz

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