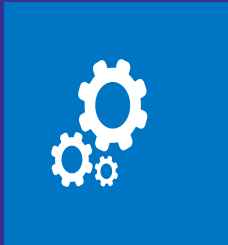


Moving Forward through Building Partnerships



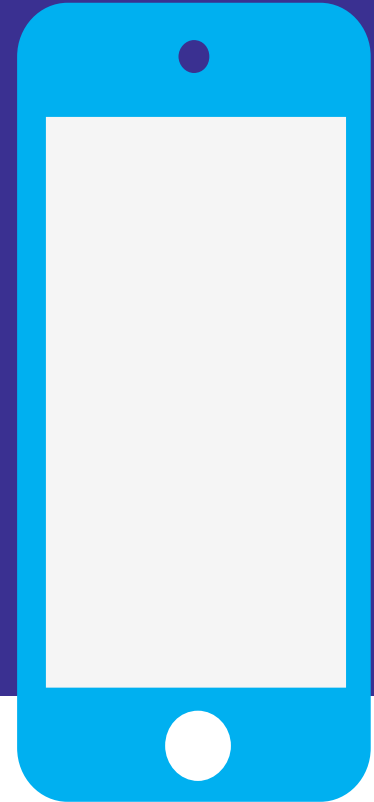
Truth



Partners



Challenges



Harnessing Mobile Technology to Predict, Diagnose,
Monitor, and Develop Treatments for Nervous System
Disorders—A Workshop

John Torous, MD MBI

Funding: NIMH 1K23MH116130-01, NARSAD Young Investigator Award

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Clinical Informatics Fellowship Programs

The following programs are accredited by the Accreditation Council for Graduate Medical Education (ACGME).

University of Arizona College of Medicine - Phoenix Clinical Informatics Fellowship Program

ACGME Program #1390314001

Clinical Informatics Fellowship

Program Director: Hamed Abbaszadegan, MD, MBA, FACP

Email: habbaszadegan@email.arizona.edu

Program Coordinator: Dulcinea Juarez

Email: COMPHX-DBMI@email.arizona.edu

Phone: (602) 827-2567

Application: <http://phoenixmed.arizona.edu/bmi/education/fellowship>

Beth Israel Deaconess Medical Center

ACGME Program #1392414001

Have Questions?

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Psychiatr Serv. 2018 May 25;appips201800063. doi: 10.1176/appi.ps.201800063. [Epub ahead of print]

Mobile Health (mHealth) Versus Clinic-Based Group Intervention for People With Serious Mental Illness: A Randomized Controlled Trial.

Ben-Zeev D¹, Brian RM¹, Jonathan G¹, Razzano L¹, Pashka N¹, Carpenter-Song E¹, Drake RE¹, Scherer EA¹.

+ Author information

Abstract

OBJECTIVE: mHealth approaches that use mobile phones to deliver interventions can help improve access to care for people with serious mental illness. The goal was to evaluate how mHealth performs against more traditional treatment.

METHODS: A three-month randomized controlled trial was conducted of a smartphone-delivered intervention (FOCUS) versus a clinic-based group intervention (Wellness Recovery Action Plan [WRAP]). Participants were 163 clients, mostly from racial minority groups and with long-term, serious mental illness (schizophrenia or schizoaffective disorder, 49%; bipolar disorder, 28%; and major depressive disorder, 23%). Outcomes were engagement throughout the intervention; satisfaction posttreatment (three months); and improvement in clinical symptoms, recovery, and quality of life (assessed at baseline, posttreatment, and six months).

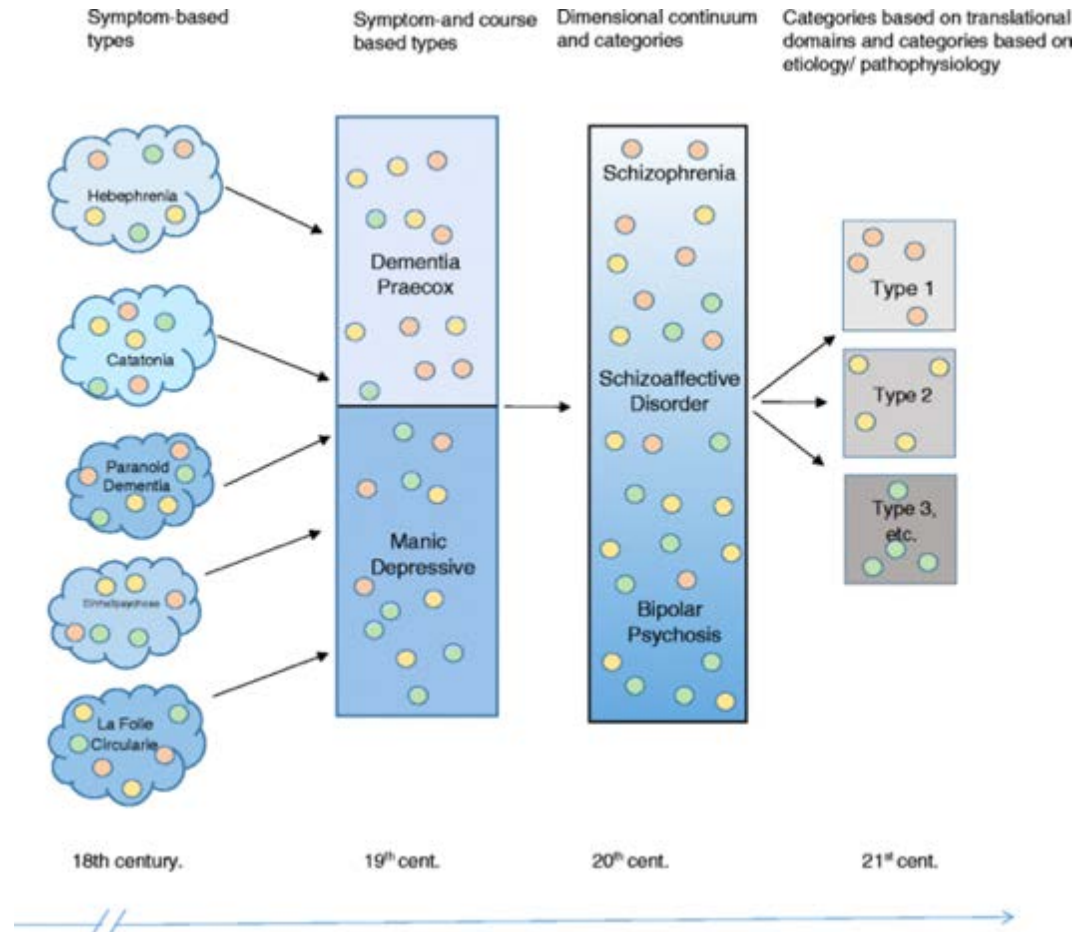
RESULTS: Participants assigned to FOCUS were more likely than those assigned to WRAP to commence treatment (90% versus 58%) and remain fully engaged in eight weeks of care (56% versus 40%). Satisfaction ratings were comparably high for both interventions. Participants in both groups improved significantly and did not differ in clinical outcomes, including general psychopathology and depression. Significant improvement was seen in the WRAP group posttreatment, and significant improvements in recovery and quality of life were seen in the FOCUS group at six months.

CONCLUSIONS: Both interventions produced significant gains among clients with serious mental illnesses who were mostly from racial minority groups. The mHealth intervention showed improved engagement and produced patient satisfaction and clinical and recovery outcomes that were comparable to the clinic-based group intervention for illness management.



What is the Gold Standard for Clinical ?

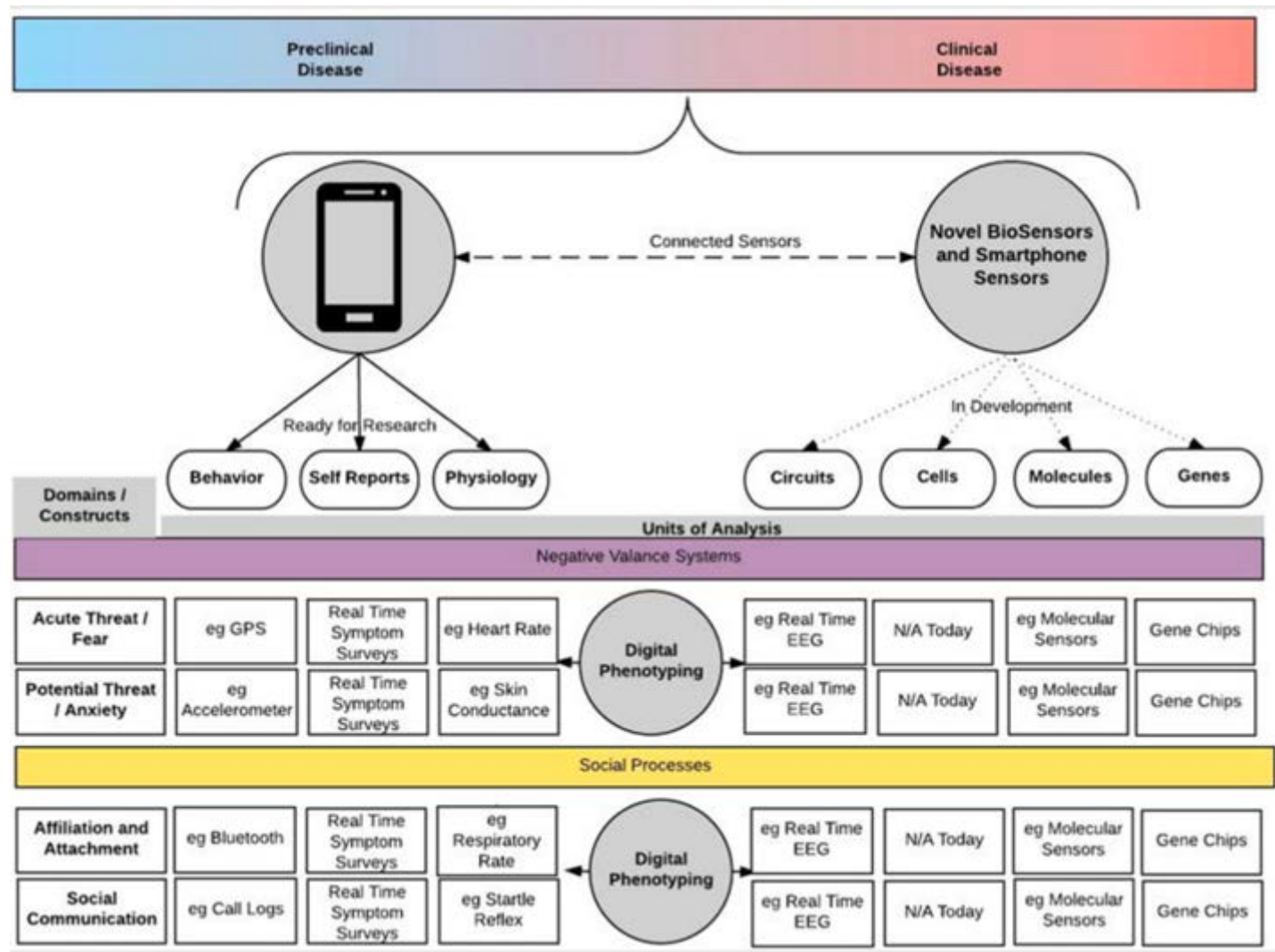
“German psychiatrist Emil Kraepelin used careful observations utilizing notecards to longitudinally assess symptoms and outcomes in insane hospitalized patients”...in the 1890s



Torous J, Summergrad P, Ghaemi SN. Bipolar disorder in the digital age: new tools for the same illness. International journal of bipolar disorders. 2016 Dec 1;4(1):25.

Torous J, Keshavan M. The future of psychoses as seen from the history of its evolution. Current Behavioral Neuroscience Reports. 2014 Jun 1;1(2):94-9.

Evolving Nosology? Ripe for Stratification?



Torous J, Onnela JP, Keshavan M. New dimensions and new tools to realize the potential of RDoC: digital phenotyping via smartphones and connected devices. *Translational psychiatry*. 2017 Mar;7(3):e1053.

Clinicians as Partners

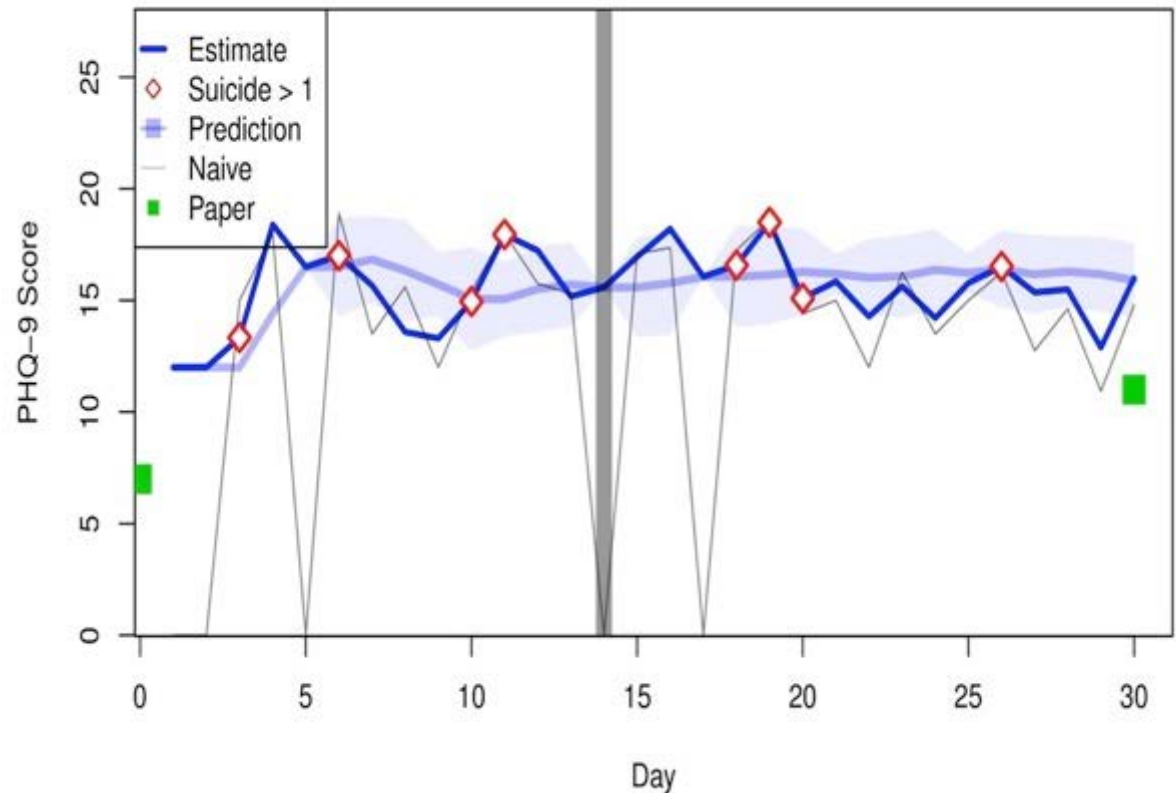
●●●● T-Mobile LTE 9:45 PM

Back Please rate the following statements. Submit

I have been sleeping well

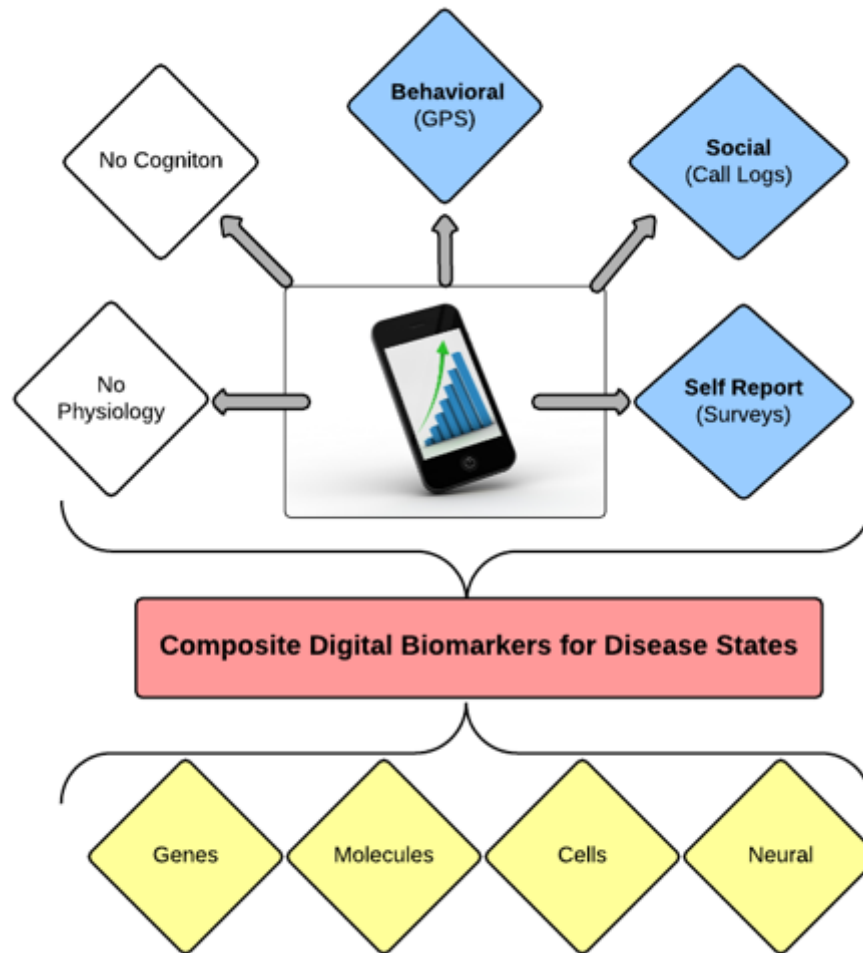
I would be better off dead or hurting myself

I have trouble concentrating



Torous J, Staples P, Shanahan M, Lin C, Peck P, Keshavan M, Onnela JP. Utilizing a Personal Smartphone Custom App to Assess the Patient Health Questionnaire-9 (PHQ-9) Depressive Symptoms in Patients With Major Depressive Disorder. JMIR Ment Health 2015;2(1):e8

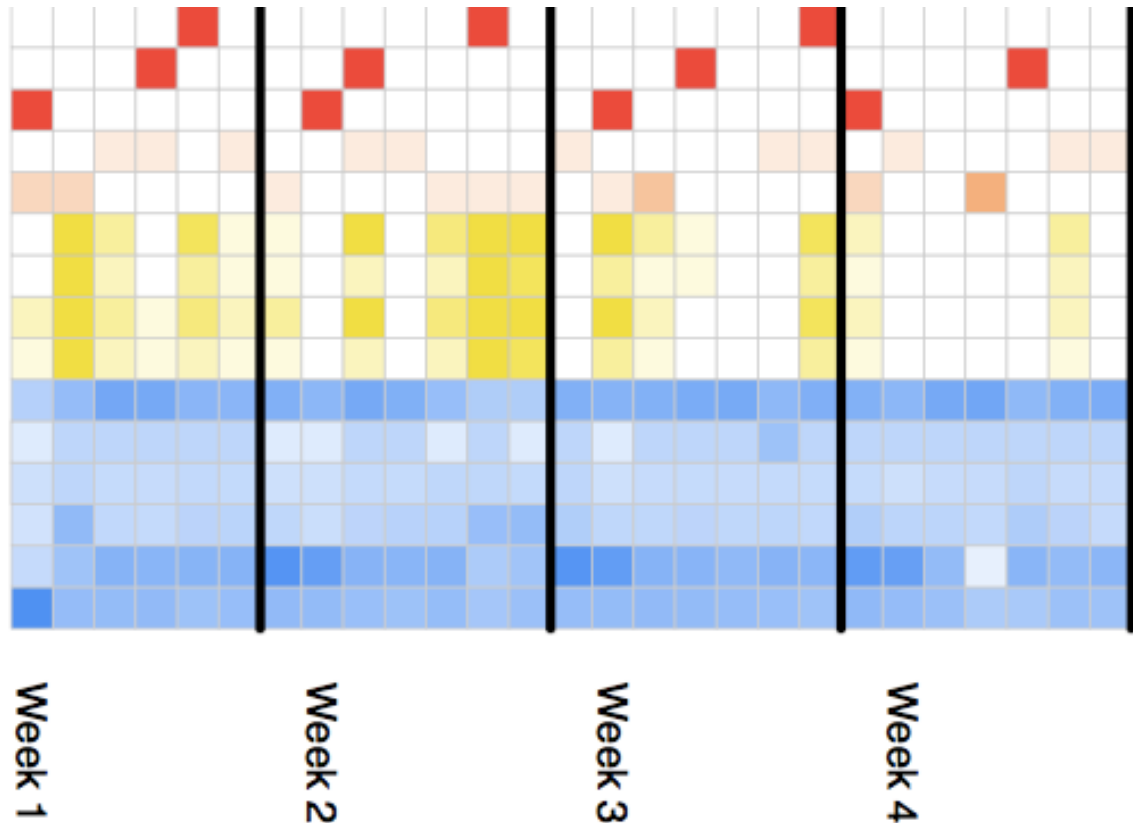
Clinicians as Partners : Relapse Prediction



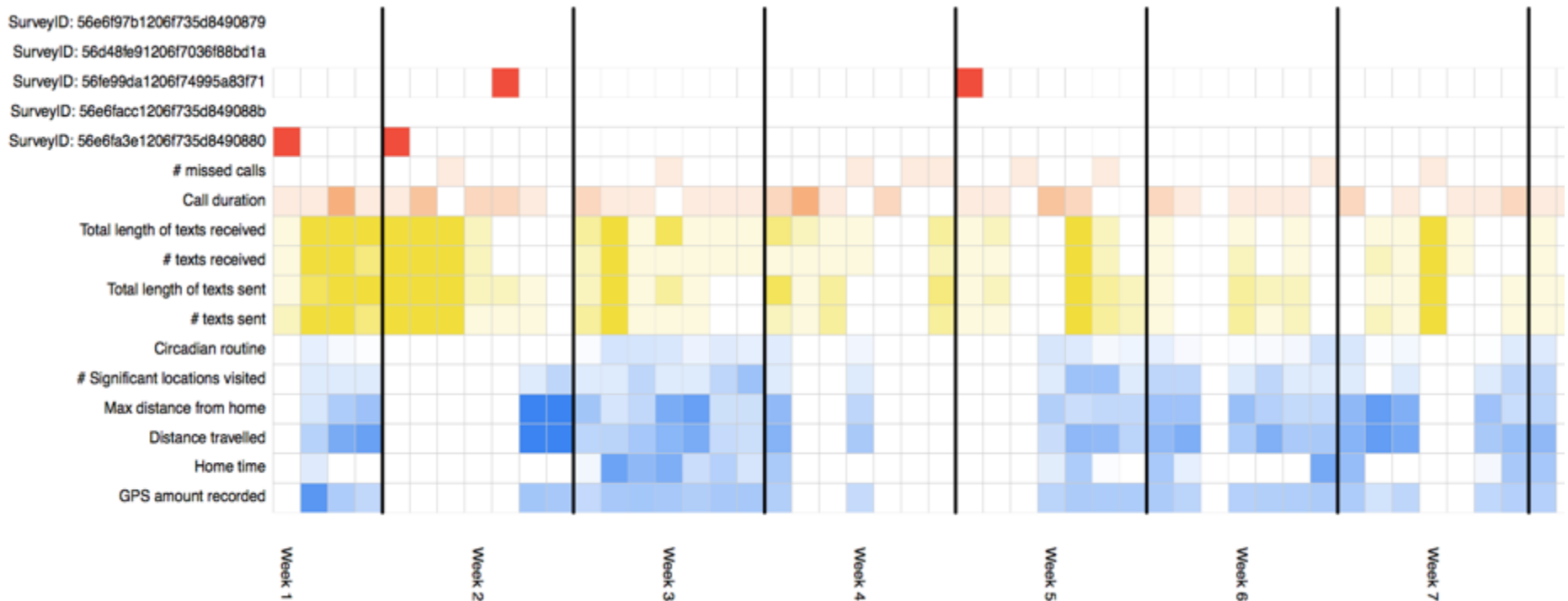
Clinicians as Partners : Relapse Prediction

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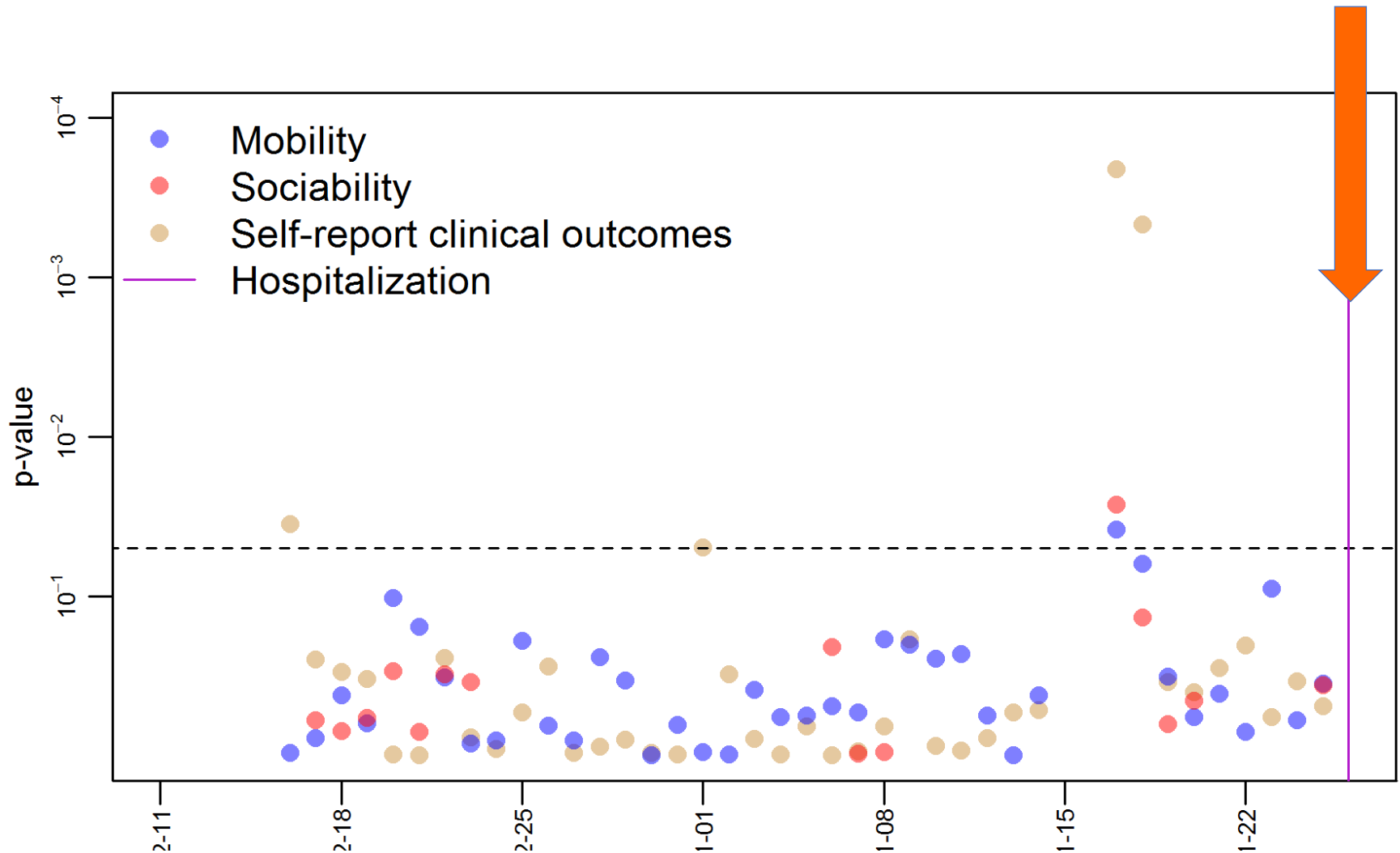
- # missed calls
- Call duration
- Total length of texts received
- # texts received
- Total length of texts sent
- # texts sent
- Circadian routine
- # Significant locations visited
- Max distance from home
- Distance travelled
- Home time
- GPS amount recorded



Clinicians as Partners : Relapse Prediction

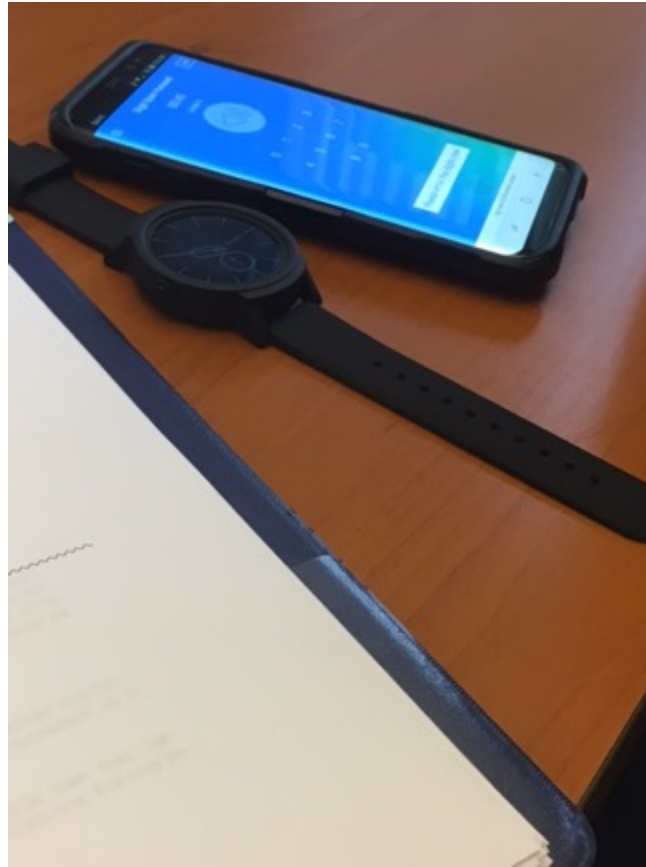


Clinicians as Partners : Relapse Prediction

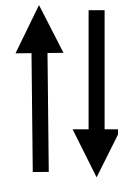
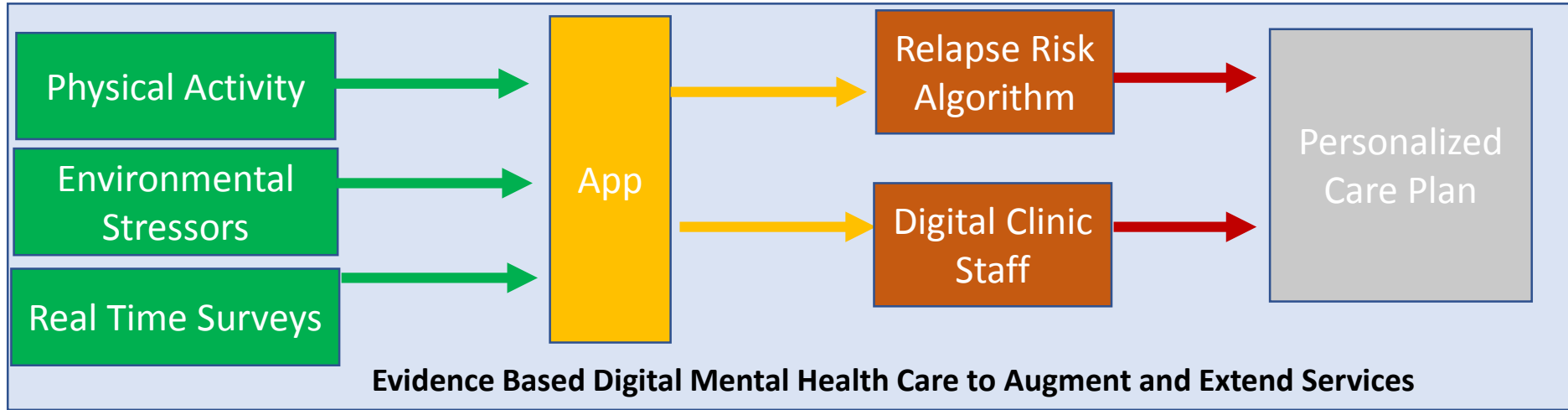


Barnett I, Torous J, Staples P, Sandoval L, Keshavan M, Onnela JP. Relapse prediction in schizophrenia through digital phenotyping: a pilot study. *Neuropsychopharmacology*. 2018 Feb 22:1.

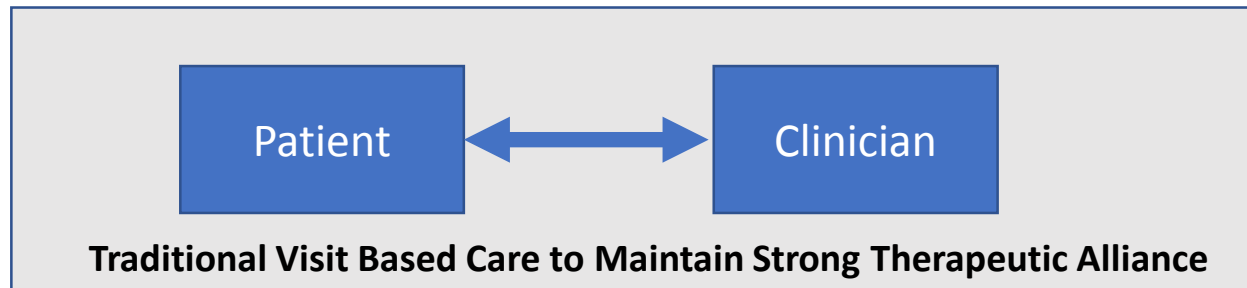
Clinicians as Partners : Relapse Prediction



New Clinical Models?



Digital Clinic Staff Support Patients and Psychiatrists in Setting Up, Customizing, and Monitoring Digital Data Streams



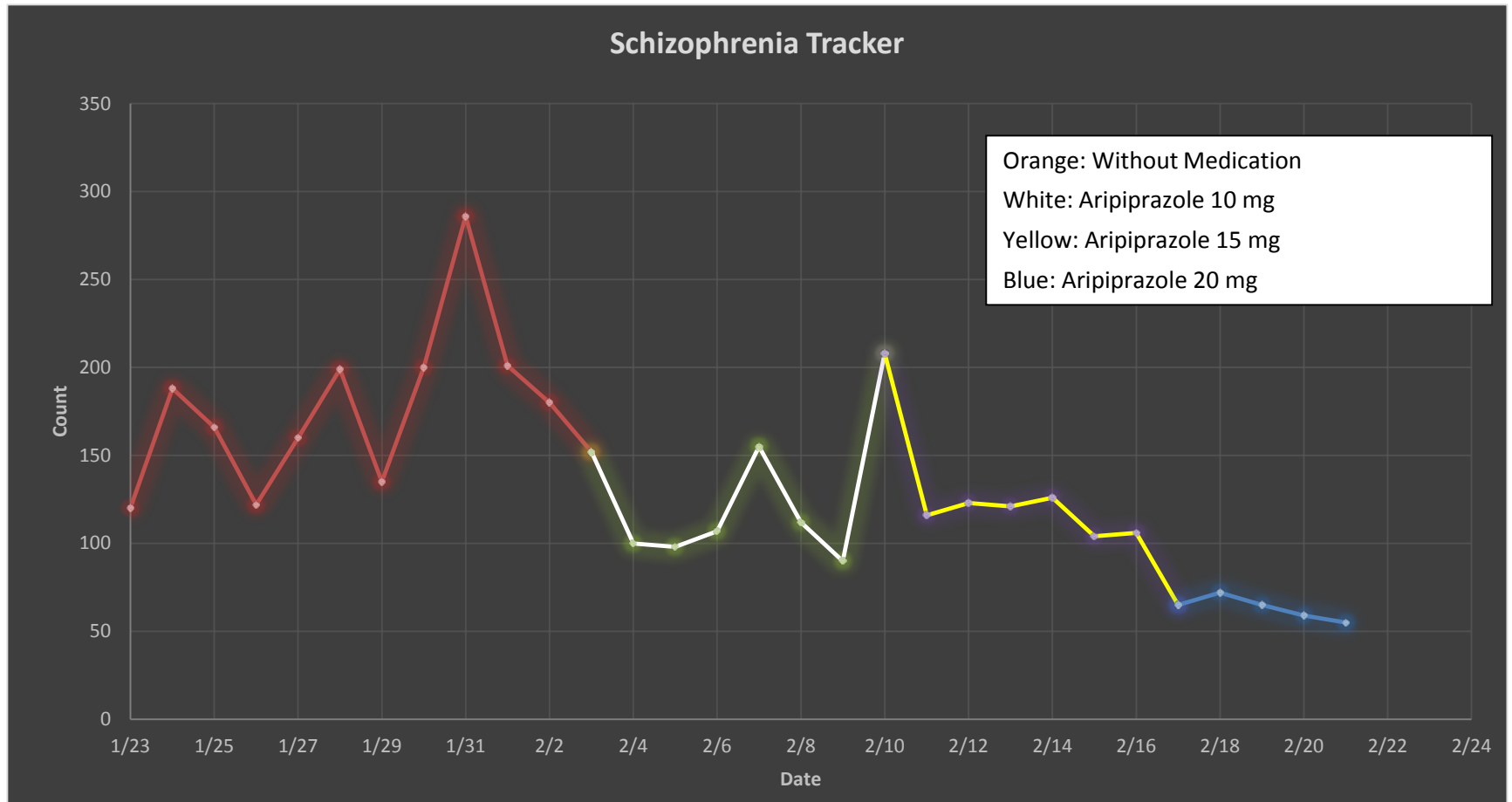
Patients as Partners

- 28-year-old male diagnosed with schizophrenia
- Noticed symptoms of auditory hallucinations were becoming more frequent.
- Psychiatrist recommended a dosage change in an antipsychotic medication.
- But he wanted to know if the medication would actually be helpful for him

Patients as Partners



Patients as Partners



Torous J, Roux S. Patient-Driven Innovation for Mobile Mental Health Technology: Case Report of Symptom Tracking in Schizophrenia. JMIR Ment Health 2017;4(3):e27

Patients as Partners

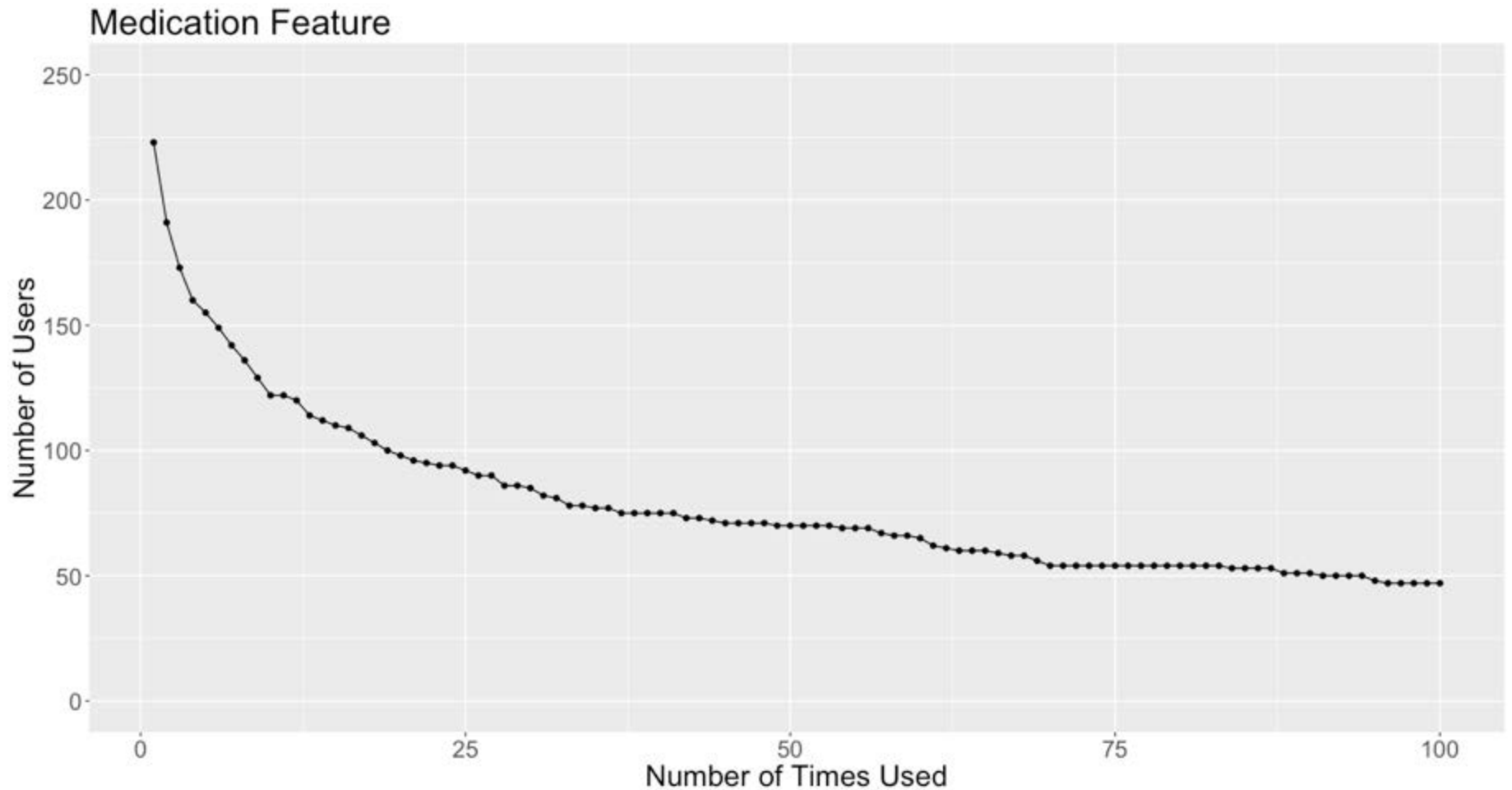


SARDAA Health Storylines

A photograph of a family of three—a young man, an older woman, and an older man—gathered around a laptop. The woman is pointing at the screen, which displays the SARDAA Health Storylines app interface. The app interface is a grid of colorful tiles with icons for various features like "Medication Tracker", "Symptom Tracker", "Daily Moods", "Daily Visits", "Appointment Calendar", "My Journal", "Healthy Topics", "Questions to Ask", and "When to Call a Doctor". A smartphone in the foreground also displays the app interface.

NOW AVAILABLE
Free tool to help you or your loved one
with schizophrenia and related disorders.

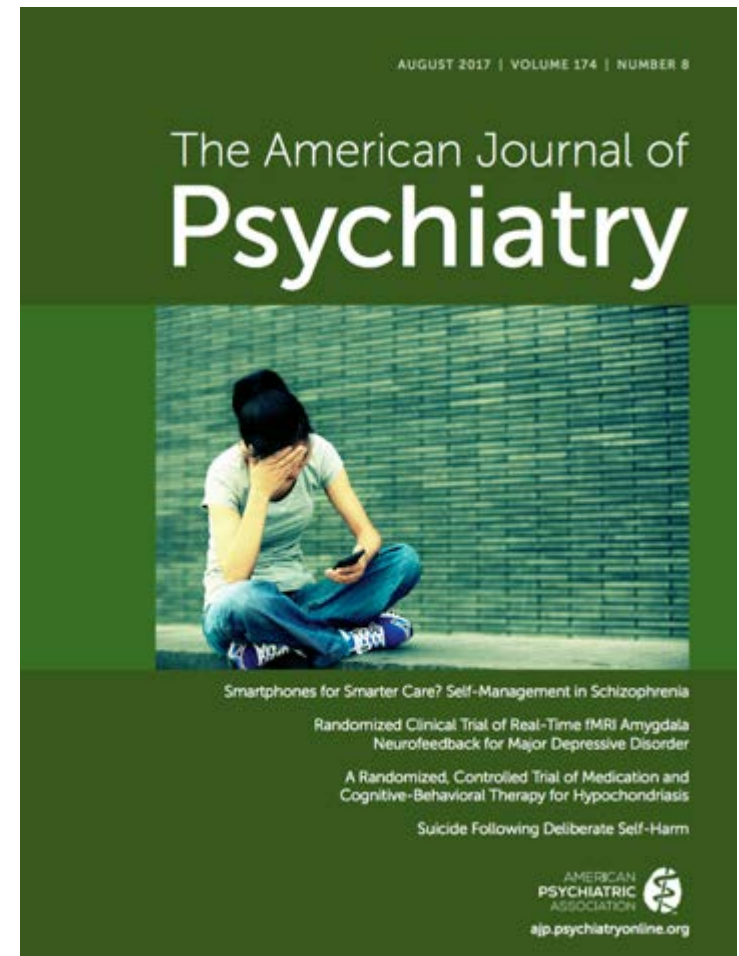
Patients as Partners



Torous J, Staples P, Slaters L, Adams J, Sandoval L, Onnela JP, Keshavan M. Characterizing Smartphone Engagement for Schizophrenia: Results of a Naturalist Mobile Health Study. *Clinical Schizophrenia & Related Psychoses*. 2017 Aug 4.

Patients and Clinicians as Partners ... Seeking Help Today

- Increasing number of health apps
- Many make bold claims
- Some are dangerous
- Some are useful
- Patients are using them right now

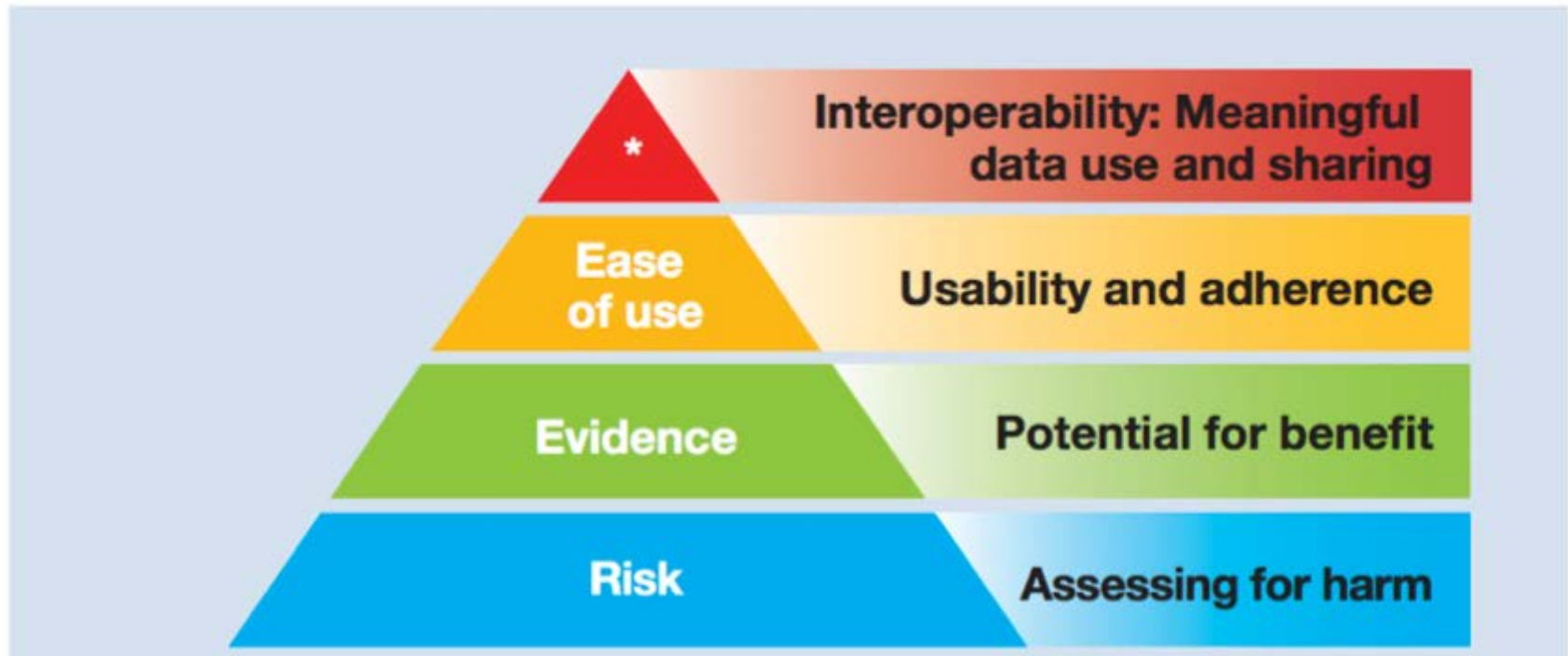


Torous J, Roberts LW. Needed innovation in digital health and smartphone applications for mental health: transparency and trust. *Jama psychiatry*. 2017 May 1;74(5):437-8.

Sandoval LR, Torous J, Keshavan MS. Smartphones for Smarter Care? Self-Management in Schizophrenia. *American Journal of Psychiatry*. 2017 Jul 25;174(8):725-8.

ALL IN: Informed Decision Making Today for Success Tomorrow

The American Psychiatric Association App Evaluation Model



Torous J, Lou J, Chan S. Mental Health Apps: What to Tell Patients. *Current Psychiatry*. 2018 March;17(3):21-25.

Torous JB, Chan SR, Gipson SY, Kim JW, Nguyen TQ, Luo J, Wang P. A hierarchical framework for evaluation and informed decision making regarding smartphone apps for clinical care. *Psychiatric Services*. 2018 Feb 15;69(5):498-500.

1. Risk: Privacy / Transparency

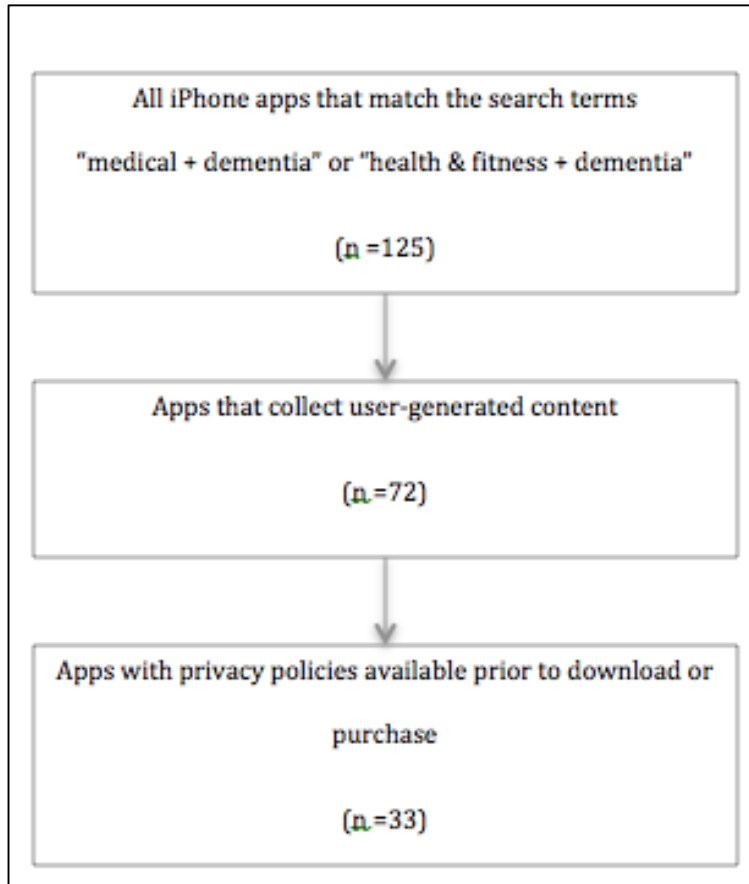


TABLE 2: Privacy policy specifications for Apps (n = 25)

Criteria	Yes n (%)	No n (%)	Not mentioned n (%)
May record IP or UDID	15 (60%)	-	10 (40%)
May store cookies	17 (68%)	-	8 (32%)
May share data with business partners or third parties	20 (80%)	5 (20%)	-
May share data with marketers or advertisers	9 (36%)	14 (56%)	2 (8%)
May sell data in merger or acquisition	13 (52%)	1 (4%)	11 (44%)
May sell data otherwise	-	13 (52%)	12 (48%)
Will be disclosed if legally bound	21 (84%)	-	4 (16%)
Can be deleted/amended upon request	16 (64%)	-	9 (36%)

Rosenfeld, Torous J, Vahia IV. Data Security and Privacy in Apps for Dementia: An Analysis of Existing Privacy Policies. The American Journal of Geriatric Psychiatry. 2017 Jun 1.

2. Evidence (in Depression Apps)

	Studies	Sample size (smartphone/control)	Hedges' g
Main analysis	18	1,716/1,698	0.383
Intent-to-treat or complete outcome data	16	1,669/1,651	0.399
Smartphone vs. active control	12	1,195/1,186	0.216
Smartphone vs. inactive control	13	891/783	0.558

Significant values are highlighted in bold prints

Table 4 Post-hoc analyses: mood disorder samples

	Studies	Sample size (smartphone/control)	Hedges' g
Self-reported mild-to-moderate depression	5	917/973	0.518
Major depressive disorder	2	56/62	0.085
Bipolar disorder	2	74/75	0.314
Anxiety disorders	2	259/242	0.250

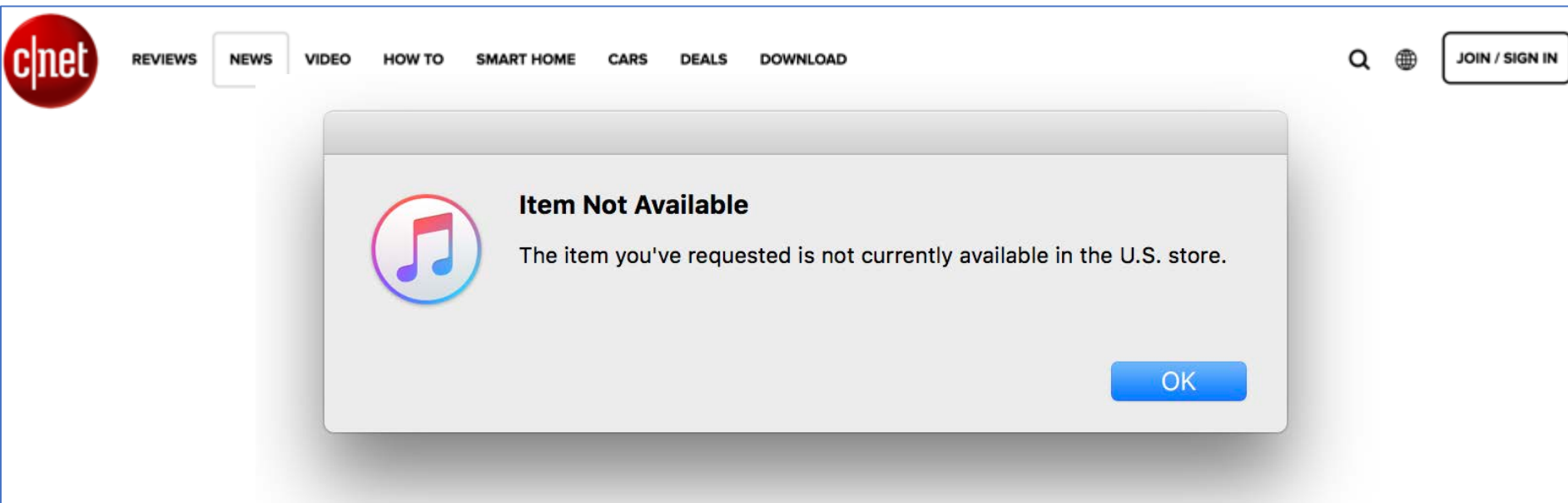


Torous J, Firth J. The digital placebo effect: mobile mental health meets clinical psychiatry. *The Lancet Psychiatry*. 2016 Feb 1;3(2):100-2.

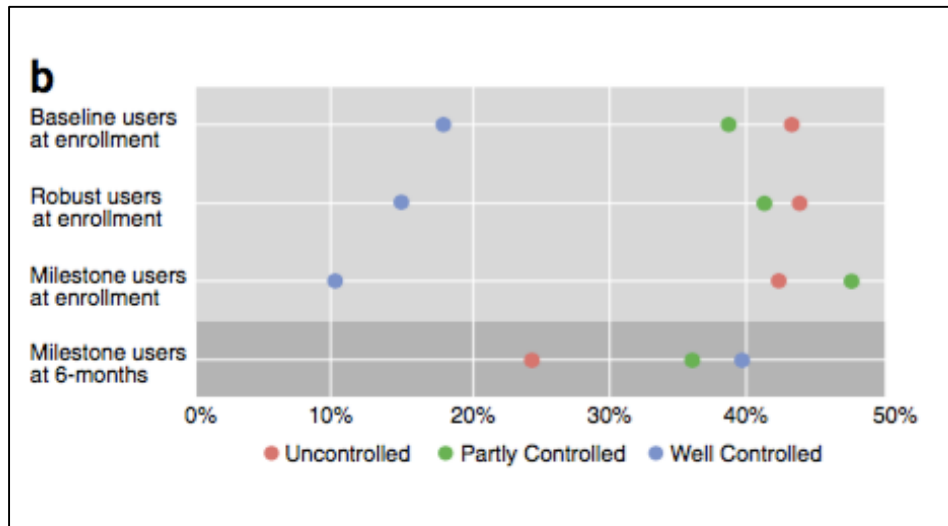
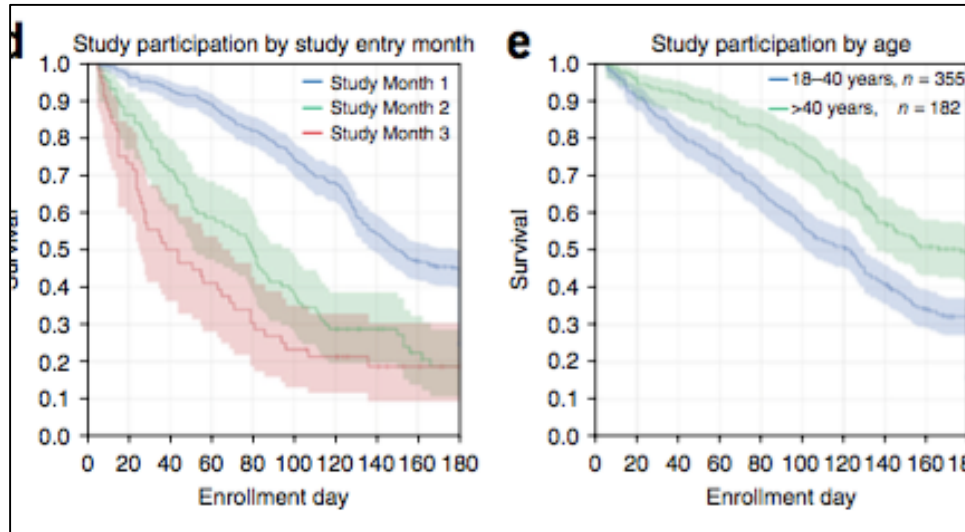
Firth J, Torous J, Nicholas J, Carney R, Prata A, Rosenbaum S, Sarris J. The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials. *World Psychiatry*. 2017 Oct 1;16(3):287-98.

3. Engagement

ALREADY COVERED!!



But Engagement with Asthma Apps



- Eligible = 8,524
- Enrolled = 7,953
- Participants = 6,370
- Robust Users = 2,317 = ≥ 5 total surveys
- Milestone Users = 175 = completed a survey at 6 months

Informed Decision Making -> New Efforts

Who are we?

- Safety-net health system
- 12 Primary Care sites, 3 hospitals
- 140,000 patients
- 43% speak a primary language other than English
- **Behavioral health providers embedded within Primary Care**



Current 1 Year Pilot Study

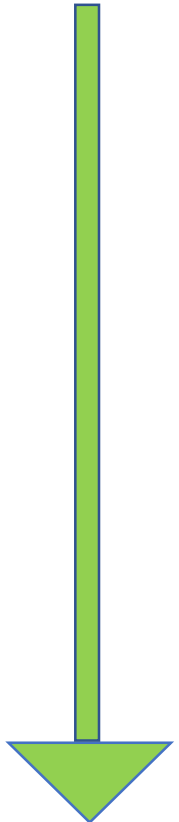
- ✓ Reduce barriers to mental health care
- ✓ Clinical “Extender”
- ✓ Enhanced patient self-management

CURATE APPS

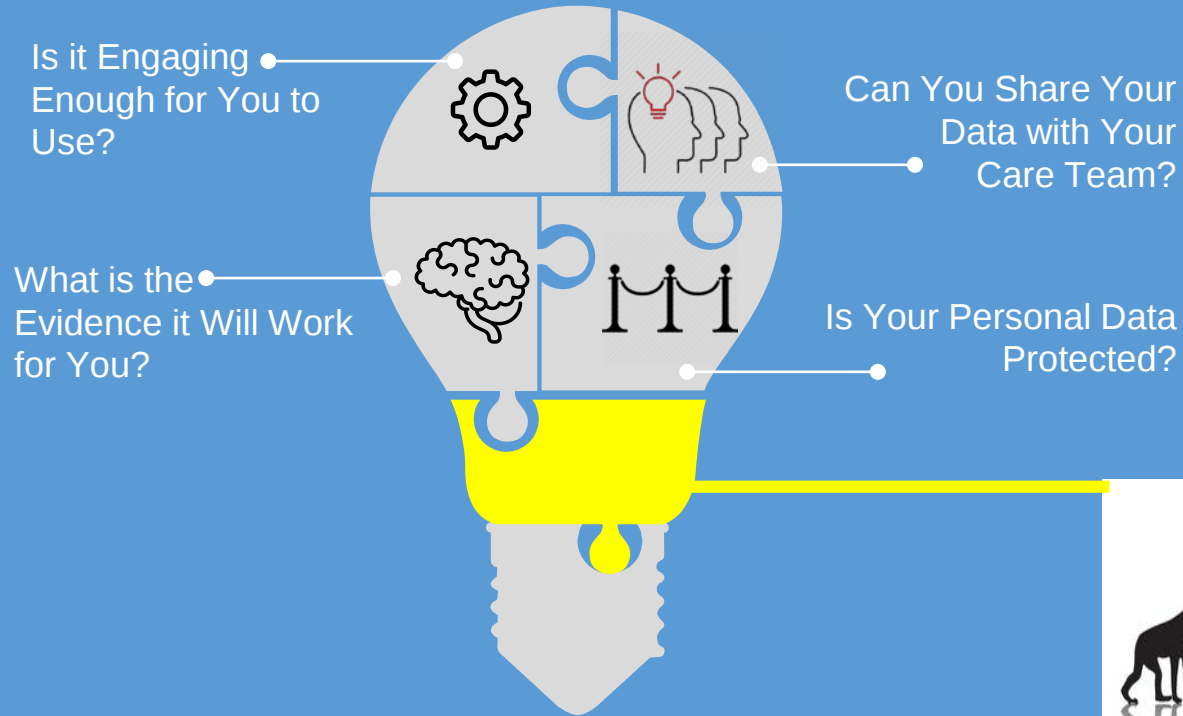
APP TOOLKIT +
SCRIPTS

TRAIN CLINICAL TEAM

TEAMS OFFER TO
PATIENTS



Collaborative Health App Rating Teams (CHART)



Thank You!



jtorous@bidmc.harvard.edu ©JimBenton.com

Funding: NIMH 1K23MH116130-01, NARSAD Young Investigator Award