

Colorado Technology Innovations for Mental HealthCare- Scientific Meeting



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BRAIN HEALTH for all, for life.

Colorado Technology Innovations for Mental HealthCare Scientific Meeting

Targeting Mental Wellness Through Digital Remote Patient Monitoring

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Department of Psychiatry
Executive Director, Helen and Arthur E. Johnson
Depression Center |
University of Colorado School of Medicine



Can apps improve mental health care?

I was a skeptic!

Every Wharton student was making a mental health app!

“Mental health care became”
“popular.”

Treating mental illness can be complicated.”





This Matters



38% of people who attempt suicide had a healthcare visit within the week prior, 64% within the previous month.

80% of rural counties in the US are without a practicing psychiatrist.

Mental health care for the modern era of medicine



A platform for real-time objective
behavioral health monitoring

Providers

Clinical Trials & Research

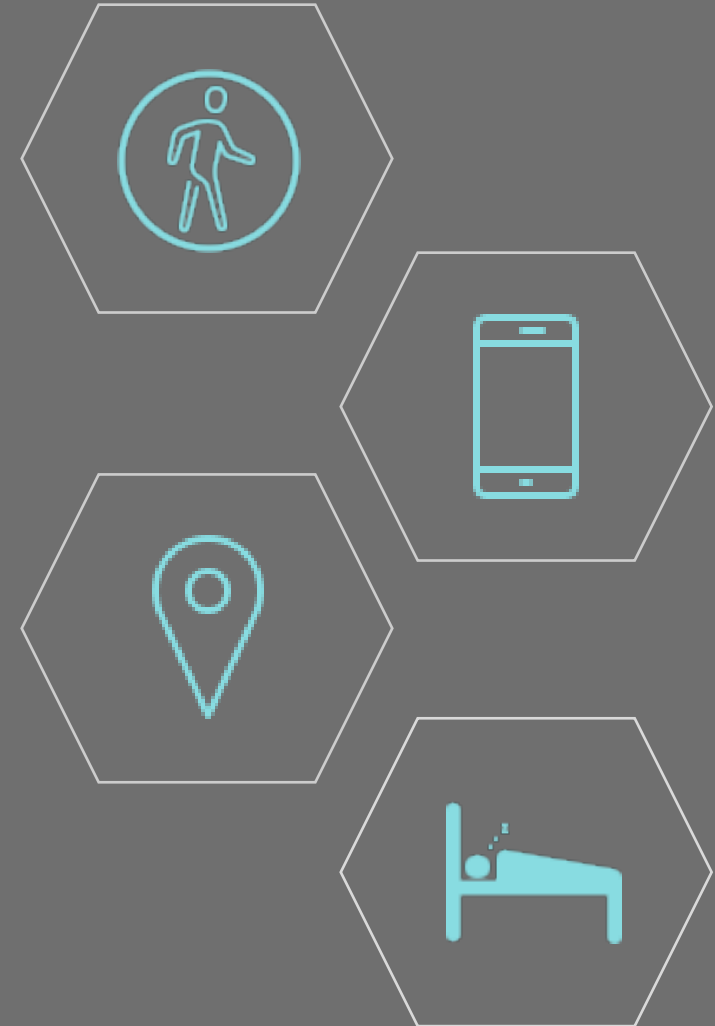


Rhythms App

Rhythms™ uses smartphone sensors to detect continuous information about human patterns of behavior and uses Machine Learning to predict bad outcomes before they occur.

The app captures the following data:

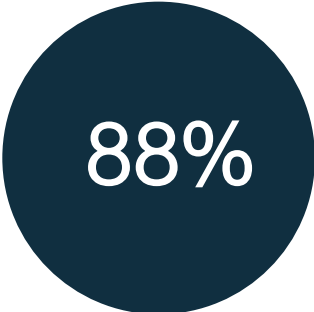
- **Physical activity** including number of steps, walking rate, and types of physical activities undertaken
- **Social activity** as reflected in time spent at home vs. in other locations
- Inferred **sleep duration** and timing of **wake/sleep cycles**
- Amount and timing of **phone use** by screen on/off time



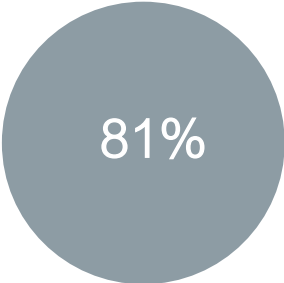
Prediction: Accuracy approaches 90%

Exceeds broadly accepted predictive tests in other areas of medicine.

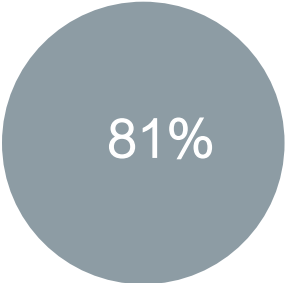
HealthRhythms' vs. broadly accepted standard medical tests



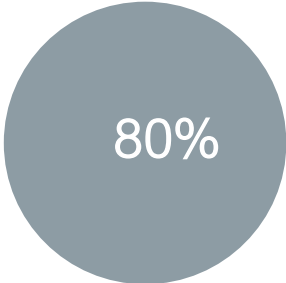
HealthRhythms
Mood Index
Decompensation
= 88%



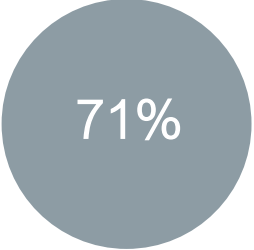
PAP Smear
Cervical Cancer
= 81%



Mammogram
Breast Cancer
= 81%



gFOBT
Colon Cancer
= 80%



PSA
Prostate Cancer
= 71%

EMBERLY MULLER, ESQ.

s, entrepreneurs, and investors to help CU Researchers create biomedical te
CU Innovations translates discovery into impact through transparent, flexible, be

Medical Campus, CU Innovations provides access to an extensive portfolio of bio.

CU ANSCHUTZ IMPR

B+ **2000+**

onomic
Colorado

Patent applications
filed since 2002

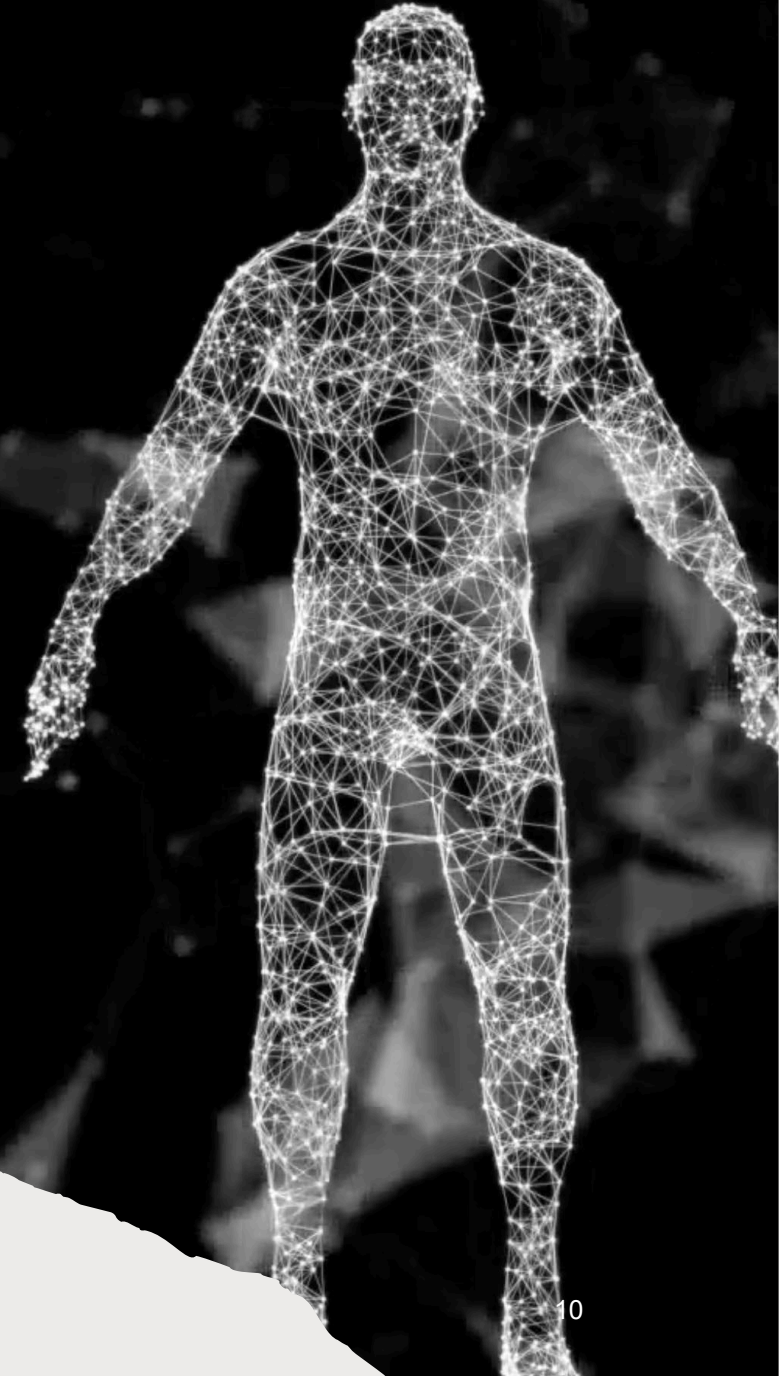




uhealth

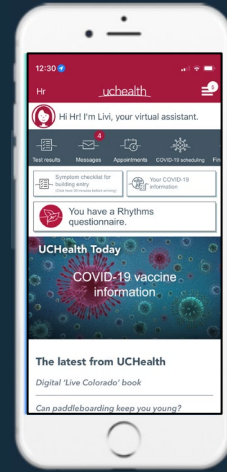
CARE Innovation Center

**DISRUPTING
AND REINVENTING
HEALTH CARE**



HEALTH SYSTEM INVESTMENT TO BRING
NOVEL THERAPEUTICS AND OTHER
INNOVATIONS TO PSYCHIATRY AND
BEHAVIORAL HEALTH

Rhythms™ is integrated in the UCHealth App and Epic



1

Participants enrolled by their providers download the UCHealth app and use their smartphone in the normal course of their lives

2

The Rhythms™ feature in the UCHealth app, passively collects data from smartphone sensors

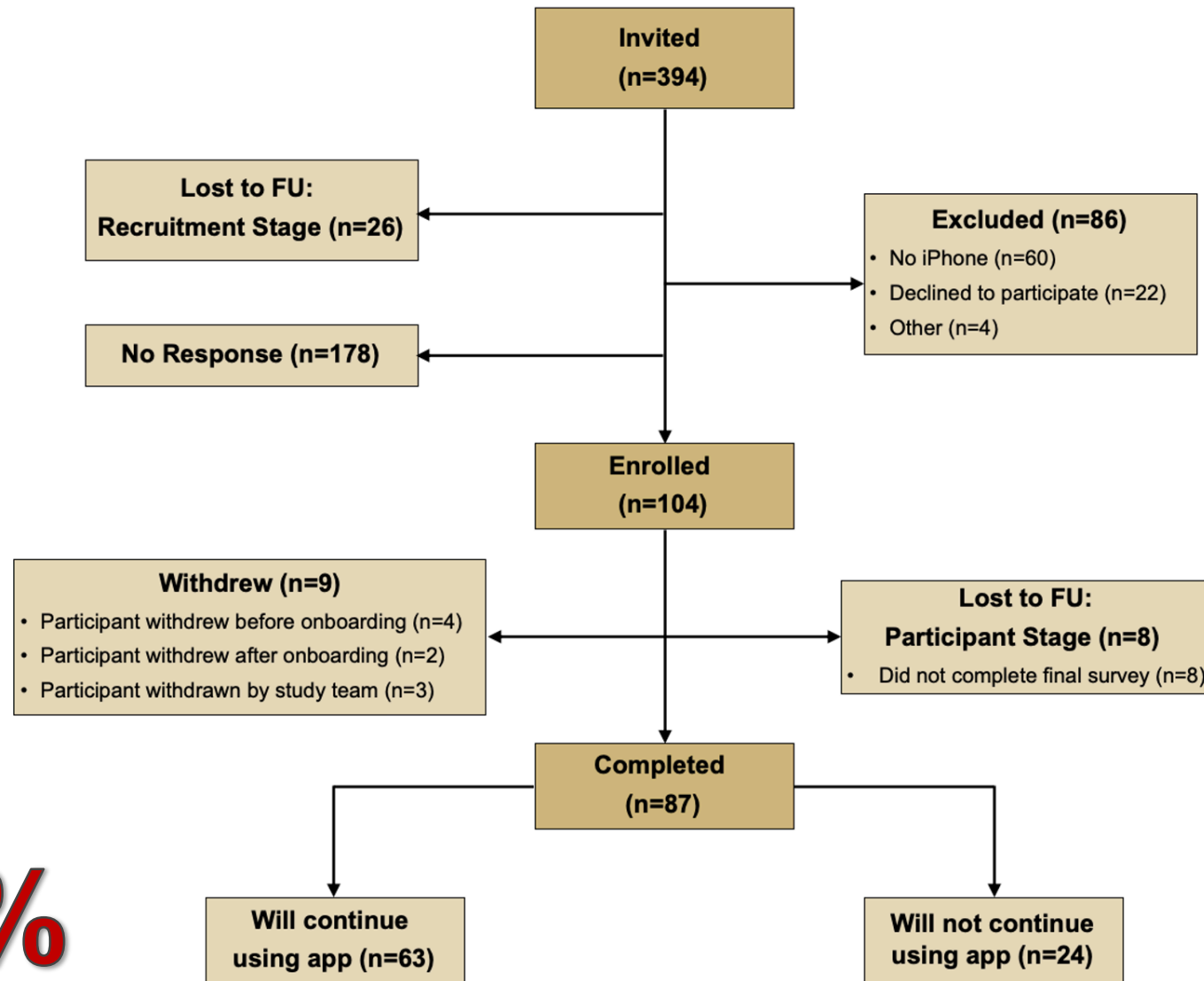
3

HealthRhythms platform runs continuous, objective, real-time analysis of patient data on encrypted HIPAA, GDPR, and CPAA compliant servers

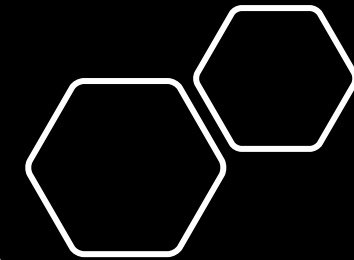
4

HealthRhythms analyses reveal trends in each participant's data that can be used to monitor treatment response. **This data is accessible from within a custom-built HealthRhythms Portal in Epic.**

72%



		Count (%)
Age (years)		42.1 ± 15.9
Sex		
	Female	72 (69.23)
	Male	29 (27.88)
	Trans or Non-Binary	3 (2.88)
Ethnicity		
	Hispanic	3 (2.88)
	Non-Hispanic	100 (96.15)
	Not answered	1 (0.96)
Race		
	Asian	9 (8.65)
	Black/African American	1 (0.96)
	Native American/American Indian	1 (0.96)
	White	84 (80.77)
	More than one race	4 (3.85)
	Other or prefer not to answer	5 (4.81)
Diagnosis		
	Major Depressive Disorder	71 (68.27)
	Bipolar 1 Disorder	12 (11.54)
	Bipolar II Disorder	11 (10.58)
	Other Mood Disorder	10 (9.62)



Patient Characteristics

Table 2: Algorithm for Urgent and Emergent Alerts

URGENT ALERT	EMERGENT ALERT
<ul style="list-style-type: none">• PhQ-9 score is 20-27, when previous score was lower• C-SSRS question #3 = yes• ASRM Scale score is ≤ 11• ASRM Scale score for question #3 is 3 or 4• If bipolar disorder diagnosis + sleep decrease by 40%• If bipolar disorder diagnosis + sleep decrease > no sleep in 2 days• GAD-7 score ranges from 15-21, when previous score was not in this range	<ul style="list-style-type: none">• C-SSRS questions #4, #5 or #6 = yes• ASRM Scale total score >11 and answer to question #3 is a 4

Table 2 Legend: PhQ-9 = Physician Health Questionnaire- 9 item; C-SSRS = Columbia-Suicide Severity Rating Scale; ASRM = Altman Self-Rating for Mania; GAD-7 = Generalized Anxiety Disorder – 7 [item](#).

C-SSRS question # 3 = Active suicidal ideation with any methods (not plan) without intent to act.

C-SSRS question # 4 = Active suicidal ideation with some intent to act, without specific plan.

C-SSRS question # 5 = Active suicidal ideation with specific plan and intent

C-SSRC question #6 = Have you ever done anything, started to do anything, or prepared to do anything to end your life?

ASRM question #3 = Regarding Sleep Patterns: Score of 3 = *I frequently need less sleep than usual.* Score of 4 = *I can go all day and night without any sleep and not feel tired.*

Number of Alerts and Active Patients Over 16 Weeks of Remote Participant Monitoring with Rhythms

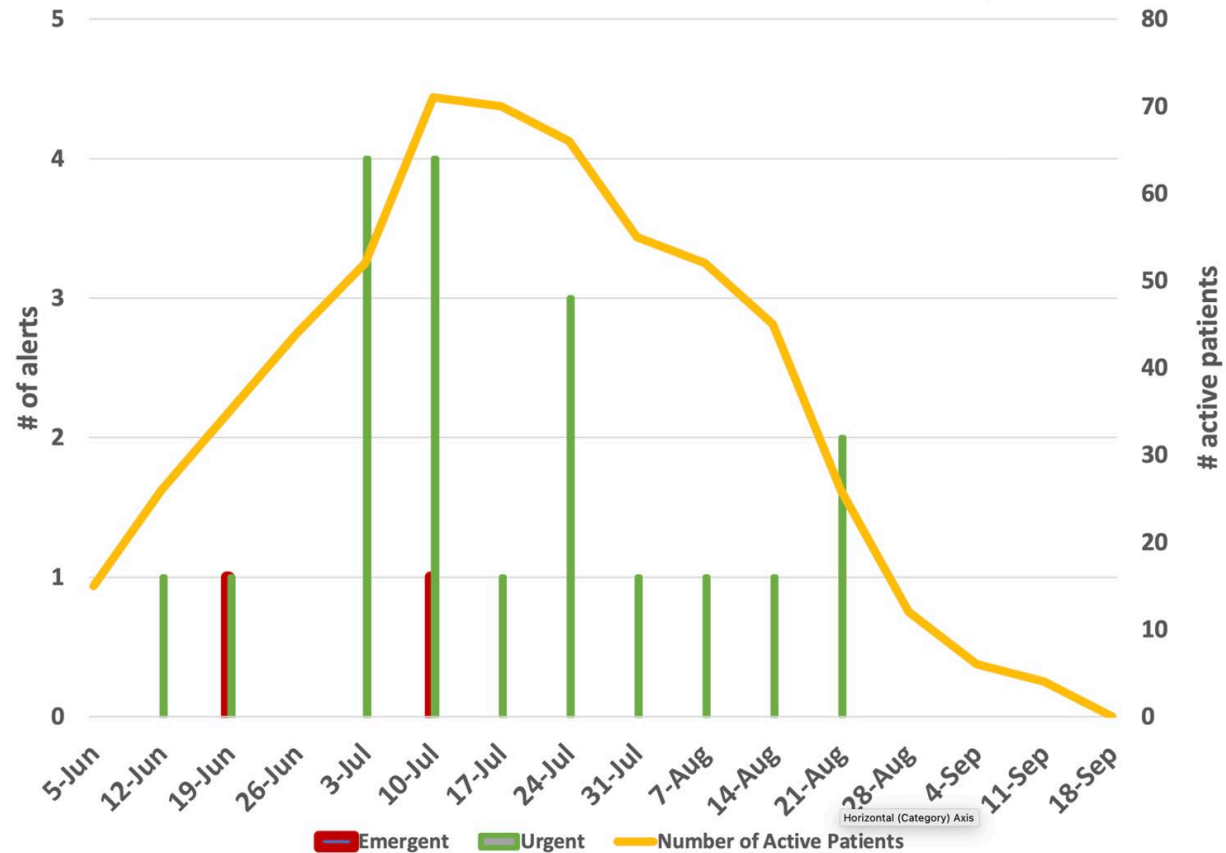


Figure 3 Legend: One hundred and four individuals completed a 6-week study over the course of 16 weeks. There were a total of two emergent alerts and 19 urgent alerts. The largest number of active patients being monitored at any one time was 92 with an average of 64 persons monitored daily.

Participant Responses

Like Most About the Platform: Connection with Provider

"I was very surprised when I got a call to check in on me because my anxiety scores had increased. I hadn't thought about it when I was answering the survey, but once I was told this, I realized that my anxiety actually had increased lately. I think this showed me that sometimes my mental health can change without me knowing it."

"I only see my psychiatrist every 6 months. When I'm asked how I've been doing, I can only really remember the past month. This would be a great way to track how I'm actually doing over those 6 months"

Liked Least About the Platform: Phone issues

"That it (i.e., Rhythms) used the navigation feature on my phone continuously and bogged down my phone."

Provider Responses

Like Most About the Platform: Ability to better care for patients

“...the sleep section was the most useful for me to review. I am very surprised that one of my patients is only averaging about 5 hours of sleep per night, so that is definitely something we will talk about.”

“The more frequent assessment was great. I don't think patients remember their condition for more than a few days. It was great for knowing when people were OK. It works for surveillance. Then when things change, you can be right on top of it. I was able to reach out to a couple of patients based on worsening in the data.”

Transforming mental healthcare

Moving from subjective to objective measures in order to improve outcomes.



Mental Wellbeing is Subjective

- Current diagnostic structure is primarily based upon self-report of symptoms
- Poor functional measures
- Current practice is inefficient due to limited data and time to obtain data



Behavioral Vital Signs | AI

- Objective measures of behavior
- Information gathered over time and deviations from baseline are noted
- Predictive analytics based upon the group and individual
- Providers have plethora of data between visits



Care Redesign

- Crises are detected
- Practices can be responsive
- More efficient use of face-to-face time to discuss interventions instead of gathering history



Putting Control in Patients' Hands

- Immediate feedback
- Dashboards to depict patterns of behavior over time
- Evidence-based treatments with direct-to-consumer platforms
- Oversight by professionals who can intervene when needed



Comments?

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