



AGENCY FOR HEALTHCARE RESEARCH AND QUALITY



**National Center for Excellence in Primary Care Research  
Presents**  
***Innovative Use of Technology in Primary Care Delivery***

September 14, 2023

**Presented by:**

Anjana Estelle Sharma, MD, MAS

Adrian Aguilera, PhD

Ryan J Coller, MD, MPH

Nicole Werner, PhD

**Moderated by:**

Edwin Lomotan, MD

AHRQ

# NCEPCR Webinar Series



The views expressed in this webinar do not represent official views of the U.S. Department of Health and Human Services or the Agency for Healthcare Research and Quality.

# Welcome



## **Matthew Simpson, MD**

Physician, Division of Practice Improvement,  
Center for Evidence and Practice Improvement  
AHRQ

# One Hundred Sixth Congress of the United States of America

AT THE FIRST SESSION

*Begun and held at the City of Washington on Wednesday,  
the sixth day of January, one thousand nine hundred and ninety-nine*

## An Act

To amend title IX of the Public Health Service Act to revise and extend the Agency for Healthcare Policy and Research.

*Be it enacted by the Senate and House of Representatives of  
the United States of America in Congress assembled,*

### SECTION 1. SHORT TITLE.

This Act may be cited as the “Healthcare Research and Quality Act of 1999”.

### SEC. 2. AMENDMENT TO THE PUBLIC HEALTH SERVICE ACT.

(a) IN GENERAL.—Title IX of the Public Health Service Act (42 U.S.C. 299 et seq.) is amended to read as follows:

## “TITLE IX—AGENCY FOR HEALTHCARE RESEARCH AND QUALITY

### “PART A—ESTABLISHMENT AND GENERAL DUTIES

“(1) IN GENERAL.—There is established within the Agency a Center for Primary Care Research (referred to in this subsection as the ‘Center’) that shall serve as the principal source of funding for primary care practice research in the Department of Health and Human Services. For purposes of this paragraph, primary care research focuses on the first contact when illness or health concerns arise, the diagnosis, treatment or referral to specialty care, preventive care, and the relationship between the clinician and the patient in the context of the family and community.

“(2) RESEARCH.—In carrying out this section, the Center shall conduct and support research concerning—

“(A) the nature and characteristics of primary care practice;

“(B) the management of commonly occurring clinical problems;

“(C) the management of undifferentiated clinical problems; and

“(D) the continuity and coordination of health services.



# NATIONAL CENTER FOR EXCELLENCE IN PRIMARY CARE RESEARCH

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Working to:

- Develop a more coordinated primary care research portfolio & agenda
- Create more targeted primary care research funding opportunities
- Support & expand a diverse primary care research workforce
- Build a more robust & systematic dissemination strategy

# NCEPCR Webinar Series



## Strengthening Primary Care Research Webinar Series

### Innovative Use of Technology in Primary Care Delivery

# Today's Webinar Objectives



## Innovative Use of Technology in Primary Care Delivery

1. Introduce examples of AHRQ-funded grants that research the use of innovative technology in primary care delivery
2. Describe how the use of technology in primary care delivery advances AHRQ's mission (to make healthcare safer, higher quality, more accessible, equitable, and affordable)

# Moderator



**Edwin Lomotan, MD**  
Senior Advisor for Clinical  
Informatics, Center for Evidence  
and Practice Improvement  
AHRQ



# Today's Webinar Presenters



- **Anjana Estelle Sharma, MD, MAS** (University of California, San Francisco, School of Medicine), *ExPERTS-PC: Engaging Patients in Event Reporting for Safety in Primary Care*
- **Adrian Aguilera, PhD** (University of California, Berkeley, School of Social Welfare; and University of California, San Francisco), *Improving Diabetes and Depression Self-management Via Adaptive Mobile Messaging*
- **Ryan J Coller, MD, MPH** (University of Wisconsin, Madison; School of Medicine and Public Health) and **Nicole E. Werner, PhD** (Indiana University School of Public Health-Bloomington), *Improving Medication Safety for Medically Complex Children with mHealth Across Caregiving Networks*

# Presentation 1

## **ExPERTS-PC: Engaging Patients in Event Reporting for Safety in Primary Care**

Development of a mobile safety event reporting tool



**Anjana Sharma, MD, MAS**  
**Department of Family &  
Community Medicine,**  
**University of California, San  
Francisco**

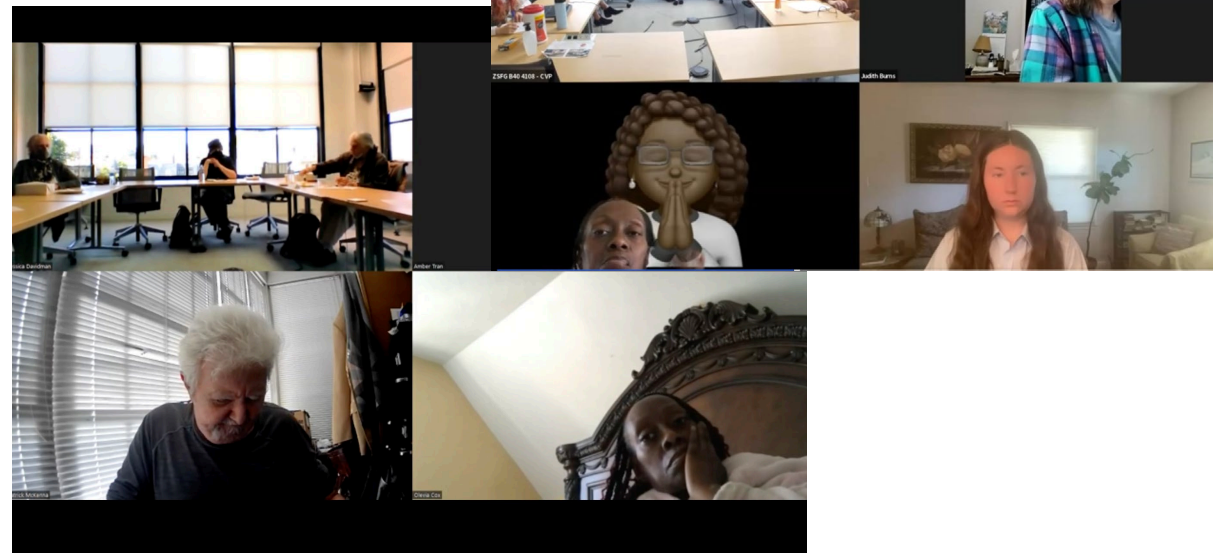
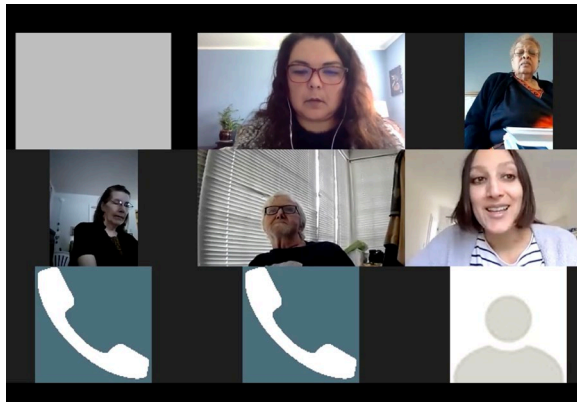
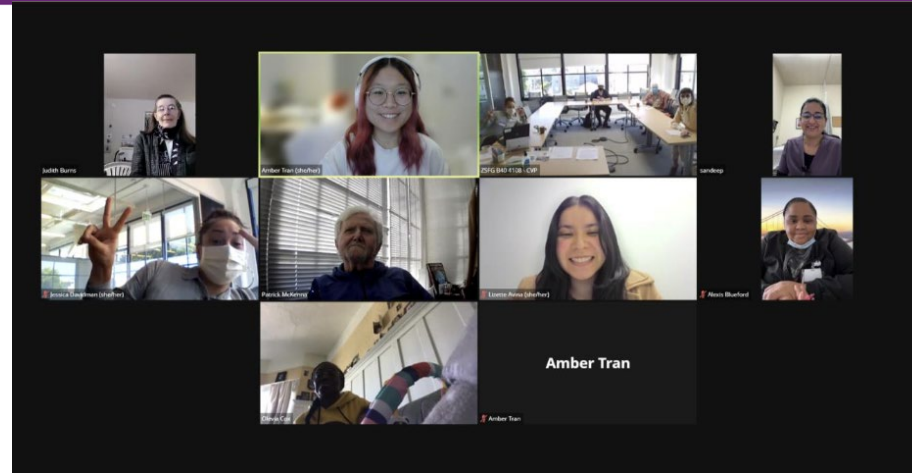
# Background

- Ambulatory adverse events cause significant morbidity and mortality
  - ▶ 5% of US adult outpatients may have experienced a diagnostic error annually
  - ▶ 4.5 million ambulatory care visits annually in US may have been related to an adverse drug event.
- Primary care patients and caregivers are drivers of safe outpatient care, but are not usually involved in safety solutions
- We sought to involve patients and stakeholders in a patient-safety reporting tool in this K08

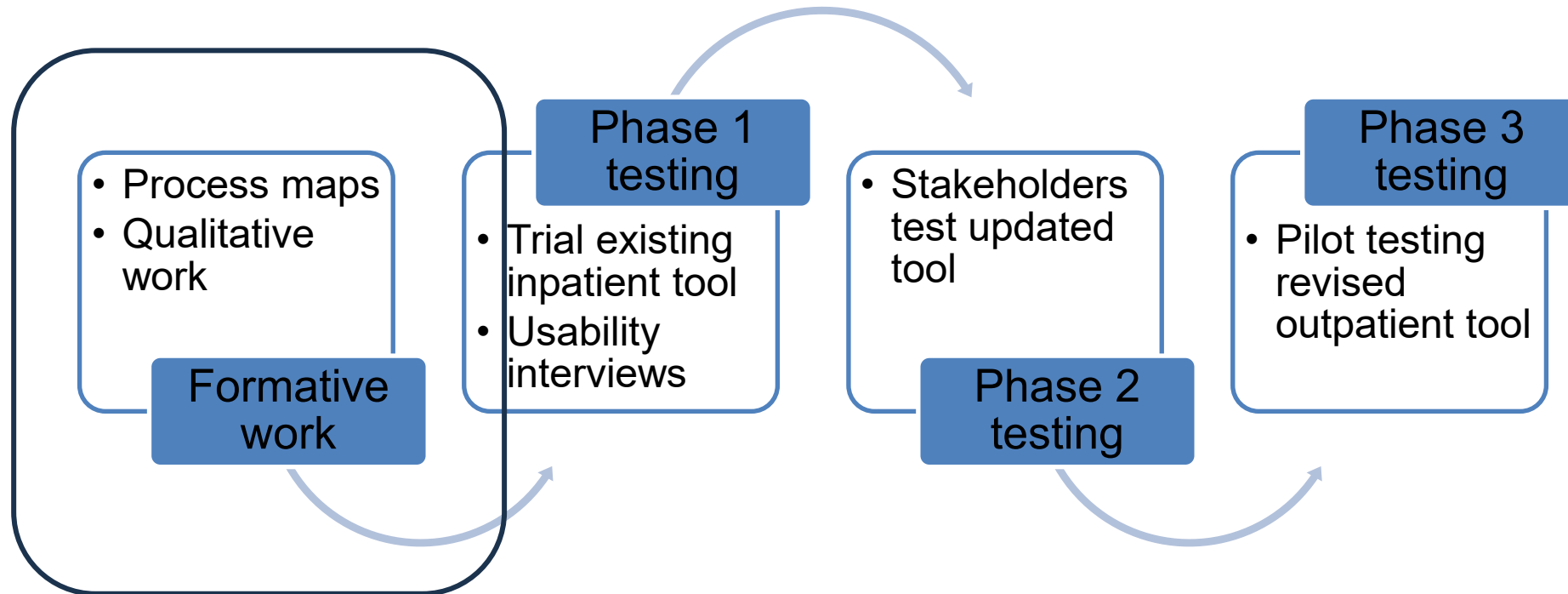
# Technology Being Studied

- Text-messaging has shown promise in patient safety work
- Benefits: easy, accessible, high cell phone uptake even in low-income populations
- Precedent work has found text-message safety reporting to be feasible in the **inpatient pediatric setting** [*Bardach et al, J Hosp Med 2022*]

# Stakeholder Advisory Research Council: 2019-2023

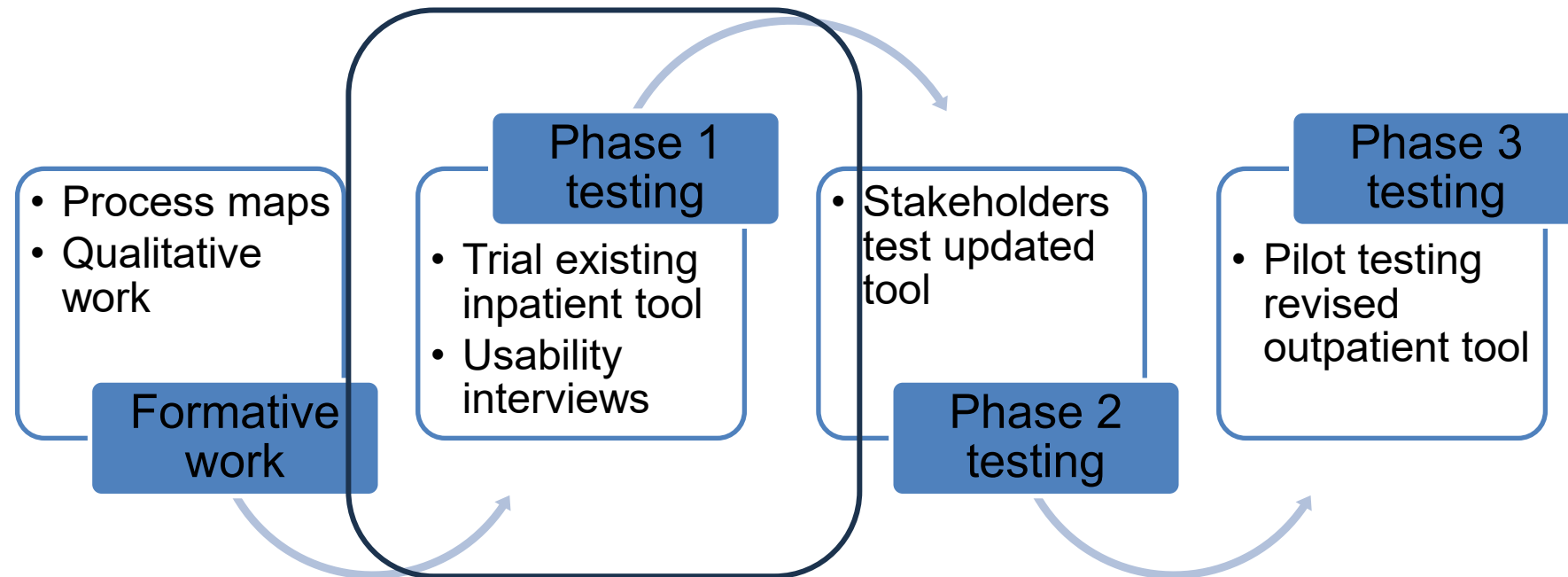


# Iterative, User-Centered Design Process



Process maps, focus groups and interviews (pre-K08):  
*Need for more communication regarding potential safety concerns*

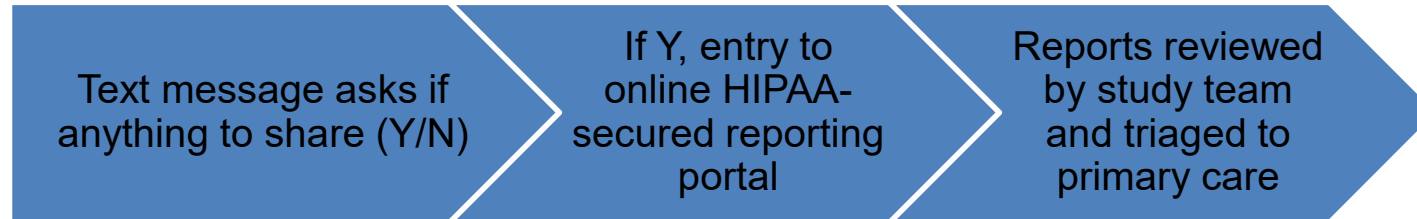
# Iterative, User-Centered Design Process



Phase 1: 10 primary care patients trialed the initial "FIQS" tool and provided usability interviews

Inclusion criteria: SF Public Health Network, patients, age 18+, English-speaking, own smartphone, experience with insulin, opioids, blood thinners




# Text-messaging mobile reporting tool










Hello [REDACTED],

At San Francisco General Hospital, we care about safety. Have you experienced safety issues today (Friday, April 16, 2021)? If yes: click the link below. If no, text N.

<https://qgen.run/y2r08c>

  Mensaje de texto 

Choose the category that best fits your experience.

-  Medications, Infusions, Food, or Formula >
-  Hospital Room and Equipment >
-  Communication >
-  Infection Prevention >
-  IVs, Procedures, or Tests >
-  Other >
-  What Went Well >

<

Next >

## Daily Safety Survey

 WHAT WENT WELL

In your words, please tell us your story:

When did it happen?

- Morning (7am-1pm)
- Afternoon (1pm-7pm)
- Evening (7pm-1am)
- Night (1am-7am)

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# Development of Our Tool

## Phase 1 Testing

### Participant Characteristics (n=10)

Participant characteristics	N (%)
Gender	
Female	6 (60%)
Male	4 (40%)
Age	
18-30	1 (10%)
31-45	3 (30%)
46-60	3 (30%)
61-70	3 (30%)
Race/ethnicity	
African American	5 (50%)
Hispanic/Latinx	2 (20%)
American Indian	1 (10%)
White	1 (10%)
Asian	1 (10%)

### Reports Submitted by Category (n=16)

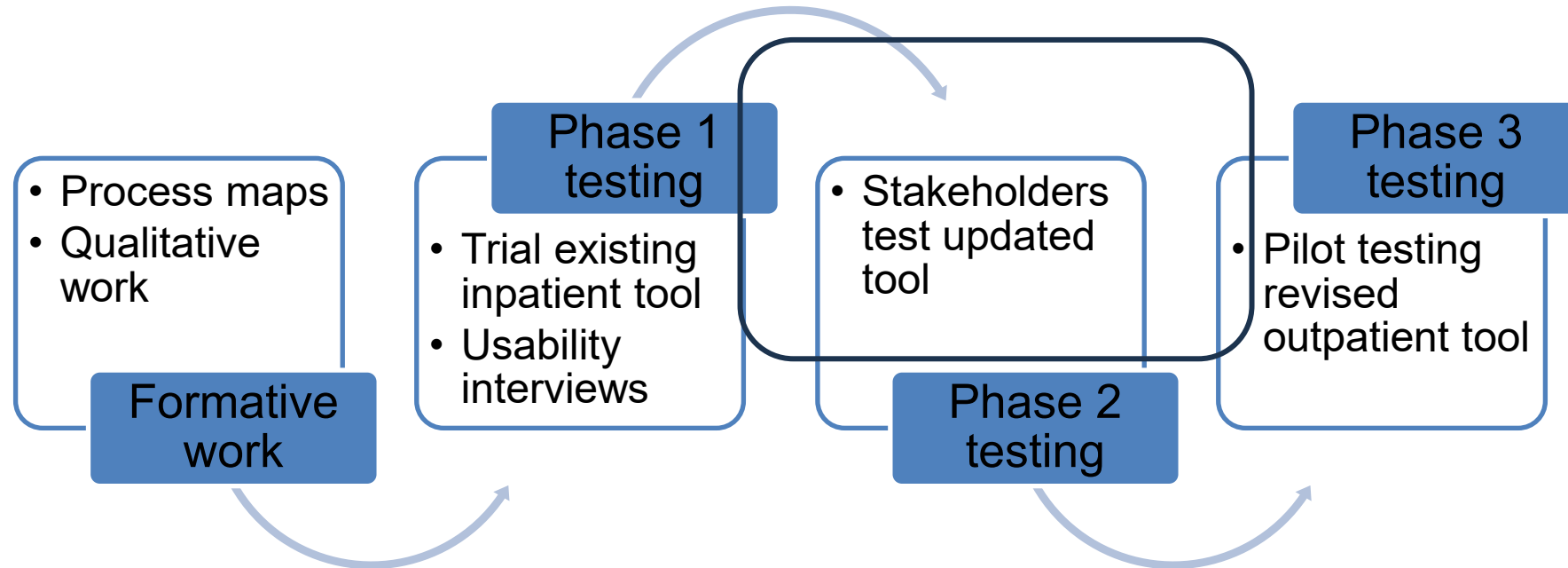
Category	N=16 (%)
Other	6 (37.5%)
Communication	4 (25%)
Hospital Room and Equipment	2 (12.5%)
What Went Well	2 (12.5%)
Infection Prevention	1 (6.25%)
IVs, Procedures, or Tests	1 (6.25%)

Two reports of chest pain! -->  
Phase 1 halted

# Usability Themes

Themes	Examples
Ease of Use	<ul style="list-style-type: none"><li>• simple/user friendly</li><li>• Non-repetitive</li><li>• Feels like someone is “looking out for me” and “Cared for”</li><li>• Really like the “N” and “Y” because so short</li><li>• Prefer not talking to someone on phone</li><li>• Can stay home in COVID</li></ul>
Barriers to Use	<ul style="list-style-type: none"><li>• too much going on</li><li>• immigrants/undocumented may feel less comfortable</li><li>• Confusion about reporting symptoms vs reporting SAFETY</li><li>• No follow up leads to lack of knowledge of where info is going</li></ul>
Why used for emergency?	<ul style="list-style-type: none"><li>• Felt alone, no other options for how to communicate</li><li>• Because it's in text, feels more accessible</li><li>• Didn't consider it an acute emergency, more of chronic</li><li>• Didn't understand</li><li>• Wanted quick response</li><li>• Felt ppl on other side cared</li></ul>
Ideas for improvement	<ul style="list-style-type: none"><li>• Significant changes to orientation protocol</li><li>• Multiple stopgaps to ensure not emergency</li><li>• Wording, color, display suggestions</li></ul>

# Iterative, User-Centered Design Process



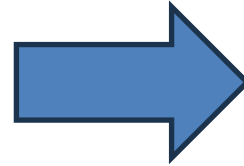
We reviewed the Phase 1 results with SARC and modified the tool based on the findings and recommendations.

At UCSF Benioff Children's Hospital, we care about safety. Have you experienced safety issues today? If yes: click the link below. If no, text N.

dev.studydata.net



FIQS2 TOOL



At UCSF/ZSFG, we care about your safety.

Have you experienced any medical safety issues today?

If yes, please click the link below. If no, please text N.

<https://www.studydata.net/qgen/MSurvey.php?key=275c809e2b%3Aexp%3Ab58df446fa8d4dc6c7ee36&qri=584f389cd4fd3bcdf3c7ecec349e68e7>

EXPERTS-PC TOOL

Daily Safety ZSFG Adult



Today is: 09/22/22



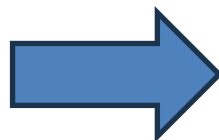
### Attention

If this is an emergency, or something that needs urgent attention, contact your nurse or doctor immediately.

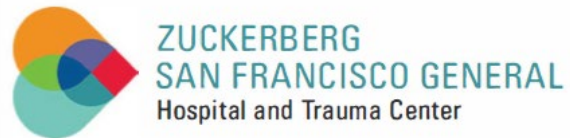
Submissions are reviewed every 24 - 72 hours.



FIQS2 TOOL



Daily Safety Survey



Today is: 09 / 22 / 22



### Attention

If this is an emergency, such as chest pain/shortness of breath, or something that needs urgent attention, contact 911 or your doctor's office immediately.








Submissions are reviewed every 24 - 72 hours.



EXPERTS-PC TOOL



Choose the category that best fits your experience.







-  Medications, Infusions, Food, or Formula >
-  Hospital Room and Equipment >
-  Communication >
-  Infection Prevention >
-  IVs, Procedures, or Tests >
-  Other >
-  What Went Well >

< [Next >](#)

FIQS2 TOOL



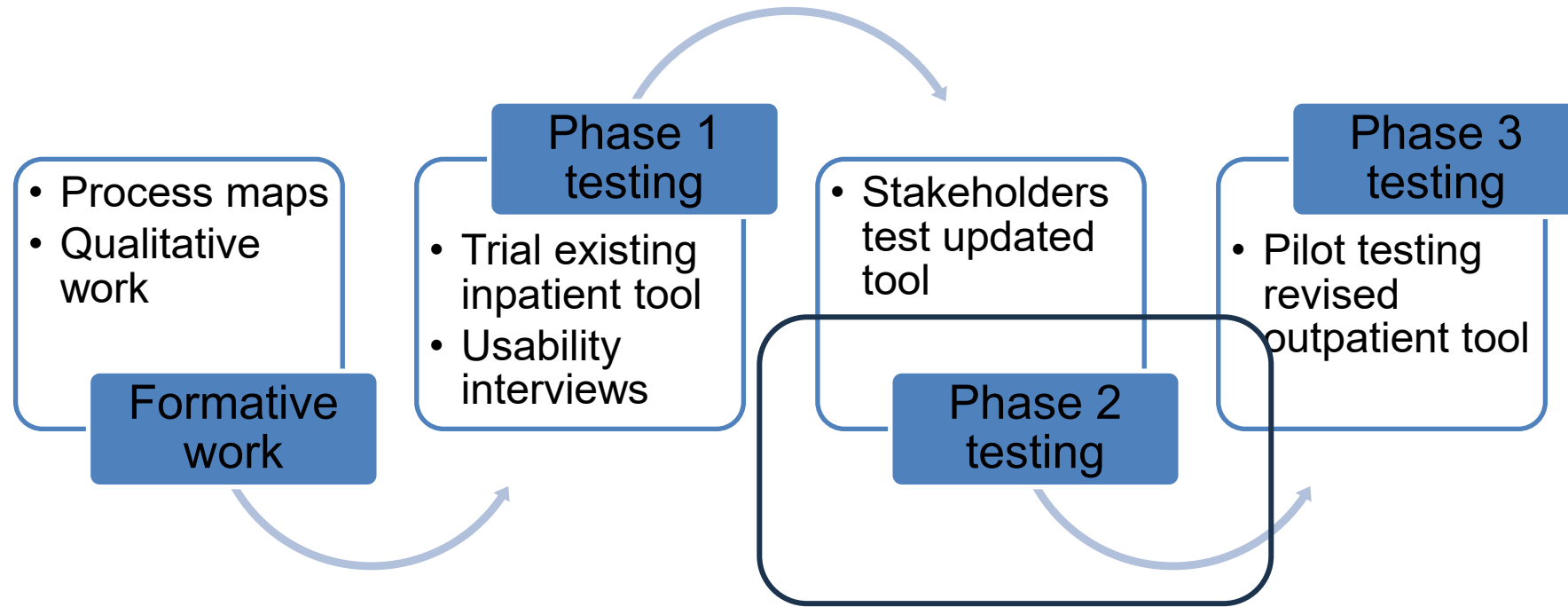
Choose the category that best fits your experience.

-  Medication/Pharmacy >
-  Communication/Respectful Care >
-  Diagnosis, Procedures, or Tests >
-  Delay/Timing of Care >
-  Other >
-  What Went Well >

< [Next >](#)

EXPERTS-PC TOOL

# Iterative, User-Centered Design Process



Phase 2 Testing: Went back to our stakeholder advisory council and asked them to trial the updated tool, now called EXPERTS-PC

# Phase 2 Testing



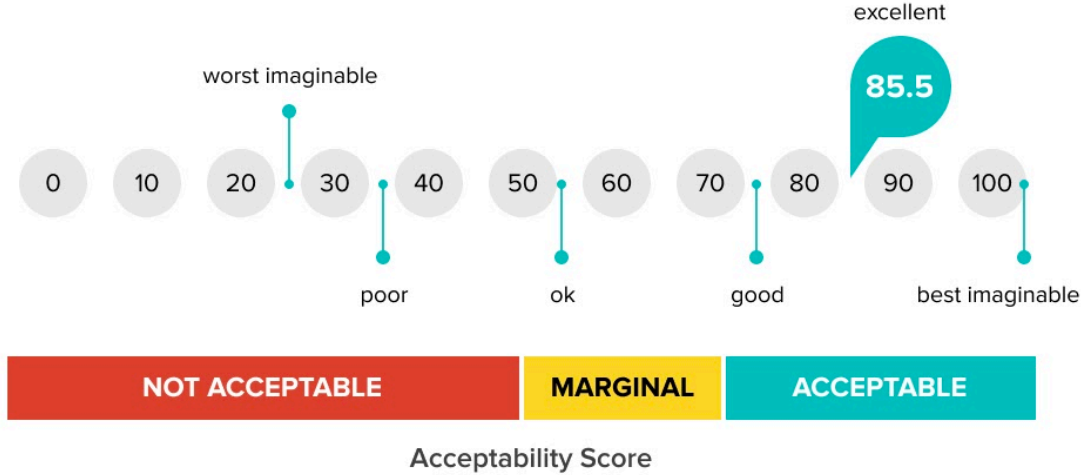
## e-Health Literacy Questionnaire Scores (n=9, 5 patients/caregivers + 4 providers)

Role	Mean	Sum of SDs
Patient	6.4	3.383
Provider/Healthcare staff	7.4	3.766

## System Usability Score of EXPERTS-PC (n=6, 5 patients/caregivers + 1 provider)

Median	72.5
Mean	75
SD	10.36822

## System Usability Score





# Changes in Phase 3

Daily Safety Survey



Today is: 06/08/23



## Attention

*This tool is for non-urgent medical issues.*

*If you need immediate medical attention, please  
call your doctor's office or 911.*

*Examples of emergency symptoms that are not  
for this tool [here](#)*

*Submissions are reviewed every 24 - 72 hours.*



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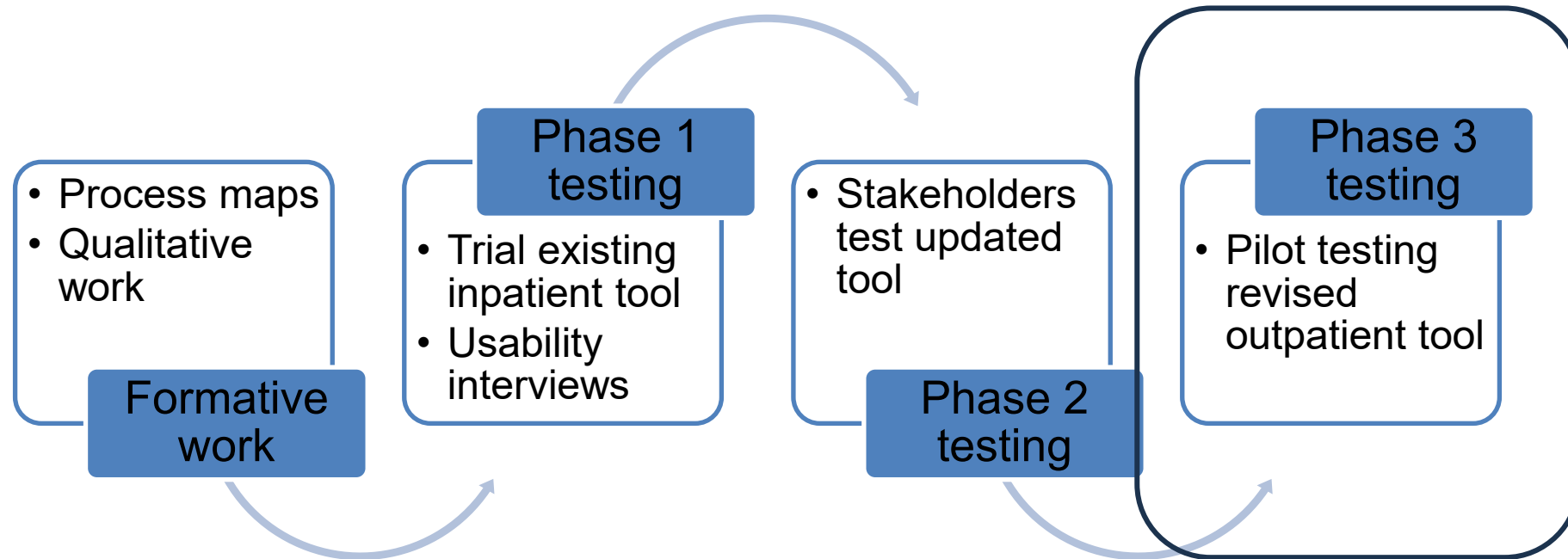
## Report submitted. Thank You

If you would like to submit another report, then please  
hit "Next". Otherwise, you can close this window.

Changes included:

1. adding link to emergency situations
2. streamlined navigation/loop for multiple reports

# Iterative, User-Centered Design Process



Phase 3 Testing: We made additional modifications, and then rolled out Phase 3 testing with a new cohort of adult outpatients

- Phase 3 Testing to-date
- Total enrolled = 8 patients, 1 caregiver to-date, goal N=30
- Total reports to-date: 17

Patient characteristics	N (%)
Gender	
Female	4 (44%)
Male	5 (56%)
Age	
18-30	1 (11%)
31-45	2(22%)
46-60	3 (33%)
61-70	3 (33%)

# Benefits and Challenges

- Very rich engagement from stakeholder advisors
- Public health site serving low-income, racially diverse population
- Remote enrollment and participation - allows more diverse population to participate in study
- Significant delays due to COVID, IRB, and staffing transitions
- Thoughtful work takes time!
- Patients desire more follow-up than this tool can provide
- Getting more difficult to recruit over the phone



# Future Integration into Primary Care

Tailored application for higher-risk populations (eg, hospital discharge)

Embedding into existing systems

Smart, safe use of chatbots/AI?

# Thank you

Our wonderful SARC Members

UCSF Study Staff: Amber Tran, Adriana Najmabadi, Hiba Elkhatib,  
Beatrice Huang

K08 Mentors Urmimala Sarkar and Naomi Bardach

Funded by AHRQ K08HS028477

Contact:

Anjana.sharma@ucsf.edu

Send Card



Scan or click to preview

# Presentation 2

## Improving Diabetes and Depression Self-management Via Adaptive Mobile Messaging



**Adrian Aguilera, PhD**  
**University of California,**  
**Berkeley, School of**  
**Social Welfare; and**  
**University of California,**  
**San Francisco**

# Acknowledgement



Co-PI: Courtney Lyles, PhD

Center for Healthcare Policy and

Research, University of California, Davis



# DIAMANTE

## DIAbetes & Mental Health Adaptive Notifications TExting Study

- Interventions for Depression and Diabetes are siloed
- Physical activity is a core mechanism for both
- Mobile health interventions need to be:
  - ▶ Personalized
  - ▶ Integrated into care
  - ▶ Developed with vulnerable populations

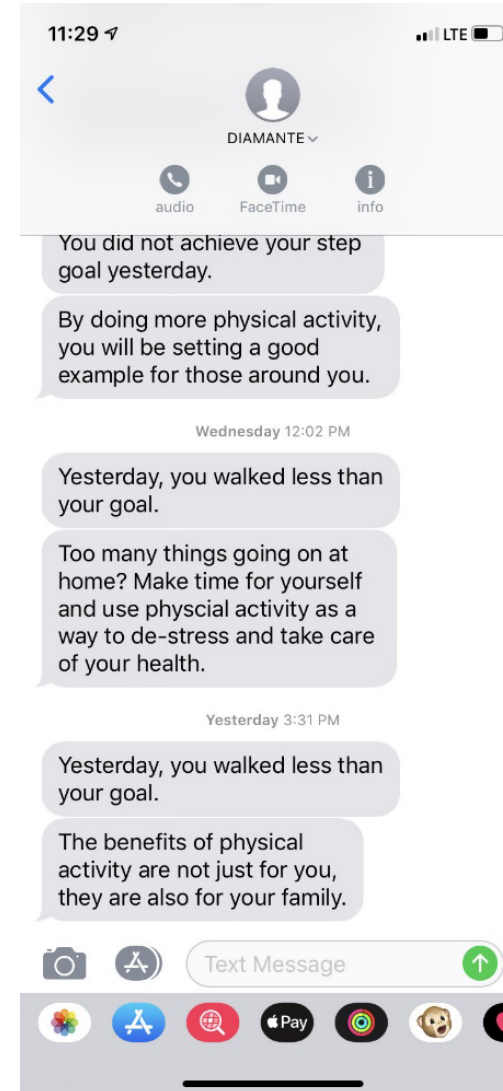
# DIAMANTE Reinforcement Learning Intervention

- Primary Project Aim is to increase physical activity via:
  - ▶ Smartphone Passive Sensing of steps
  - ▶ Personalized messaging using a reinforcement learning algorithm
  - ▶ Target individual's specific motivators

# DIAMANTE App



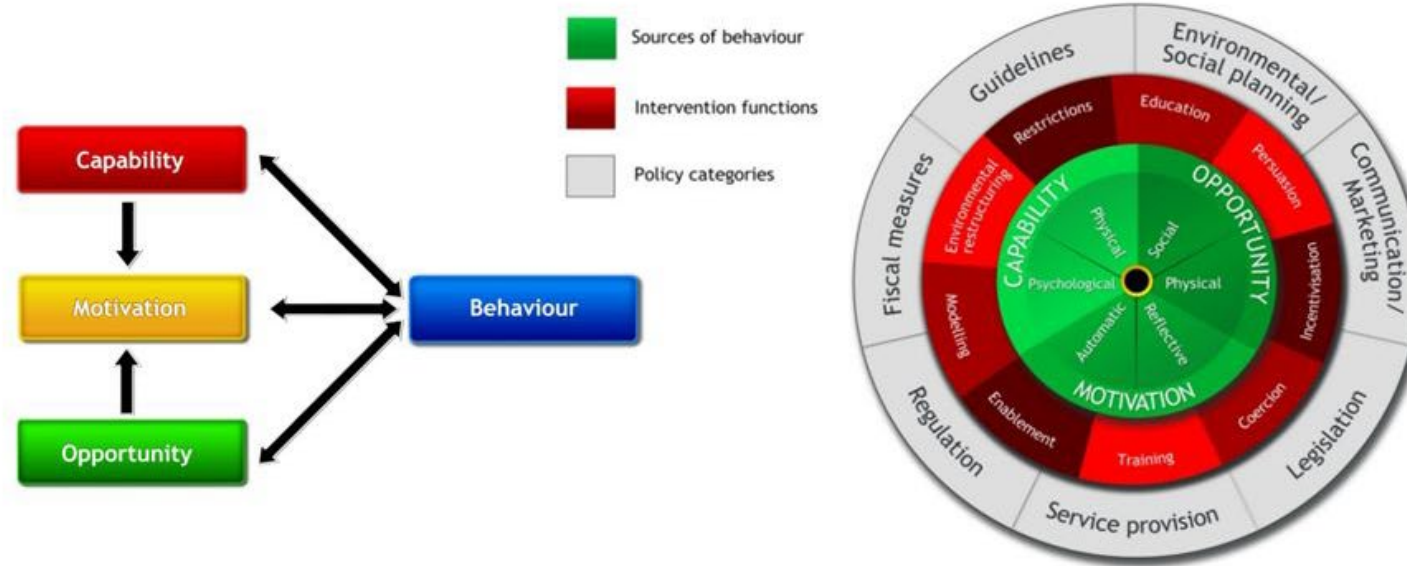
Friday: February 22, 2019	3008 Steps
Thursday: February 21, 2019	4292 Steps
Wednesday: February 20, 2019	6808 Steps
Tuesday: February 19, 2019	6714 Steps
Monday: February 18, 2019	11293 Steps
Sunday: February 17, 2019	10149 Steps
Saturday: February 16, 2019	6719 Steps
Friday: February 15, 2019	14905 Steps
Thursday: February 14, 2019	20513 Steps
Wednesday: February 13, 2019	10015 Steps
Tuesday: February 12, 2019	12306 Steps



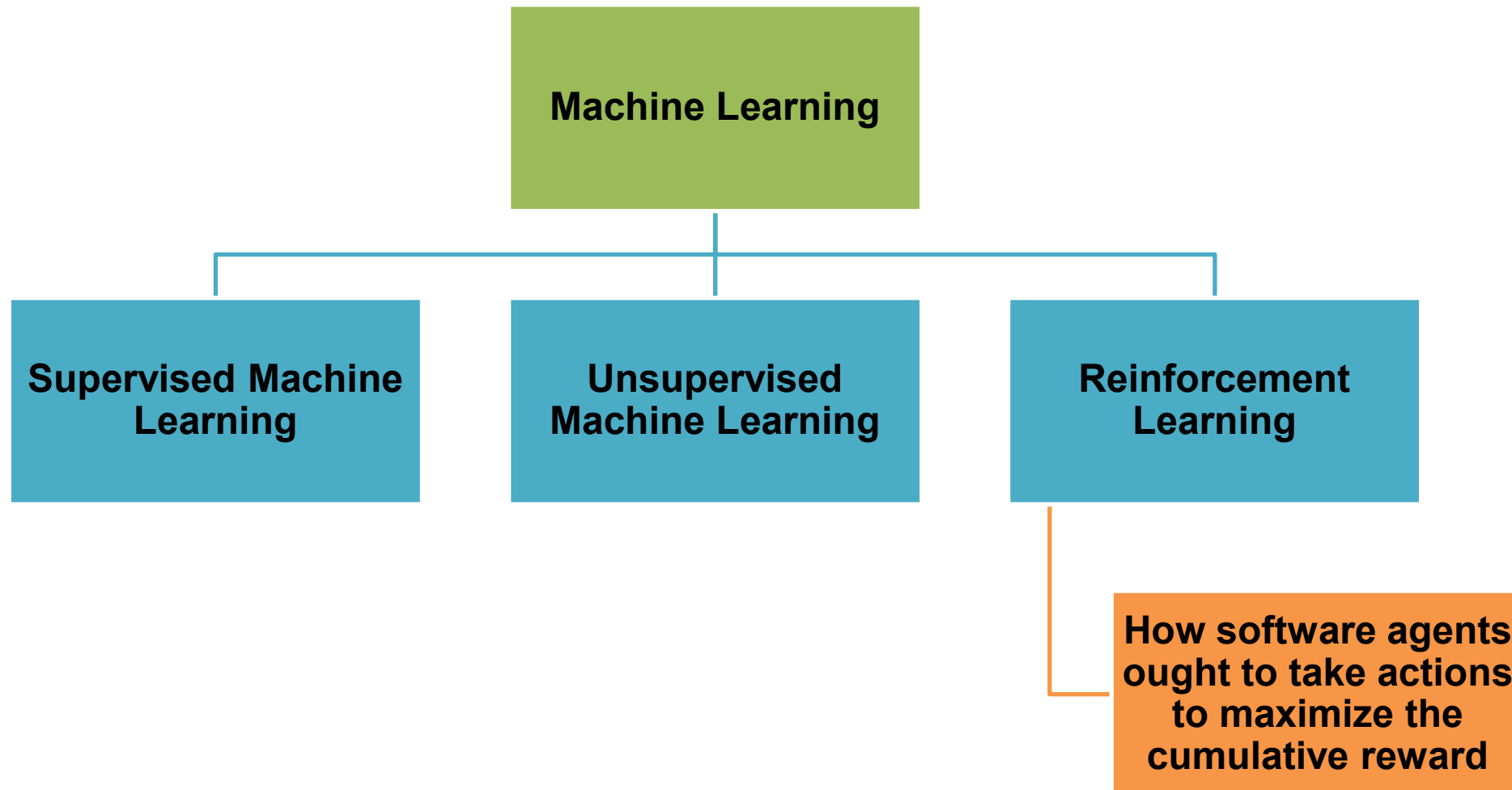
# COM-B Behavioral Change Wheel

## COM-B Behavioural Change Wheel

(2011) Michie, Stranlen and West



# Reinforcement Learning



# Important Terms



Action variable: Actions to be taken by algorithm (Feedback, Message, Time)



Contextual variables: A participant's state (characteristics, behavior, surroundings)



Reward: Outcome



Model: How we predict what the potential reward might be, as a function of the action and contextual variables.

Every morning, algorithm is re-trained on data of all participants

Action variables: Action to be taken by algorithm. Message categories (n=4).

Contextual Variables: Clinical/demographics physical activity yesterday/week, weather, days since message from category was sent on day t



Reward: Steps yesterday - steps day before

- No message: -500 steps
- Benefit: +500
- Self-efficacy: +200
- Opportunity +100

Random message from category

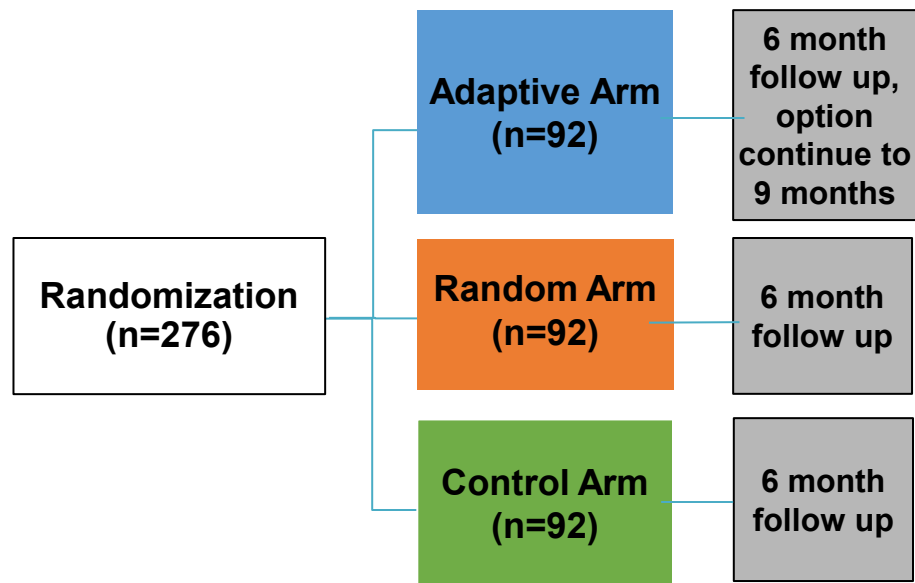
Actions predicted not to be the best ones will still be tested (Boltzmann/ Thompson Sampling)

# Methods

- **Participants & Setting**
  - Low-income patients from primary care clinic at public hospital
  - English or Spanish speakers
  - Diabetes diagnosis and depression symptoms
  - Varying digital literacy levels
  - 1 year design phase
- **COVID-19 & Recruitment issues**
  - Social Media (Craigslist, Facebook, Google Ads)
  - Half of sample
- **Sent step and PHQ-9 data to PCP via EHR messages**



# DIAMANTE Trial Design



	Adaptive	Random	Control
Download the app	X	X	X
Weekly mood message	X	X	X
Daily health promotion message. Non adaptive.		X	
Reinforcement learning to adapt and optimize text messaging: 1) feedback step count/goal 2) motivational	X		

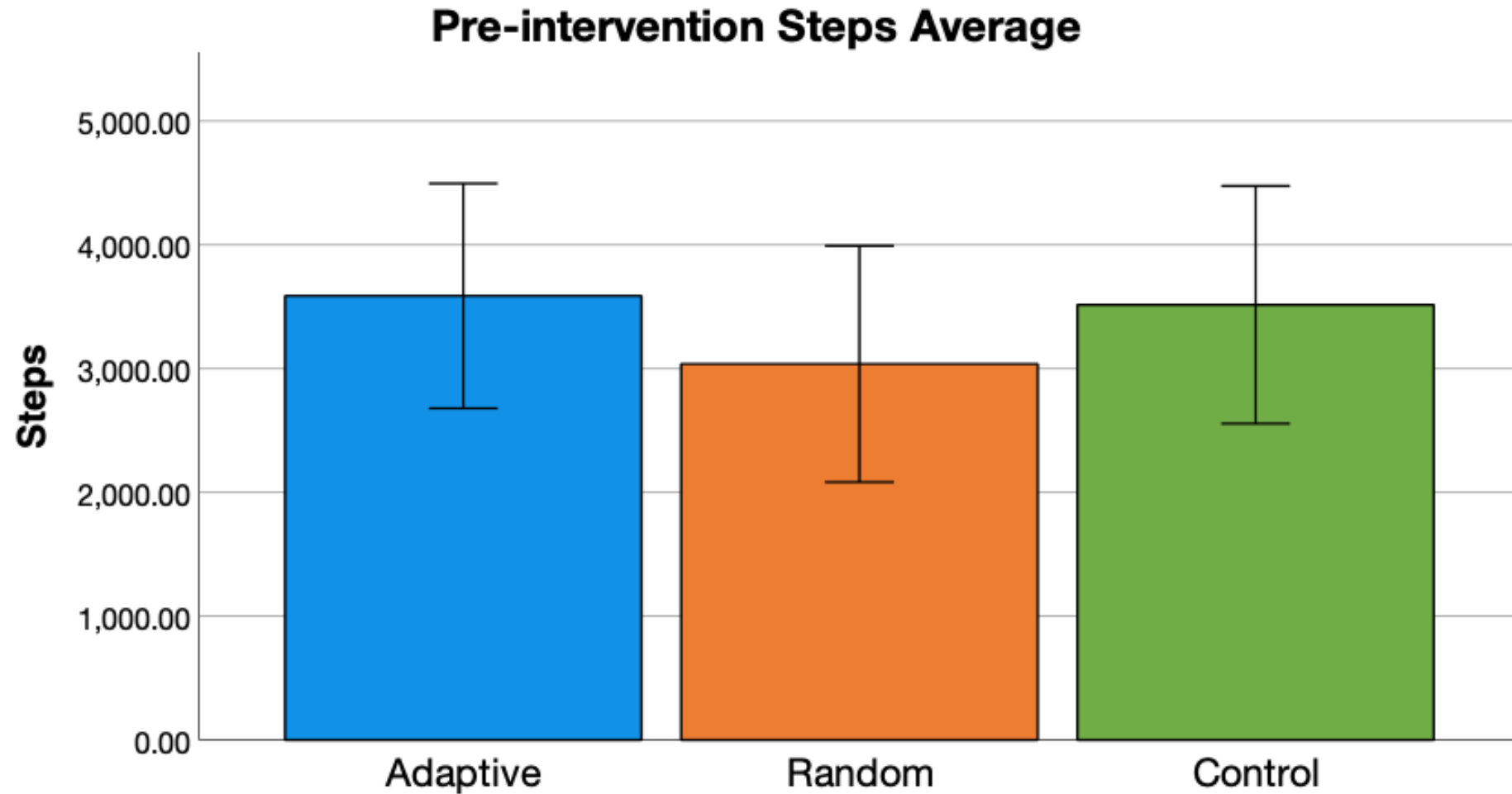
# Participants

	<b>Adaptive</b>	<b>Random</b>	<b>Control</b>
N	59	55	59
Age (years), mean (SD)	47.5 (12.0)	48.6 (11.1)	50.12 (52)
Female %	54%	67%	61%
Spanish lang Intervention %	22%	22%	29%
<b>Race/ethnicity %</b>			
Asian or Pacific Islander	9%	7%	7%
Black or African American	14%	16%	19%
White	34%	29%	24%
Latine/x	37%	36%	41%

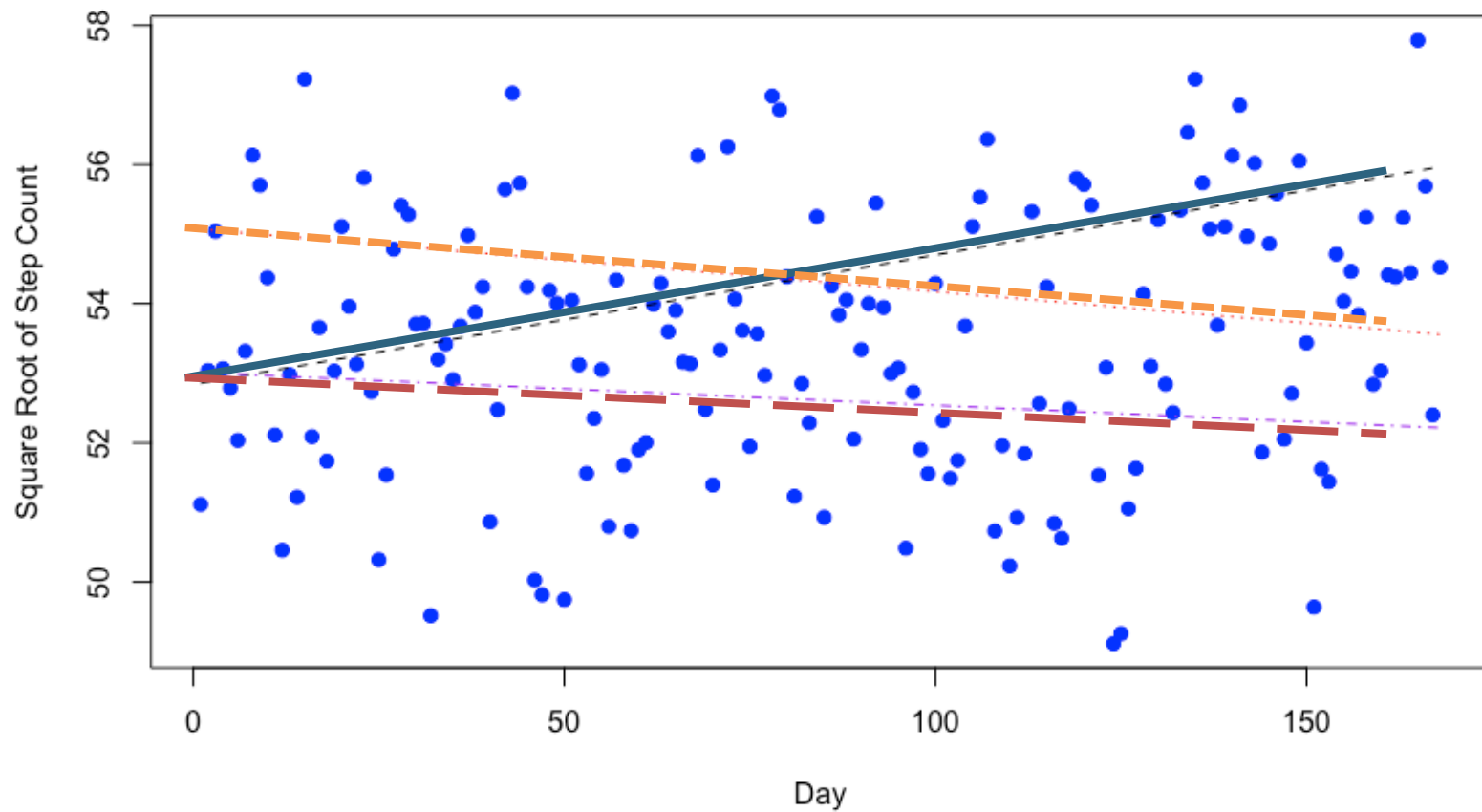
# Participants

	<b>Adaptive</b>	<b>Random</b>	<b>Control</b>
N	59	55	59
<b>Education, %</b>			
No formal edu to 8 <sup>th</sup> grade	7%	7%	12%
H.S. Grad, GED, or some H.S	27%	24%	20%
Some college	32%	31%	15%
College graduate	25%	27%	40%
Graduate degree	9%	9%	12%
<b>Employment Status, %</b>			
Full Time (>35 hrs/wk)	39%	35%	34%
Part Time	12%	25%	15%
Unemployed	19%	16%	15%
Disability	17%	11%	12%

# Physical Activity



# Linear Mixed Model



**Adaptive Arm**

**Random Arm**

**Control Arm**

# Implications

- Text messaging and low-burden digital tools can be used to promote behavior change among vulnerable populations
- Personalized and Adaptive digital health interventions may be most effective at increasing physical activity than general digital health tools
- Need to work on integration into care and EHR for improved implementation

# Presentation 3

## *Improving Medication Safety for Medically Complex Children with mHealth Across Caregiving Networks*



**Ryan J Coller, MD, MPH**  
University of  
Wisconsin, Madison,  
School of Medicine and  
Public Health



**Nicole E. Werner, PhD**  
Indiana University  
School of Public Health-  
Bloomington

# Medication Safety in Pediatrics

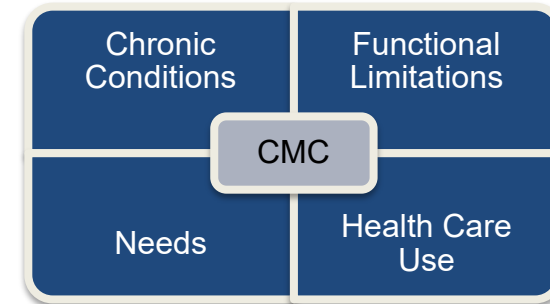


- More than half of US children take  $\geq 1$  med / week
  - ▶ >20% dose deviation by ~half of caregivers
  - ▶ >40% dose deviation by ~quarter of caregivers
- >90% of 300K annual med errors reported to US poison control centers occur at home
  - ▶ Every 8 minutes, a child experiences a medication error during routine care at home

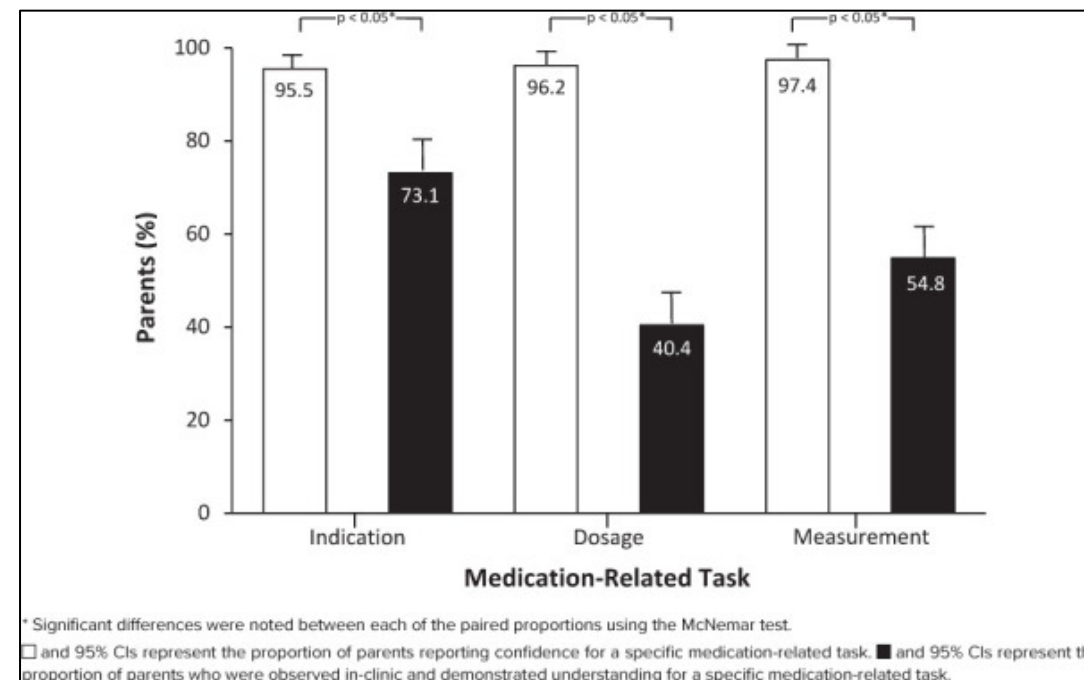
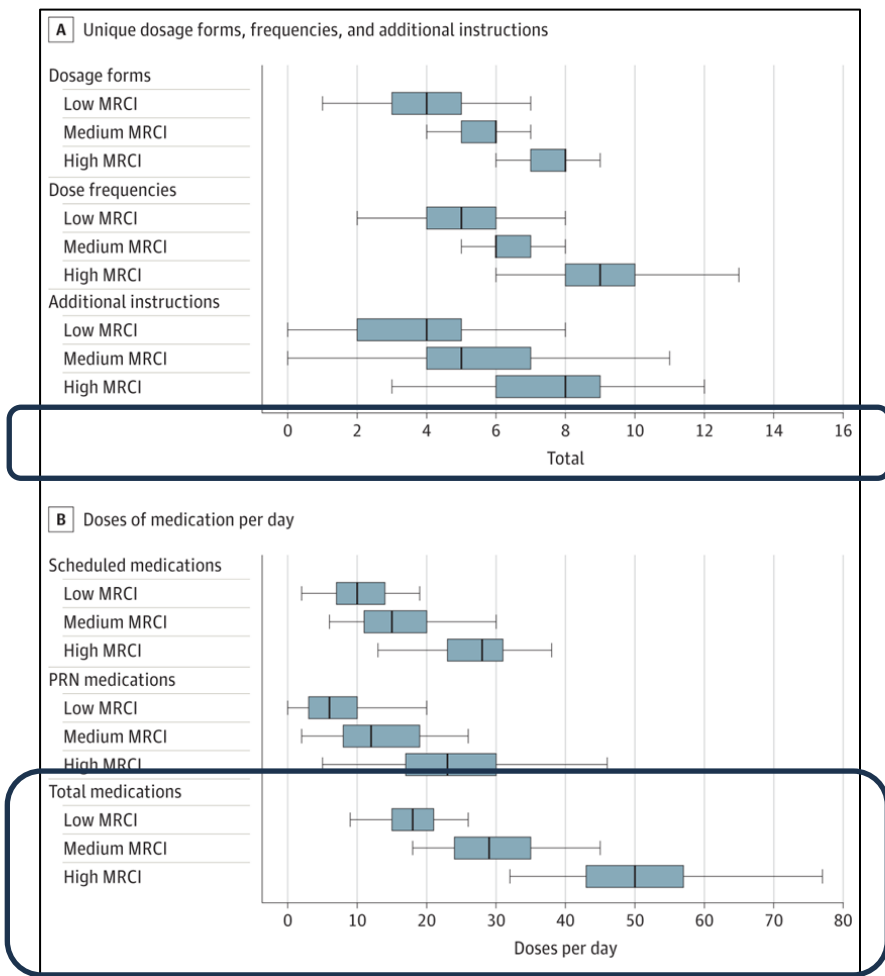


# Medical Complexity = Unique Vulnerability

- Extreme polypharmacy, medical fragility, complex regimens
  - ▶ Median 8 medications + PRNs in our cohort
  - ▶ Variable timing, formulations, routes
  - ▶ Weight-based dosing, liquid concentration
  - ▶ Narrow therapeutic windows
  - ▶ Drug-drug interactions
- 5x higher odds of an adverse drug event (ADE) leading to an ED visit than other children
  - ▶ > 1 in 50 CMC ED visits are associated with ADE
  - ▶ > 1 in 3 CMC ED ADE visits result in hospital admission

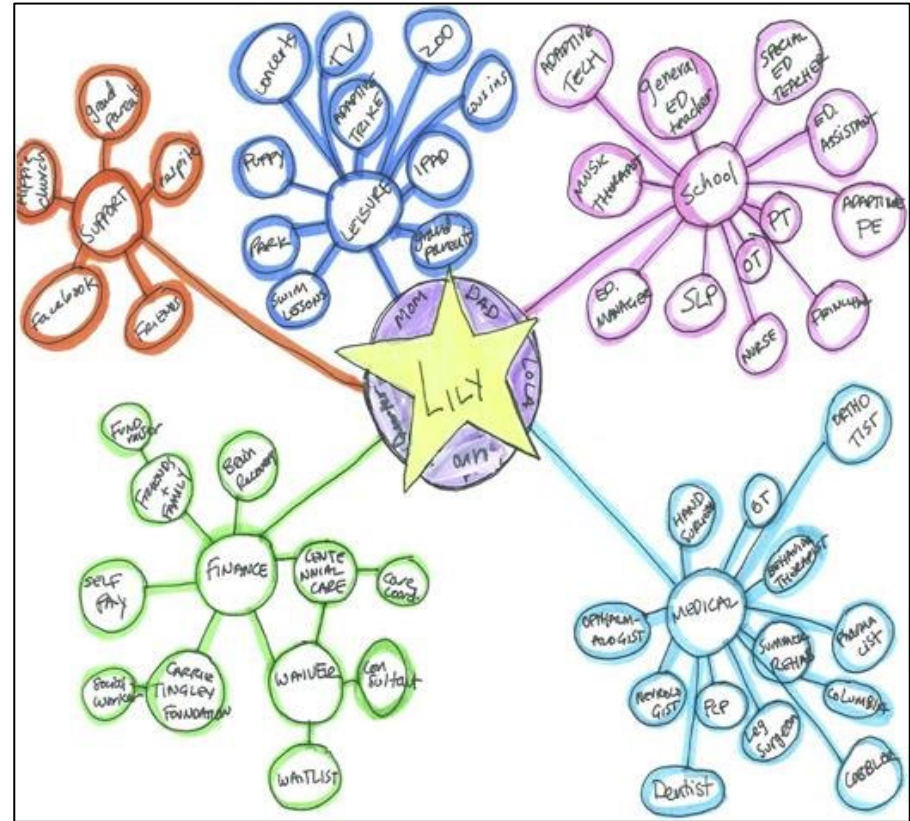


# Modifiable Root Causes

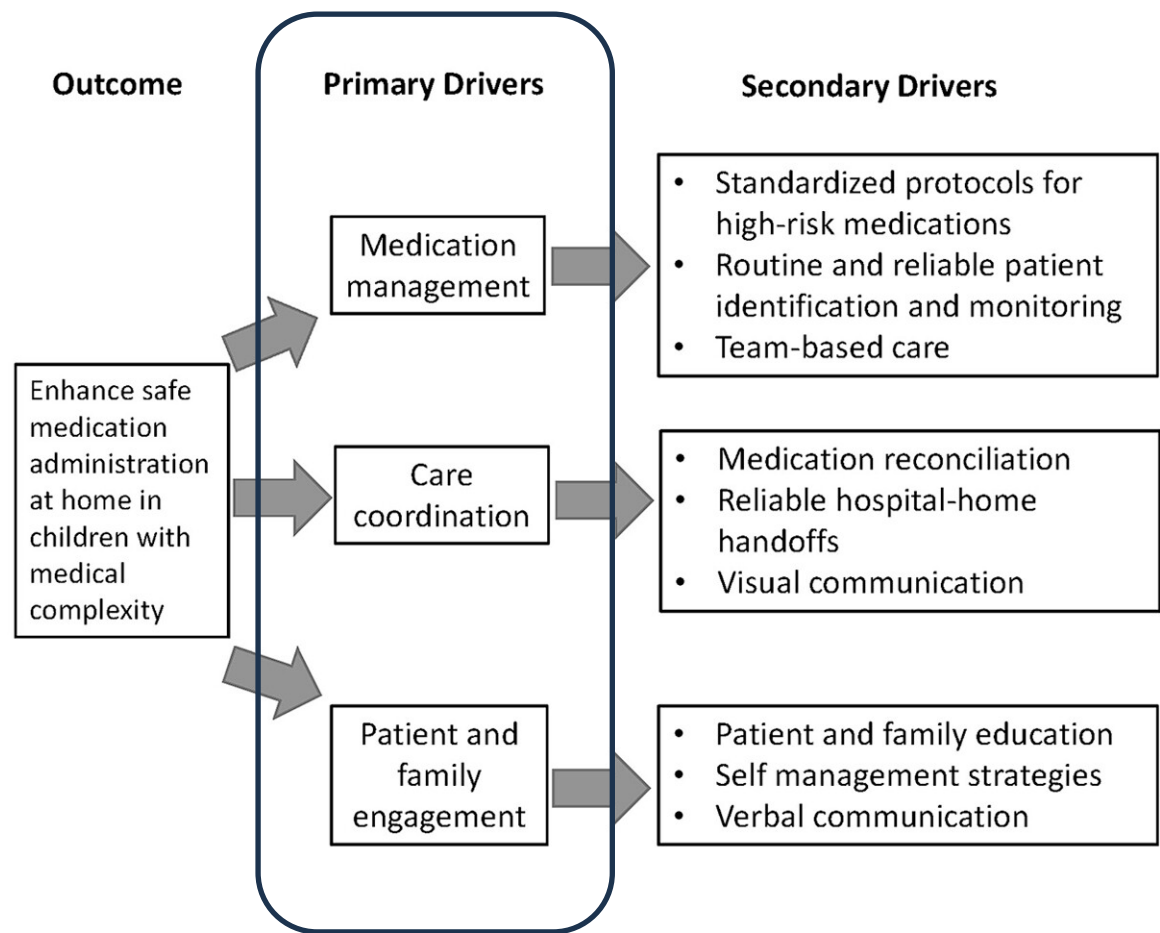


*MRCI = Medication Regimen Complexity Index – a weighted measure of formulation, frequency, and special instructions*

# Modifiable Root Causes



# Key Knowledge Gaps

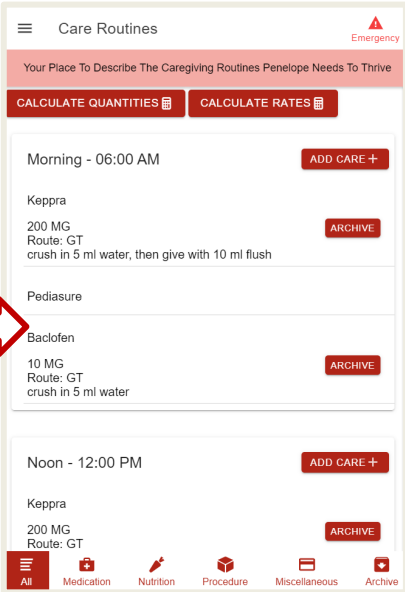
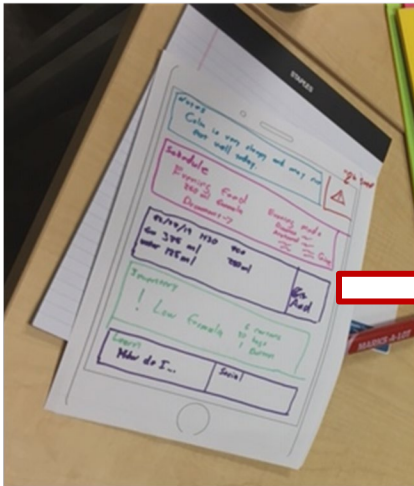


# Key Knowledge Gaps

- Despite the high risk and complex nature of CMC medication management, no tools...
  - ▶ ...are designed to support CMC caregivers' medication administration accuracy
  - ▶ ...support management across the network of other people involved in daily care

# Prototypes - Caregiver Perceptions

- *It's a one-stop...one area where they can have **all this information...**and that can **make life simpler** and **cut down on human errors** –between caregivers and spouses*



# Preliminary mHealth data

@HOME is a usable platform, and longitudinal use is feasible

## Hospital Pediatrics®

Content ▾ Authors/Reviewers ▾ Blogs 5

### Volume 10, Issue 8

August 2020



RESEARCH ARTICLES | AUGUST 01 2020

### Codesign and Usability Testing of a Mobile Application to Support Family-Delivered Enteral Tube Care **FREE**

Christie F. Cheng, BA; Nicole E. Werner, PhD; Nadia Doutecheva, MS; Gemma Warner, MSSW; Hanna J. Barton, MS; Michelle M. Kelly, MD, MS; Mary L. Ehlenbach, MD; Teresa Wagner, RN; Sara Finesilver, BA; Barbara J. Katz, BA; Carrie Nacht, MPH; Ryan J. Collier, MD, MPH ✉

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### Volume 12, Issue 7

July 2022



RESEARCH ARTICLES | JUNE 07 2022

### Feasibility Testing of Tubes@HOME: A Mobile Application to Support Family-Delivered Enteral Care

Nicole E. Werner, PhD; Alyssa Fleischman; Gemma Warner, MSSW; Hanna J. Barton, MS; Michelle M. Kelly, MD, MS; Mary L. Ehlenbach, MD; Teresa Wagner, RN; Sara Finesilver, BA; Barbara J. Katz, MA; Kristina D. Howell, MPH; Carrie L. Nacht, MPH; Nora Scheer; Ryan J. Collier, MD, MPH ✉

# Aims

- **Aim 1: Design the MedS@HOME intervention through participatory co-design with stakeholders**
  - ▶ Three design teams: Primary caregivers, Secondary caregivers, Experts in medication safety / CMC clinical care
- **Aim 2: Evaluate the effectiveness of MedS@HOME on medication administration accuracy**
  - ▶ RCT to test hypothesis that MedS@HOME improves medication administration for



# Co-Designers

1. Primary caregivers (n=8)
2. Secondary caregivers
  - School nurse
  - Home health nurse
3. Clinicians who care for CMC
  - 2 nurses
  - 1 complex care pediatrician
  - 2 pediatric clinical pharmacists
  - 1 home health company representative

<b>Gender</b>	Woman 14 (87.5%)
N (%)	Man 2 (12.5%)
<b>Race</b>	White/Caucasian 16
M(SD)	(100%)
<b>Age</b>	37.6 (10.0)
M(SD)	
<b>Geographic Area (Primary caregivers)</b>	N (%)
Rural	3 (37.5)
Suburban	4 (50)
Urban	1 (12.5)
<b>Household Income (Primary Caregivers)</b>	N (%)
20,000-24,999	1 (12.5)
50,000-74,999	3 (37.5)
100,000 and above	3 (37.5)
<b>CMC Clinical Characteristics</b>	M(SD)
# of caregivers per month	10.8 (SD=7.1)
Daily medications	10 (6.2)
<b>Hospitalized days in past year N (%)</b>	
None	3 (37.5)
1-4	3 (37.5)
5-10	1 (12.5)
11-20	1 (12.5)

# Co-Design of Meds@HOME



Design Stage	Problem Identification	Solution Generation	Convergence	Prototyping	Evaluation
	Aug 2022	Sept 2022	Oct 2022	Nov 2022	Dec 2022
Primary	Session 1	Session 2	Session 3	Session 4	Individual
Secondary	Session 1			Session 2	
Clinician	Session 1			Session 2	
Research team	Weekly debrief, consensus discussion, and planning for next session *User experience designer and software developers made prototype changes within and between sessions				
Example Prompts	“Where can things go wrong with medication administration?”  “What have you done to keep things from going wrong?”		“What do you need to ensure safe medication delivery across all caregivers?”	“Do these features reflect what you need to ensure medication safety for your child?”  “How easy to use is the prototype?”	
Design activities	Journaling Brainstorming		Consensus building Live prototyping	Think-aloud prototype walkthrough	

# Co-Design of Meds@HOME

## **Giving the right medications at the right time**

“Some of these medications can be very dangerous if he gets too much... I’ve even caught medications that someone has drawn up wrong, or even medications that I’ve drawn up wrong.” (primary)

## **Communicating about medications**

“Lack of communication about whether a medication was given can lead to double dosing.” (primary)

## **Accommodating complex medical needs**

“It may be nice to have a central place where we can describe things that are happening. Like, this child had ten seizures today...And then parents, rather than trying to remember what we said, or how we said it, or what we described the seizure looked like, can take [the app] to their clinician.” (secondary)

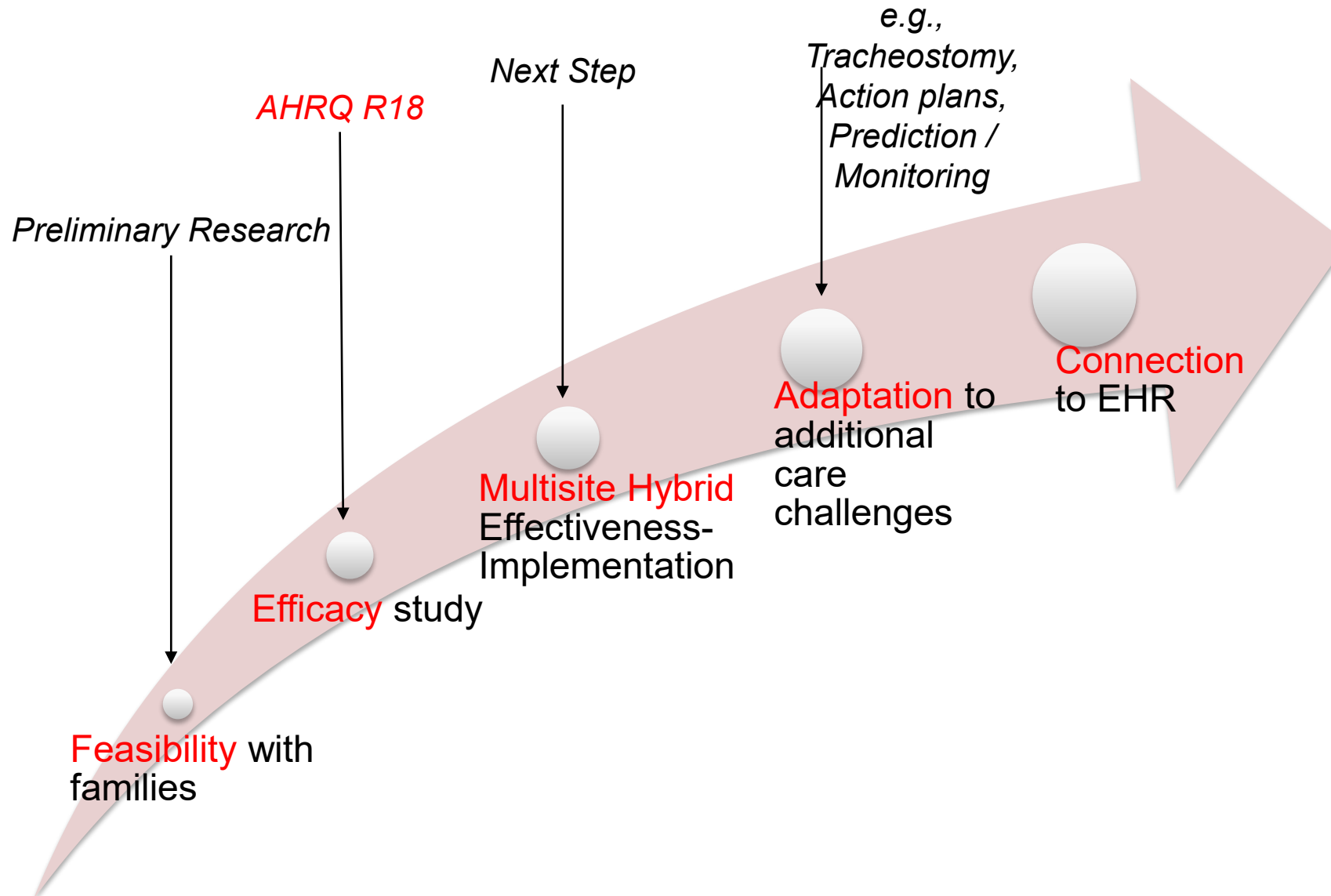
# Meds@HOME Overview Video



# Aim 2

- **Evaluate the effectiveness of MedS@HOME on medication administration accuracy.**
  - ▶ *Hypothesis: medication administration accuracy is improved with use of MedS@HOME within networks caring for CMC ages 0-17 years, who use high-risk medications*
    - **Aim 2a.** Evaluate MedS@HOME's effect on *primary caregiver* medication administration accuracy.
    - **Aim 2b.** Evaluate MedS@HOME's effect on *secondary caregiver* medication administration accuracy.

# Research Trajectory



# Integration into Primary Care

- Platform for many other aspects of “caregiver work”
  - Shed light on the “invisible system” of care at home
  - Understand this work system through data
  - Support this work system / Learning Health System
- EHR integration
  - Communication between caregiving team and clinical team
  - Opportunity for primary care recommendations, remote monitoring, AI to identify risk, etc
- Key unknowns
  - Implementation of the technology across populations
    - Through clinicians? Family and stakeholder organizations?
    - Free availability / word of mouth?
  - Sustaining technology infrastructure

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# Questions

# Thank you



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