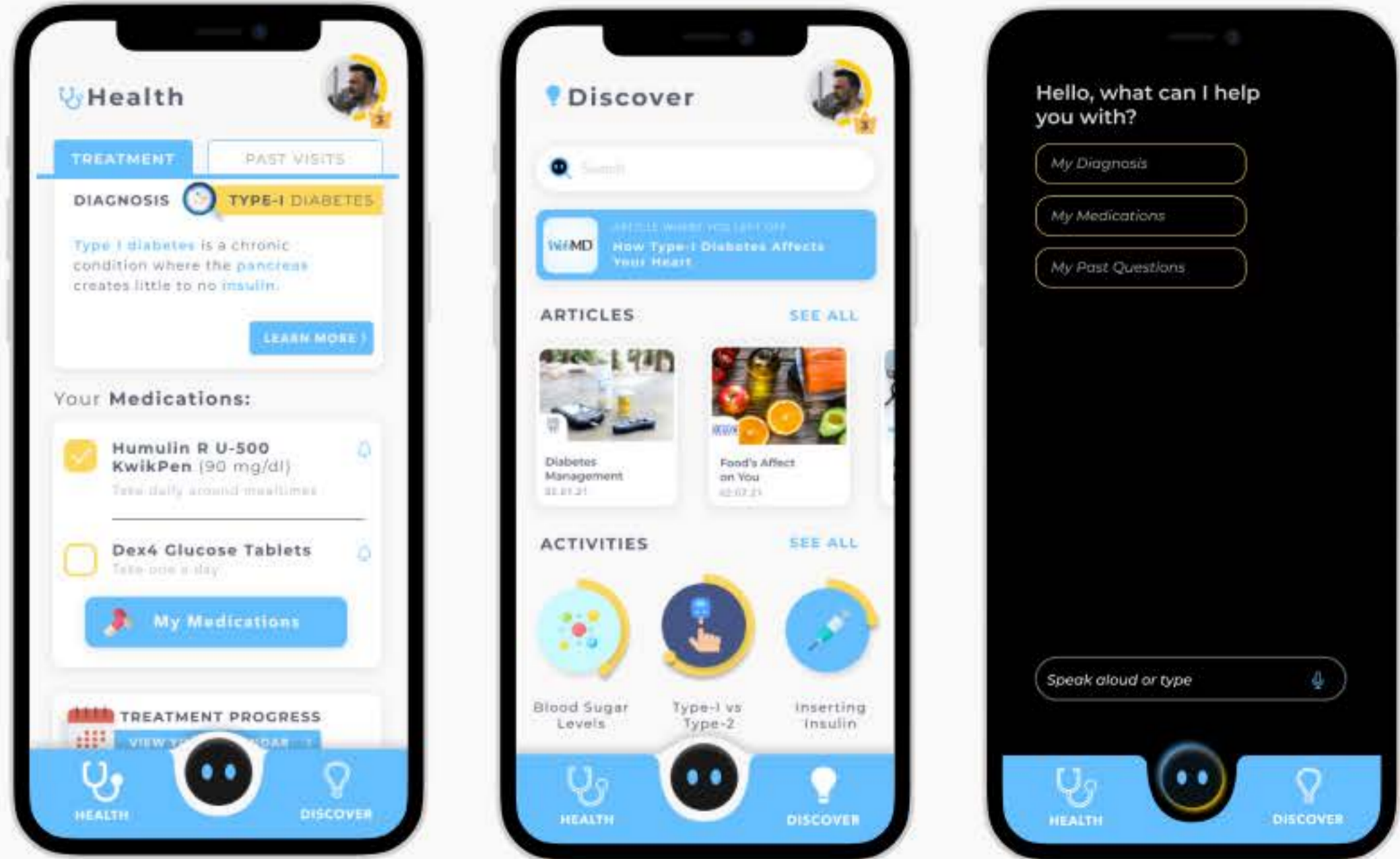# The MO Medical Network

Educating. Understanding. Healing.

Problem

One third of Americans have low health literacy and face difficulties understanding their doctor, struggling to read medication labels, or misunderstanding discharge instructions leading to a rise in preventable deaths and emergency room visits.

Solution

MO is an AI healthcare companion that educates patients about their health through catered explanations and learning material, comforts and entertains patients during their hospital stay, and helps patients keep track of their treatment plan and medications at home.

BRIEF

Solve a meaningful problem in the world with design to disruptively improve human life using the most innovative, useful, and meaningful technologies.

REQUIREMENTS

In the first of two senior design studios, students produce innovative user experience solutions to real design problems and generate working prototypes. Following state-of-the-art processes and design methodologies, students identify valuable opportunities and conduct thorough research that informs the ideation stage. Students envision and document a range of potential solutions for refinement in the next studio.

DELIVERABLES

1. Prototype Product
2. Companion App
3. Vision Video

4. Lookbook
5. Poster
6. Processbook

7. Prototype Software
8. Executive Summary
9. Product Website

MEET THE
team

REMDi

hagar baruch

*Project Manager &
UX Researcher*

baley firlus

*Content Strategist &
Visual Designer*

daniel pelletier

*UX Writer &
Programmer*

max poliseno

*Product Designer &
Conceptualist*

jasmine attanasio

*Information Architect &
Interaction Designer*

The Problem At Hand

Low health literacy affects over a third of adult patients in the US and can lead to higher mortality rates, longer-lasting health issues, and increased medical costs. They are also 3x more likely to have emergency room visits.

Target Users

- **US Adults (+18)**

  and/or

- **Of minority groups**

  and/or

- **On Medicaid, Medicare, or uninsured**

  and/or

- **Have a basic or below basic health literacy**

Design Goal

Create a solution that falls in the center space of clinician **communication, patient empowerment**, and **community** education through the outreach of various target users.

Clinician Communication

Community Education

Patient Empowerment
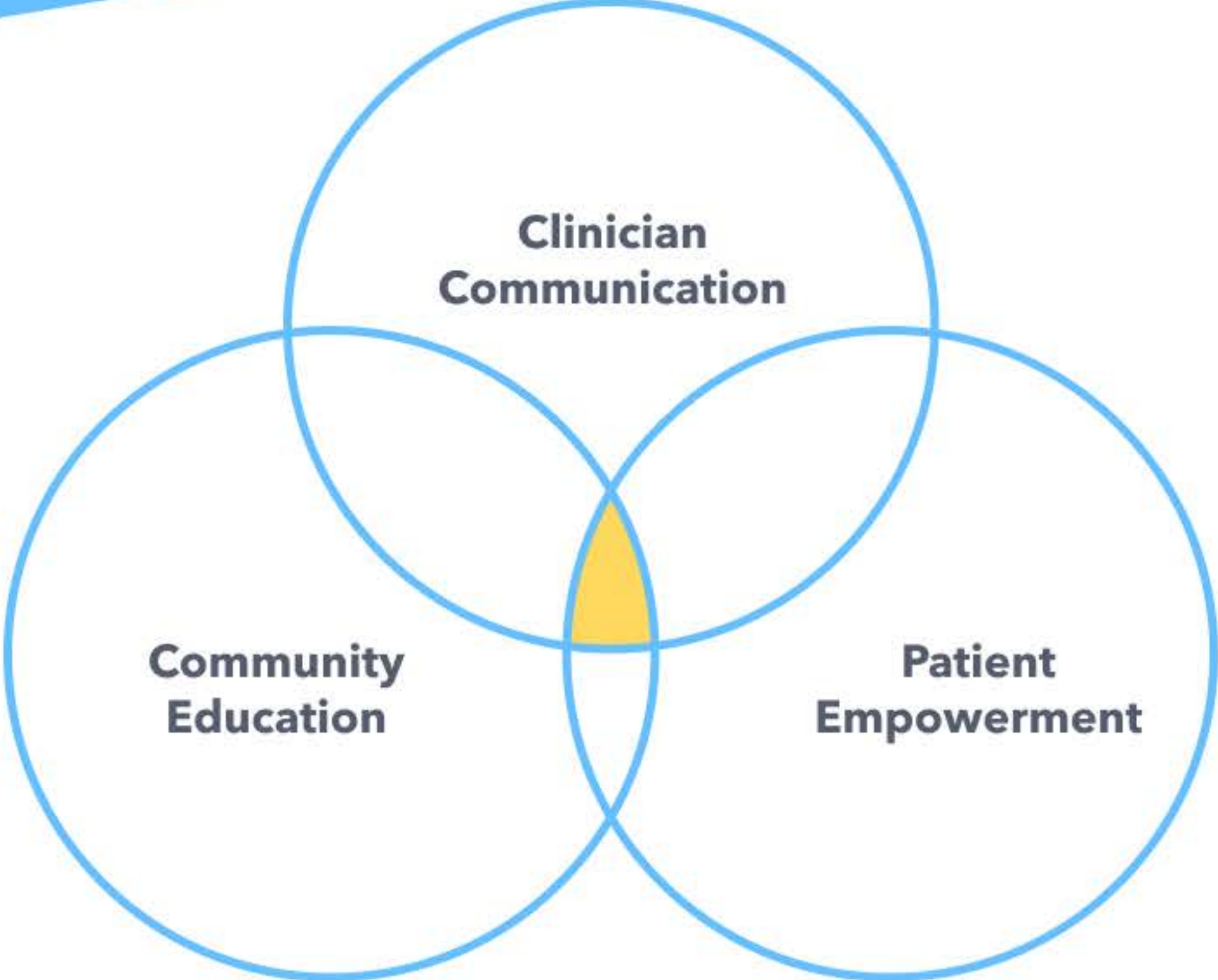
Expected Outcome

Reducing healthcare costs, risks, and concerns by fostering better communication and understanding between patient and clinician and increasing health literacy both at home and the clinic.

REMDi

Discover

Define

Develop

Deliver

Research

Look into issues with literacy in the US
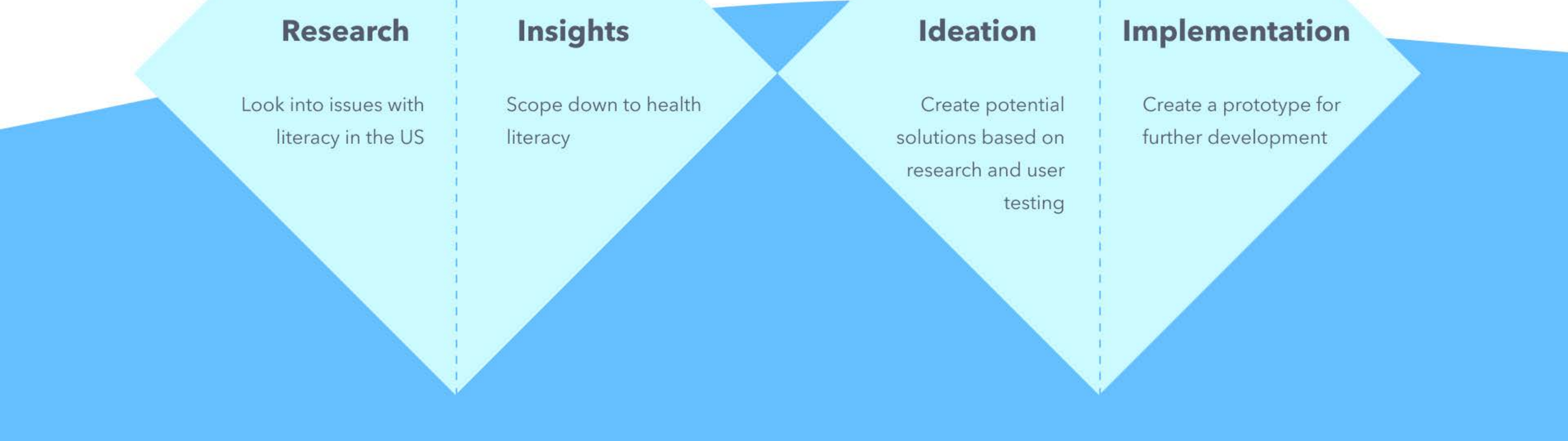
Insights

Scope down to health literacy

Ideation

Create potential solutions based on research and user testing

Implementation

Create a prototype for further development

The

MO

Medical Network

THE

Research

Secondary Research

Competitive Analysis

Primary Research

Affinitization

Persona Building

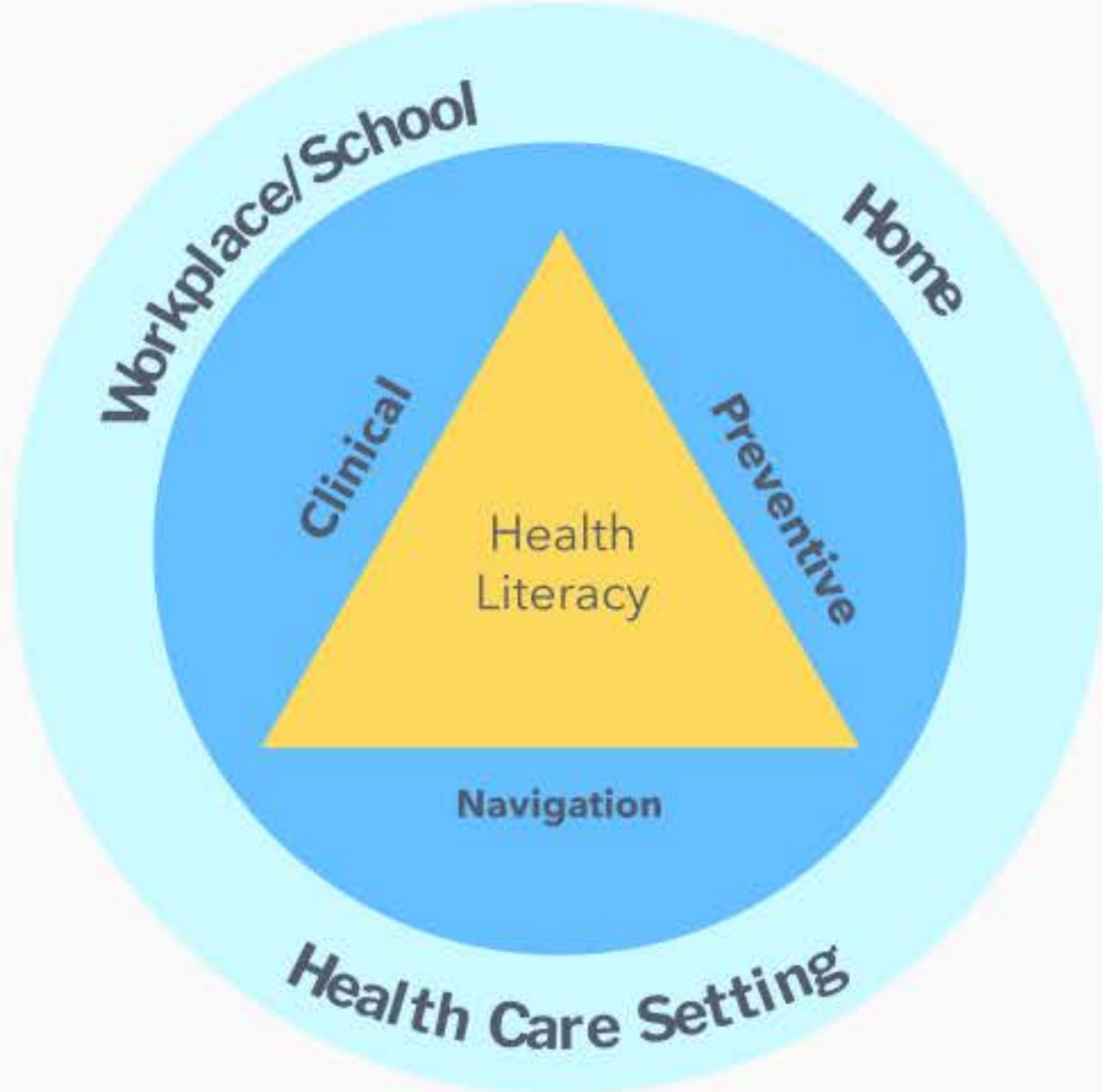# What Is **Health Literacy?**

Personal Health Literacy is the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.

Put Simply...

Health literacy is the ability to understand and use healthcare information in order to make decisions and follow instructions for treatment.

How **Health Literacy** Is Measured?

The CDC uses the National Assessment of Adult Literacy (NAAL) which has its own section for measuring health literacy.

Health Literacy Ranking

Illiterate — **Level 1**

Third grade and below; will not be able to read most low-literacy materials; will need repeated oral instructions, materials composed primarily of illustrations, or audio or video tapes. Can locate simple pieces of information.

Below Basic — **Level 2**

Fourth to sixth grade; will need low-literacy materials, may not be able to read prescription labels. Can generally able to locate information in text and make low-level inferences using printed materials.

Basic — **Level 3**

Seventh to eighth grade; will struggle with most patient education materials; will not be offended by low-literacy materials. Can integrate information from relatively long or dense texts.

Intermediate — **Level 4**

High school; will be able to read most patient education materials.Can demonstrate proficiencies associated with long and complex documents and text passages.

Proficient — **Level 5**

Medical Training; will be able to read and retell medical journals. Can demonstrate proficiencies associated with long and complex documents and text passages.

https://nces.ed.gov/pubs2006/2006483.pdf

Comparison Of Health Literacy

1/3rd of Americans have basic to below basic health literacy. Those with basic or below health literacy have a difficult time understanding basic health concepts and applying them to themselves. Compared to those with intermediate health literacy, adults with below basic health literacy will face a higher mortality rate, a 3x more likely to experience a poor health outcome, and are 3x more likely to return to the ER.

Most people with low health literacy come from minority groups and are uninsured or are on government healthcare plans such as Medicaid and Medicare. Due to their increased chance of going to the emergency room, both from not having a primary healthcare provider and not fully understanding healthcare instructions, leading to misuse of treatment and possible overdose, the annual cost of healthcare ends up rising, ranging from $106 billion to $238 billion.

$$$

$

billions (dollars)

time (1 year)

$106 billion

$238 billion
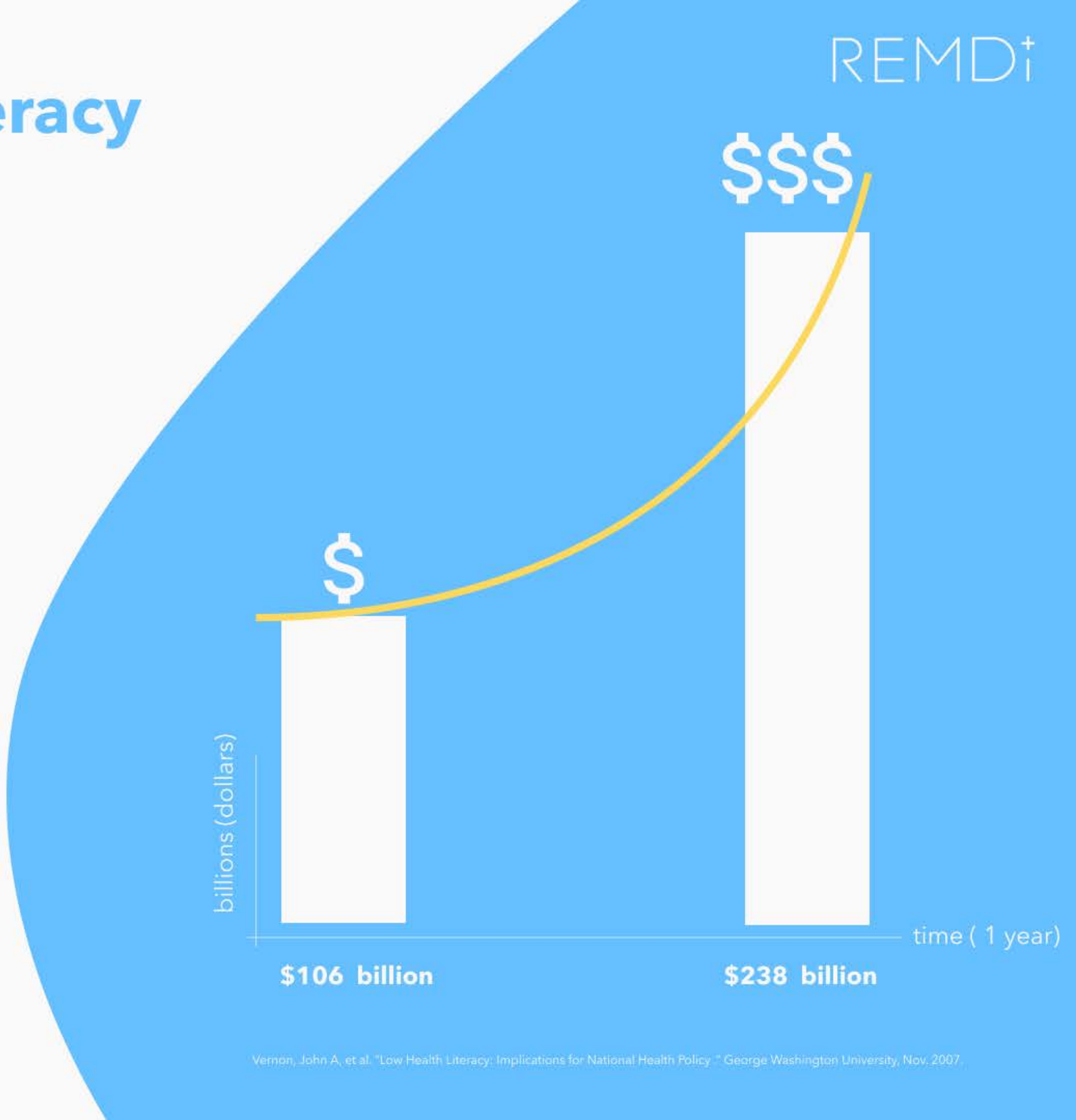
U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. (2010). National Action Plan to Improve Health Literacy. Washington, DC: Author.

Vernon, John A, et al. "Low Health Literacy: Implications for National Health Policy." George Washington University, Nov. 2007.

Research Goals & Methods

Goals

- Understand the patient's journey
- Understand clinician's journey
- Understand current in-clinic methods to aid health literacy

Methods

- Interviews
- Digital cultural probe
- In-depth secondary research
- Virtual observation (if possible)
- In-person observation (if possible)
- Shadowing (if possible)

Secondary Research

The root cause of a patient's health literacy level is integral to their future understanding of medical information. Addressing these causes is the key to effective communication with clinicians.
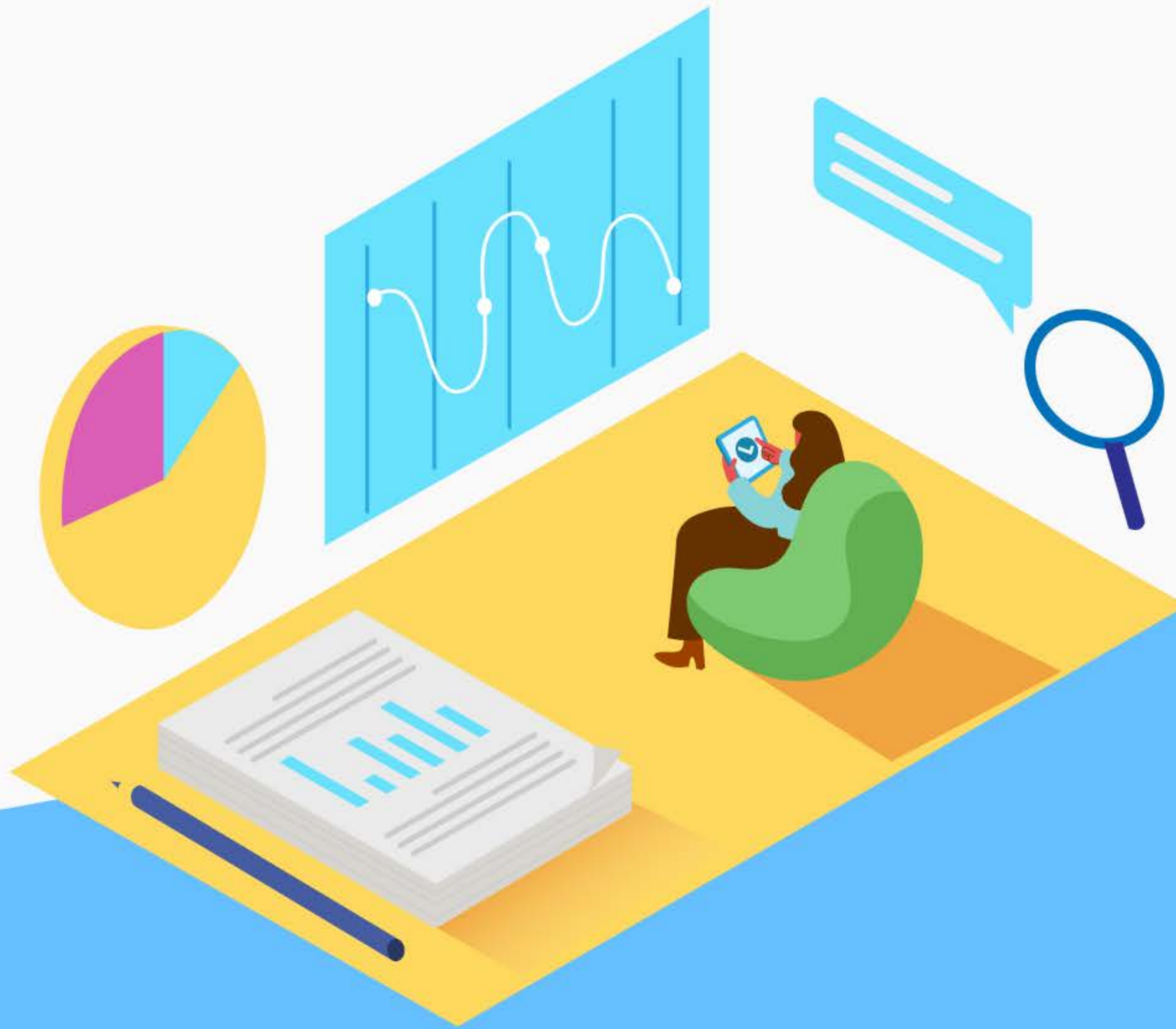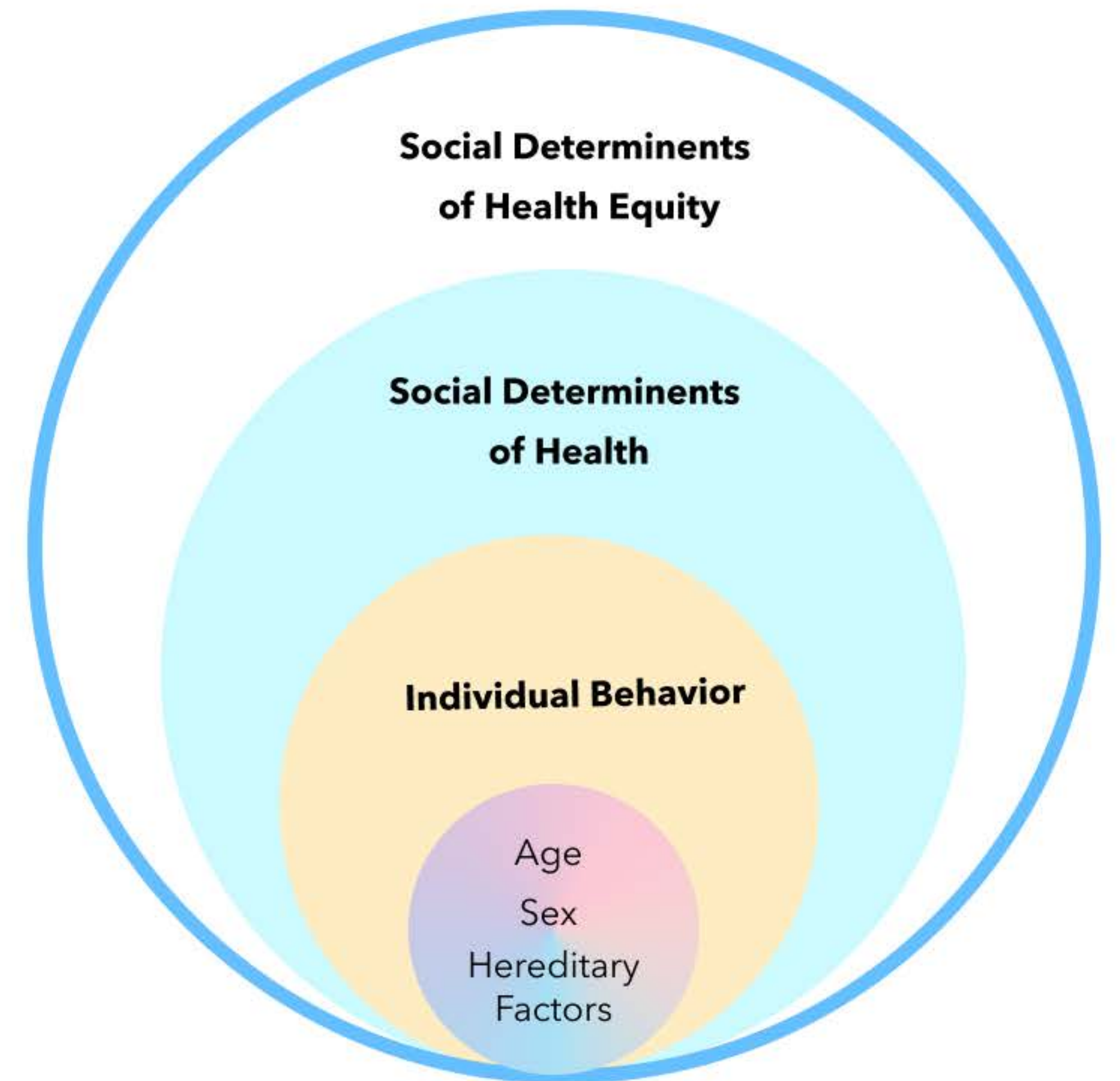
Causes of Low Health Literacy

Health literacy is caused by four major components that can be split into two sections: patient-sided issues and medical field ended. On the patient side, we have the social determinants of health, and patient shame and clinician-inspired shame that leads to health literacy. In the medical field, physician's lack of communication and patient education material not being accessible also has a great effect on individual health literacy.

The social determinants of health are factors that determine the quality of someone's overall health. The factors focus on their ability to access healthcare (health equity), cultural view of health (social determinants of health), a person's individual behavior, and unchangeable personal factors (age, sex, and hereditary factors). These factors can affect how someone approaches health; for instance, if someone views HIV and AIDS as a curse from God due to cultural belief, they may be less likely to seek medical care, or if someone has a family history of diabetes, they might have different knowledge regarding certain healthcare.

Social Determinents of Health Equity

Social Determinents of Health

Individual Behavior

Age
Sex
Hereditary
Factors

Linn Gould 2021. The Role of Critical Health Literacy in Addressing the Social Determinants of Health. Seattle, Washington: Just Health Action

Dahlgren G, Whitehead M. 1991. Policies and Strategies to Promote Social Equity in Health. Stockholm, Sweden: Institute for Futures Studies.

Patients Feel Ashamed While At The Doctor's

Patient shaming occurs when a doctor doesn't believe a patient or isn't interested in what a patient has to say. Many patients feel shamed when they think a clinician is rushing through their appointment or seems inconvenienced by their time. Patient shaming, done on purpose or not, can lead to patient neglect and can ultimately be life-threatening.

Physician-Inspired Shame vs Personal Shame

There are two main types of shame in the healthcare field. Physician-inspired shame is caused by physicians shaming patients for their condition. Over half of patients have experienced a shaming encounter from a physician, and women are statistically more likely to experience shame from a physician.

Patient personal shame derives from patients feeling ashamed of their own low health literacy. 40% of patients with low health literacy expressed feeling shame when they have trouble reading, while 68% of patients with low health literacy never share their feelings of shame with their significant other.

Darby, R. S., Henniger, N. E., & Harris, C. R. (2014). Reactions to physician-inspired shame and guilt. Basic and Applied Social Psychology, 36(1), 9-26. https://doi.org/10.1080/01973533.2013.856782

https://painterfirm.com/a/897/Why-patient-shaming-by-doctors-is-dangerous-and-can-be-medical-malpractice

Parikh NS, Parker RM, Nurss JR, Baker DW, Williams MV. Shame and health literacy: the unspoken connection. Patient Educ Couns. 1996 Jan;27(1):33-9. doi: 10.1016/0738-3991(95)00787-3. PMID: 8788747.

Current Approaches

All current solutions to patient shaming are purely on the patient's side, which leads to clinicians not being held responsible for how they make a patient feel.

The two main solutions are:
- Leaving the current clinician to find a new doctor.
- While at an ER, a patient must demand to see an attending physician.

Physician's lack of communication

Research shows that medical students' communication skills decline the further they are in school, and clinician's communication skills decline the longer they work in the medical field. Clinicians speak with multiple patients throughout the day with various communication styles and levels of understanding. But what determines good communication with such a diverse group of people?

Patient education material and inaccessibility

The average level of Patient Education Material is written at a 9th-grade level despite the national guidelines encouraging Patient Education Material to be written in a 6th-grade level. The average American reads at a 7th-grade level.

Imoisili O., Levinsohn E., Pan C., Howell B., Streiter S., Rosenbaum J.(2017). Discrepancy Between Patient Health Literacy Levels and Readability of Patient Education Materials from an Electronic Health Record. HLRP: Health Literacy Research and Practice. 1(4) e203-e207. doi: 10.3928/24748307-20170918-01 [link]

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4139691/#:~:text=Organizations%20including%20the%20American%20Medical,level%20(23%2D27).

https://painterfirm.com/a/897/Why-patient-shaming-by-doctors-is-dangerous-and-can-be-medical-malpractice

Current Solutions For Health Literacy

Current solutions focus on three major targets: community education, clinician communication, and patient empowerment. Community education solutions focus on educating various communities both in large groups and individually. Either educational focus greatly impacts overall community health knowledge.

The second is patient empowerment; patient empowerment focuses on improving a person's personal health knowledge, a person's ability to stand up for themselves through the health field, and increasing a person's ability to properly care for themselves.

Lastly is clinician communication. Clinicians receive extensive training on communicating with patients; however, communication is still the main cause of misunderstanding with health literacy. By focusing on improving the way clinicians speak and approach their patients, patient's health literacy will increase.
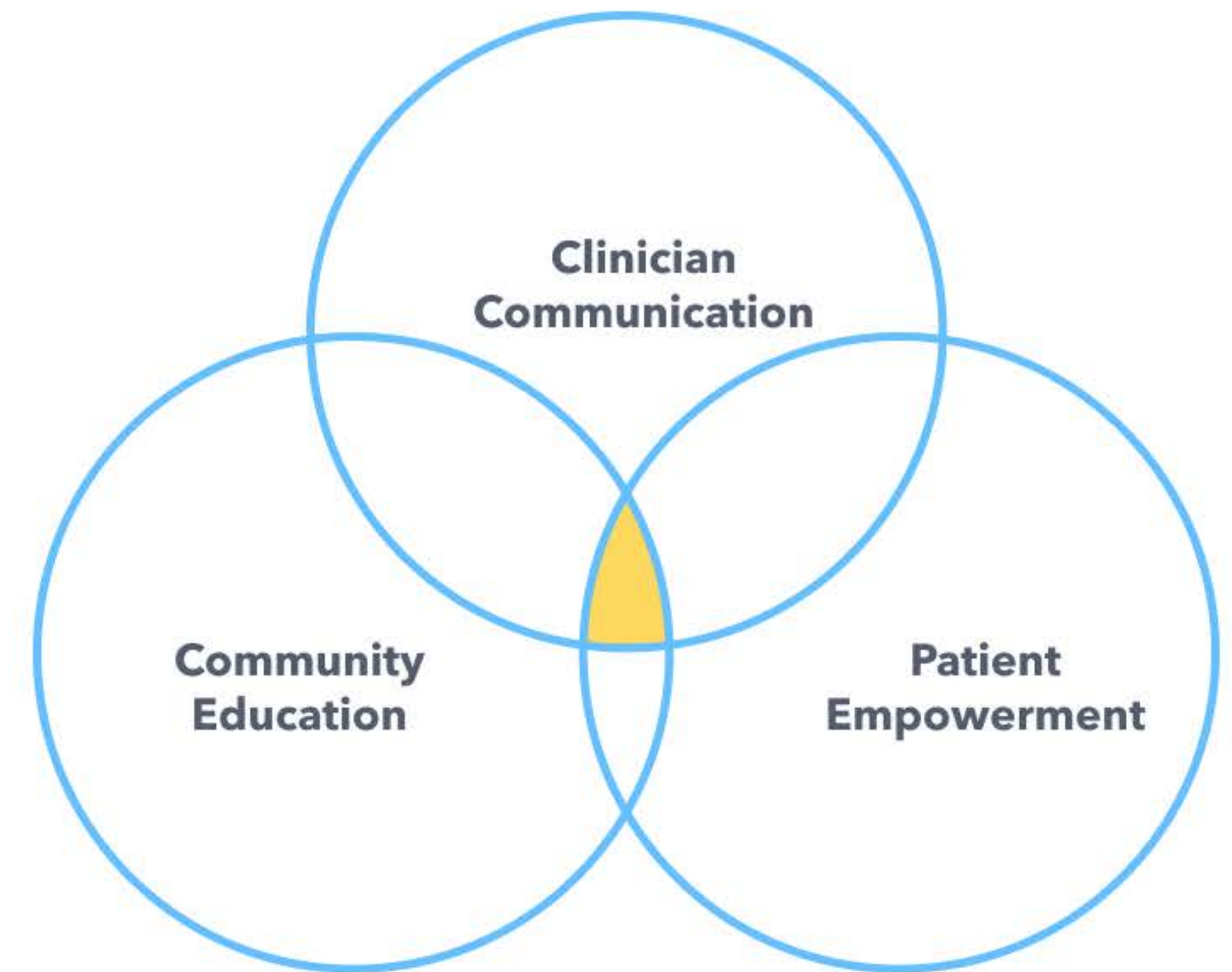
Common Medical Technology

Whiteboard

Whiteboards are the most common and direct way for clinicians to communicate critical health information with their patients while in a hospital or office.

Pros:
- Simple and versatile
- Reusable

Cons:
- No interactivity or personalization for each patient

Internet

There exist many websites that provide information on medical conditions, medications, as well as communication with those experienced in these things. Sites such as Mayo Clinic and WedMB provide general information on whatever a patient is looking for.

Pros:
- A wide variety of standardized health information
- Easily accessible

Cons:
- No personalization of information to patient
- Potential misinformation
- Only available to those with internet access

getwell:)
network®

The GetWell Network provides information to patients at every step of the medical process. It utilizes apps and webpages to deliver content to and from patients and clinicians.

The "Adobe Creative Suite" of medical information, consisting of multiple platforms designed to simplify the caretaking process at every step of the way.

Pros:
- Holistic solution that addresses all patient information needs.
- Usable in both hospital and at home.
- Eases burden of caretakers by simplifying communication between patient and staff.

Cons:
- Large potential for information overload.
- Wealth of features may be more of a burden for patients or clinicians who need only one or few.
- Dated interface.

Doctella

Doctella is a cloud based RPM solution that includes patient engagement and education, and allows doctors to more effectively interact with patients.

The application allows doctors to more easily communicate with patients and manage their patient needs, while engaging their patients to grasp their own needs better.

Pros:
- Allows doctors to more effectively lay out treatment plans for patients.
- Doctors are able to keep patients up to date with what they should expect.

Cons:
- The interface is incredibly dated and ineffective.
- The product is very intensive on the doctor; at the same time it requires the patient to do very little, and gives little incentive to the patient.

Health Care Education Association

The Health Care Education Association is an organization to promote health education throughout the medical field.

They create medical information, and encourage clinicians to educate their patients in the most effective way possible.

Pros:

- They offer supplies and material to clinicians that subscribe.
- A very large network of healthcare professionals conducting research and making materials to improve literacy.

Cons:

- Purely clinican focused, for the sake of the patients.
- Must subscribe to access resources.
- All educational materials. No technology or physical aids.

Online patient portals such as MyChart allow for patients to contact their providers, along with many other options such as as scheduling, viewing health information, and aftercare instructions.

MyChart offers patients access to their own medical information, and allows them to contact their doctor, along with a wide variety of other features to help manage their care.

Pros:
- Direct communication between clinicians/patients.
- Personalized medical information available quickly to patients.

Cons:
- Takes time to wait for a response, sometimes days.
- Content is written by the practice themselves, which can be written poorly and not take into account patient literacy.

Research Hypothesis (Primary)

Changing clinician behavior will directly affect their communication with patients and has the potential to create a more empathetic and effective environment for patient needs.

Primary Research Goals

Our overall goals for our primary was to gain an understanding of common communication methods that clinicians use, examine how these experts are applying information to current known medical services and resources, and we wanted to estimate an individual's understanding of their own health literacy.

We wanted to look into this to have MO act in an opportunity space when looking at the clinician and patient interactions.

78

Health Literacy
Survey Responses

9

Patient Interview
Participants

4

Expert Clinician
Interviews

20

Health Expert
Survey Responses

3

Medical Expert
Interviews

75+

responses

Screening Survey

First, we sent out a screening survey to ensure that we were targeting people with low health literacy. We used the Short Assessment for Health Literacy English (SAHL-E). The SAHL-E is a CDC approved rating test used to determine how well someone comprehends basic health concepts

We Found That...

Most patients who took our screening survey believed they had higher health literacy than they actually do.

Screening Survey

The questions included a stem word, and the task was to match it with the key. The distractor word was another word placed to confuse the tester. We also added an option of "Don't understand" for users who may not understand the significance of the original stem word.

8.2%
Don't Understand

4.1%
Distractor: Calm

87.7%
Key: Dizzy

Stem: Seizure
n = 75

Stem: Dose
n = 75

Key: Amount
84.9%

12.3%
Distractor: Sleep

2.7%
Don't Understand

Expert Survey

20+
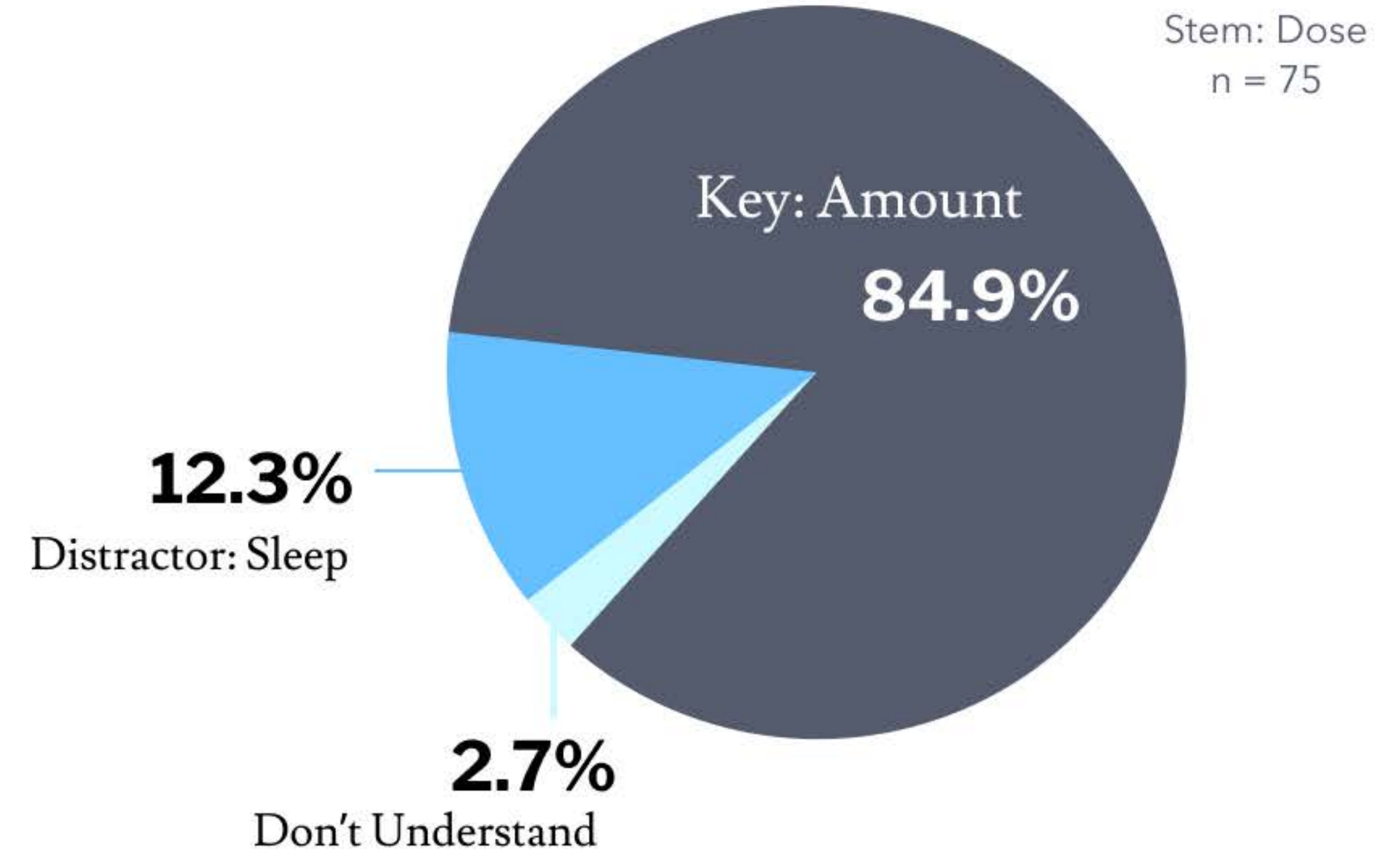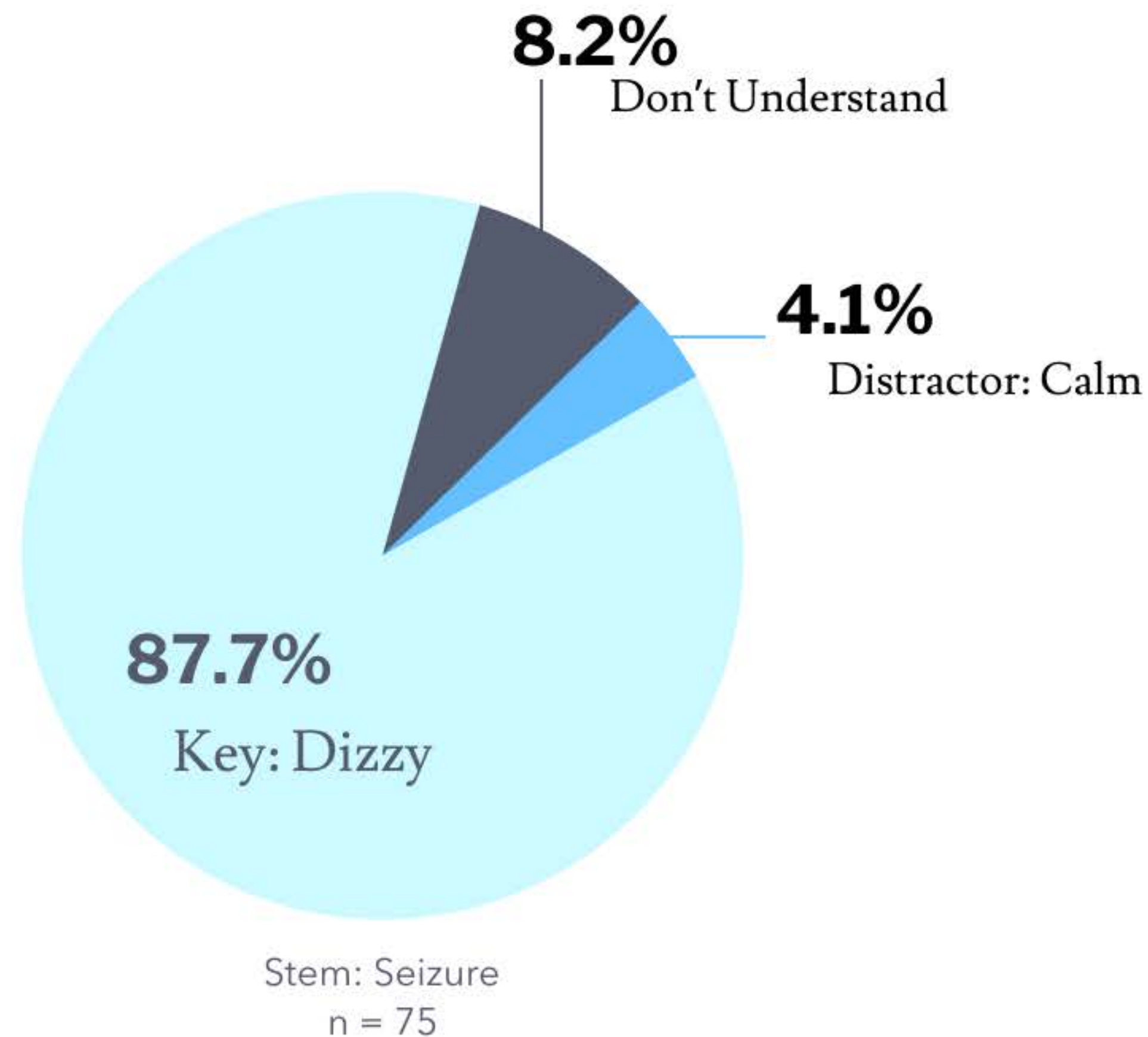
We believe that, when answering truthfully, experts will express their personal emotions, whether negative or positive, regarding patient communication and their own opinions on their patients.

This is the survey that we included that we sent to experts:

Have you ever felt pressured to diagnose a certain way?

How do you determine that a patient is being non-compliant?

Have you ever felt rushed through seeing a patient for any reason? If so, what was the situation?

Expert Interviews

We believe that by interviewing experts, we will learn about current techniques used by medical professionals and their effectiveness. We also believe that we will learn about the situations and beliefs of clinicians.

*clinicians and medical experts

Are you aware of what health literacy is and how it is used?

What level of health literacy do you believe most of your patients are at?

When discussing the health of your patient with them, do you feel that you have a full understanding of your patient's needs? Medical? Emotional? Mental?

When discussing the health of your patient with them, do you feel that they have a full understanding of the situation and what is being discussed?

Can you describe a situation where you have noticed your patient is not understanding you or what is happening?

Have you had difficulty in the past explaining the situation to a patient so they have a full understanding?

How often do your patients ask you to explain words that they do not understand?

Do you use any tools or aids in the workplace in order to benefit patients in the understanding of their health?

How do you determine that a patient has low health comprehension?

Interview Insights
Clinicians & Health Industry Professionals

Clinicians try to use clear verbal or written instructions.

Patients tend not to read instructions on medication due to confusion and instead use visual cues.

Clinicians have various tools for a variety of patients and find that drawings are often more helpful than verbal explanation.

Clinicians can often pick up the emotion of the room quickly, because it plays a role in every patient interaction.

Clinicians suppress their emotions and sometimes take it out on patients or those in their personal life.

Clinicians believe that it's a patient's responsibility to be willing to learn and educate themselves.

Clinicians often do not expect responses from patients who were unsatisfied with their care.
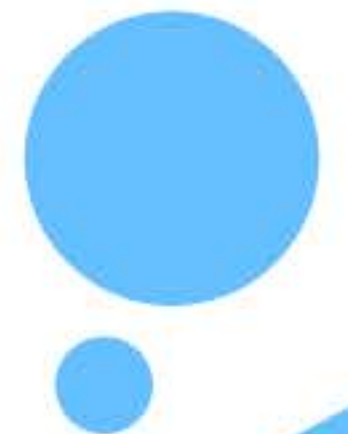
Expert Interviews

"There's a combination of where I feel like I'm lacking the materials to give them all the information that they need, but also just as a nurse, you have a lot of tasks going on."

- Lizzie Gafford
    23, Nurse RN

Current push for change

Large pharmacutical companies such as Eli Lilly & Co. and Merck & Co. are creating their own patient education material based on health literacy guidelines created by the CDC.

- Lori Hall
Director of Global Health
Literacy at Eli Lilly & Co.

Patient Interviews

We believe that by interviewing patients we will gain greater insight into patient's feelings and personal opinions on the interactions they have with their clinician and where patients believe there are flaws.

Communication

- Once you've stepped into a clinic, do you find yourself having any struggles?

- Are you understanding the forms you are given? Are you able to communicate your symptoms? Do you understand why they're giving you specific tests? etc.

- Can you recall a time when you had to communicate with a healthcare professional? If so, can you explain how you felt throughout that process?

- What type of communication was it? (email, through phone, in-person, through nurse)

- Do you feel that your doctor understands your concerns?

- How did you explain your concerns in order to be understood?

- When discussing your health issues, do you have any problems understanding what your healthcare provider is saying? Can you recall an instance where you've had a misunderstanding?

- Are there some terms your doctor has used or actively uses that you have trouble understanding?

- Do you use any tools or resources that help you when communicating with your doctor?

Patient Interviews

We believe that by interviewing patients, we will gain greater insight into patient's feelings and personal opinions on the interactions they have with their clinician and where patients believe there are flaws.

Preliminary Understanding

How often do you visit your doctor or the hospital?

Are you always encountering the same doctor or has it been multiple?

Can you go through step by step a general visit to your doctors?

Personal Understanding

Are you aware of what health literacy is?

What do you consider your health literacy level (below basic, basic, intermediate)?

What level of satisfaction would you say you feel once leaving an appointment?

When you have left your appointments, do you feel that you understood what was discussed during the appointment?

Do you feel you are able to fully understand healthcare instructions from your medical professionals?

Once you've left an appointment, do you feel that you have a full understanding of the instructions left for you and why you're taking certain medications?

How effectively do you feel you are able to follow instructions from your doctor?

Interview Insights
Patients

Pleasant interactions with clinicians, where the clinician addresses the patients concerns and asks about them as a person aside from the patient's health, make the patient feel cared for and safe.

The clinicians answered the patient's questions before, during, and after my appointment and even wrote down their responses to ensure the patient felt safe.

The clinician makes the patient feel stupid and humiliated because of their own bias and the patient is being advised to see another clinician.

The patient felt safe and comfortable in their appointment because of the positive environment the clinician made.

The doctor uses language the patients do not understand and withholds information from patients, which leads the patient to leave appointments feeling like they still don't have a full understanding.

When the patient is speaking with their doctor, they feel annoyed that they have to defend themselves.
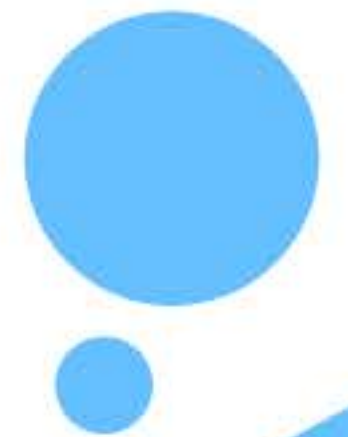
Patient Interviews

"I didn't understand anything that was going on for about 10 months, from there they had people who specialized with kids and explaining what's happening...before that it was the worst year of my life."

- Jason Castleberry
    20, AMPS patient

"There are times when walking away from the appointment that I have to Google stuff afterwards and figure out what they were trying to tell me."

(24, Female)

"I didn't understand what was wrong with me."

(21, Male)

Opportunity Area

REMD+

Our decided on opprtunity area is to be:

- An institutional solution
- Target basic and below basic health literacy patients
- Accessible and incluvise to all

Stakeholder Matrix

Influence

High influence and low stake　　　　　　　　　　　*High influence and high stake*

Doctors　　　★ **Clinicians**

Self Regulation (of medicine)

Nurses

Hospital Staff/Admins　　　　　　　　　　　Physician Assistant

Health Industry Professionals　　　Midwife

Pharmacists　　　　　　　　　　　　　　Technicians

Therapists

Medicine Subscriptions

Third Party Apps　　　　　　　　　　　Patients

Online Instruction

Online Diagnosis Platforms　　　　　　　　Family

Pharmaceutical Companies　　　Friends　　　　　　　Caretakers

　　　　　　　　　　　　　　　　Parents

C.D.C (Centers for Disease
Control & Prevention)　　　Children

W.H.O (World Health
Organization)

Low influence and low stake　　　　　　　　　　　*Low influence and high stake*

Interest

Primary

REMDi

TARGET USERS

- Patients
- US adults (18+)
- Low health literacy

TARGET AREAS

- Emergency Room (ER) Departments

HMW

For Patients

Help patients positively interact and communicate with their clinician?

Encourage patients to take charge of their health and healthcare?

Ensure patients feel comfortable with their clinician?

Secondary

TARGET USERS

- Clinicians
- Healthcare Providers

TARGET AREAS

- Outpatient offices

HMW

For Clinicians

Help clinicians stop patient non-compliance?

Encourage more positive communication between the patient and the clinician to prevent the patient from feeling ashamed?

Assist clinicans in feeling less rushed so patients feel heard and fully understood?

Aid clinicians in communicating information in a way the patient understands?

Overarching HMW

How might we help patients take charge of their health and feel comfortable with their clinicians through the use of education and patient empowerment?

Ideation Methods

- Crazy 8s
- Affinitization
- Wishes

Product **Goals**

Educating patients of their personal health.

Empowering patients to take charge of their health.

Understanding clinicians and medical jargon that applies to them.

REMDi

The
MO
Medical Network

Concept 1 **Wearable Patient Companion**

REMDⁱ

A wearable AI companion with a corresponding app that records patient-clinician conversations and transfers the recording to an app for later review. The wearable allows a patient to tap each time they have a question or are confused. Taps get sent to the app, and an AI generates a transcript and potential questions for the patient to ask their clinician.

HMW Encourage patients to take charge of their health and healthcare?

Aid clinicians in communicating information in a way the patient understands?

Features
Touch Sensor
Microphone
Transceiver
AI

Functions
Notifies AI when patient has questions
Records conversation with clinician
Sends conversation to app
Generates questions based on recorded conversation

Rationale

Patients are often confused about medical instructions and information but are unsure of what questions to ask or forget the information once discharged. By creating a platform that advises patients on questions to ask and enables patients to return to recordings of previous sessions, patients can have more control of their medical encounters.
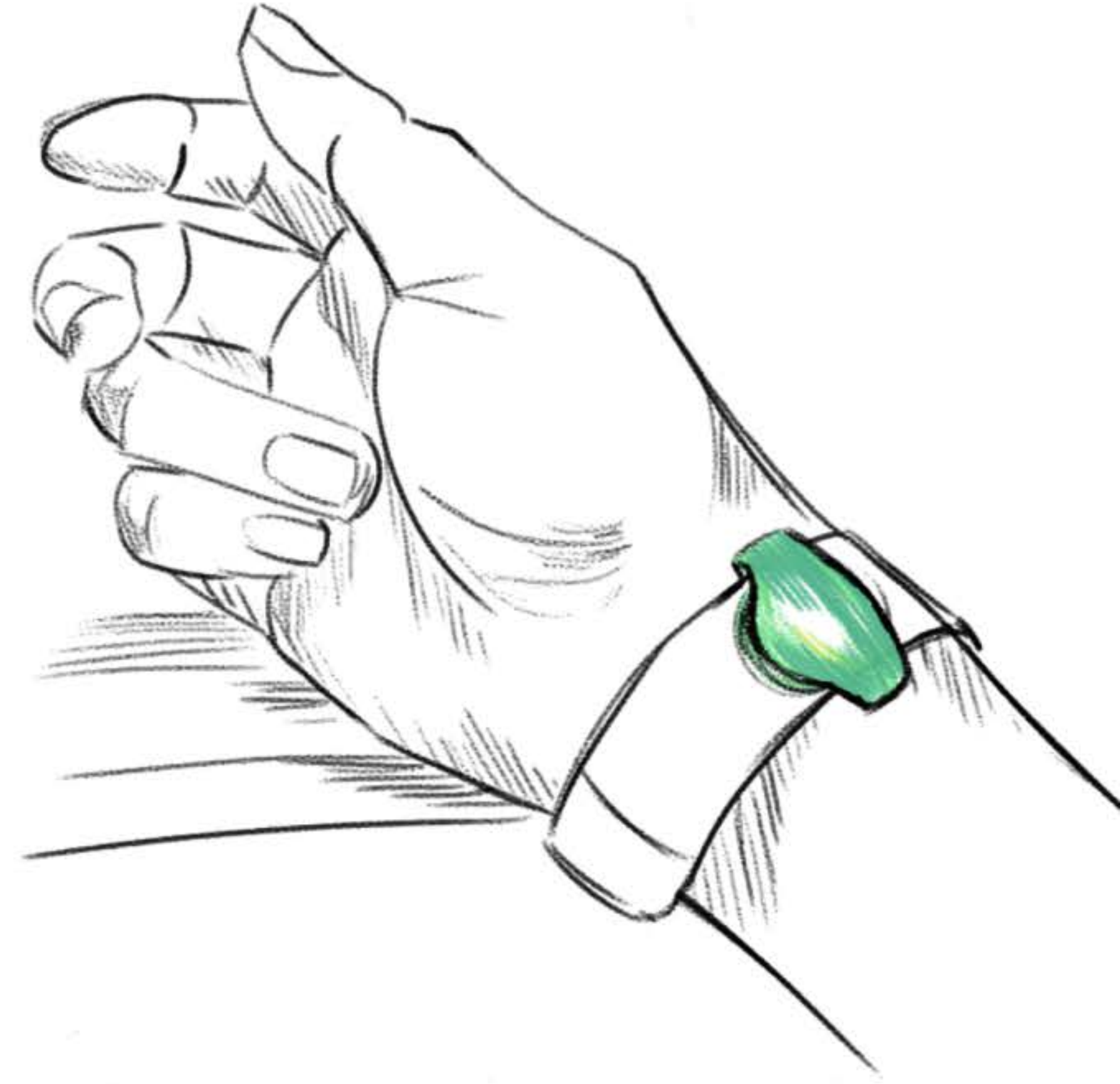
Wearable Patient Companion

Storyboarding
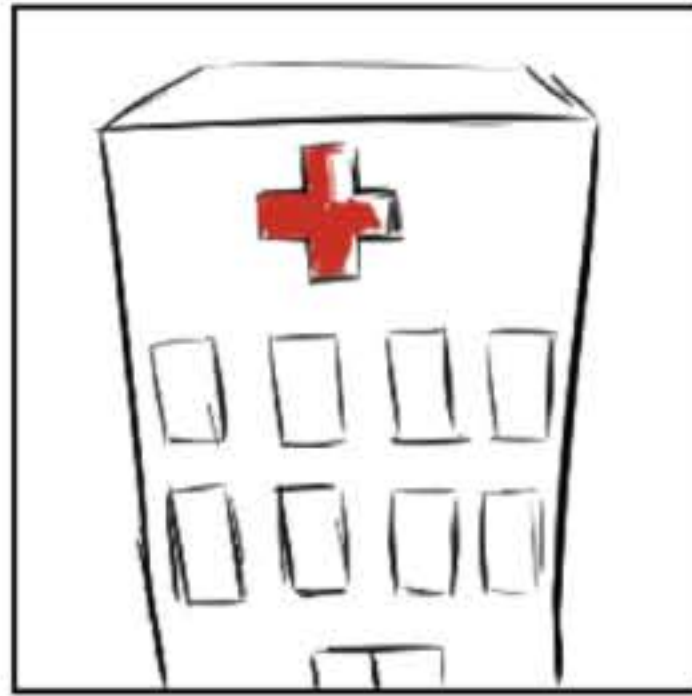
Isaac goes to the emergency room because he begins feeling sharp abdominal pain.
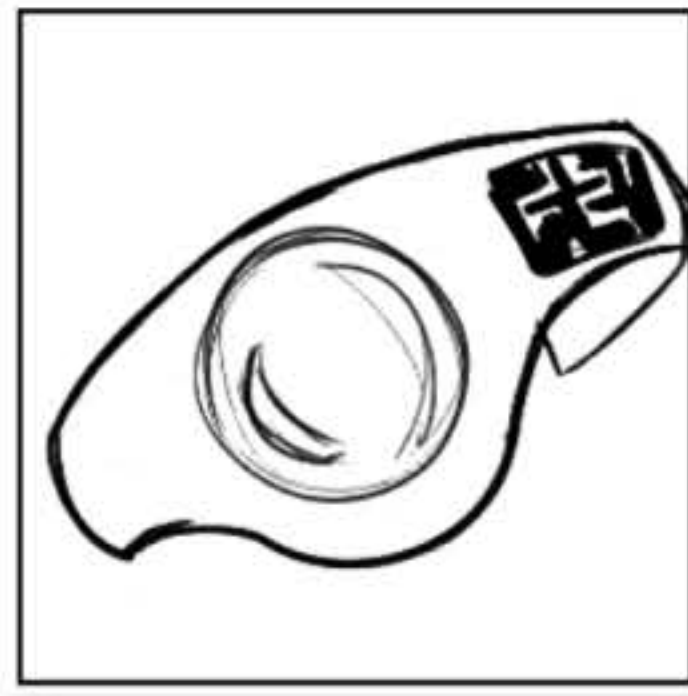
After getting checked in at the ER and examined by a nurse, Isaac is given an electronic clip that attaches to his ID band or sleeve.
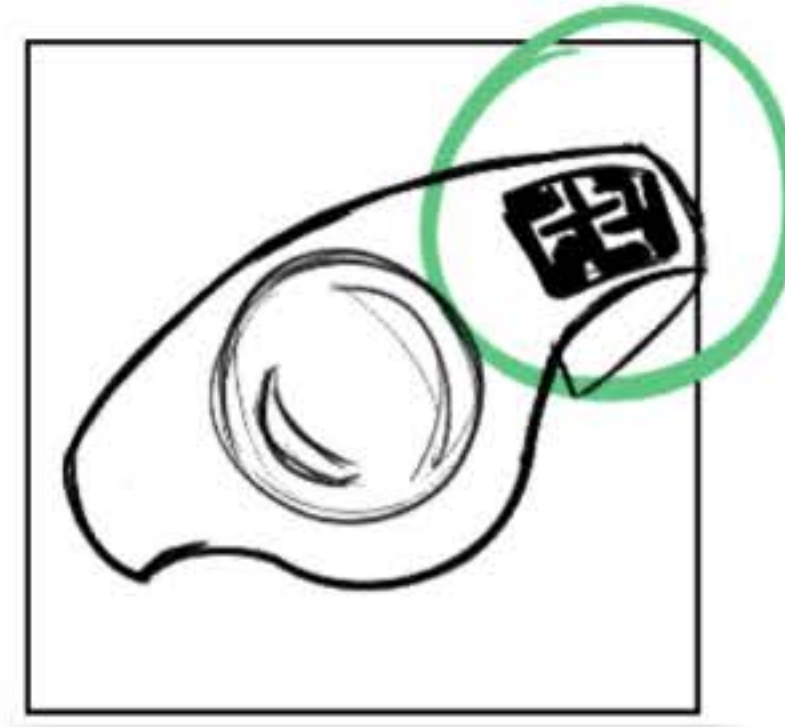
The device will record the conversations that he has with his clinicians, and he can click the button on the clip to bookmark the last few seconds of the conversation in case he has any questions for later. He then scans the QR code on the clip.

He is brought to a website that shows a transcript of the conversations he's had since putting the clip on. It also educates him on how the ER works. This helps him to relax and know when he can expect to see a doctor.

Isaac is guided through the appropriate scans with his doctor, after being diagnosed with pancreatitis. The clinician uses many words that Issac doesn't understand.
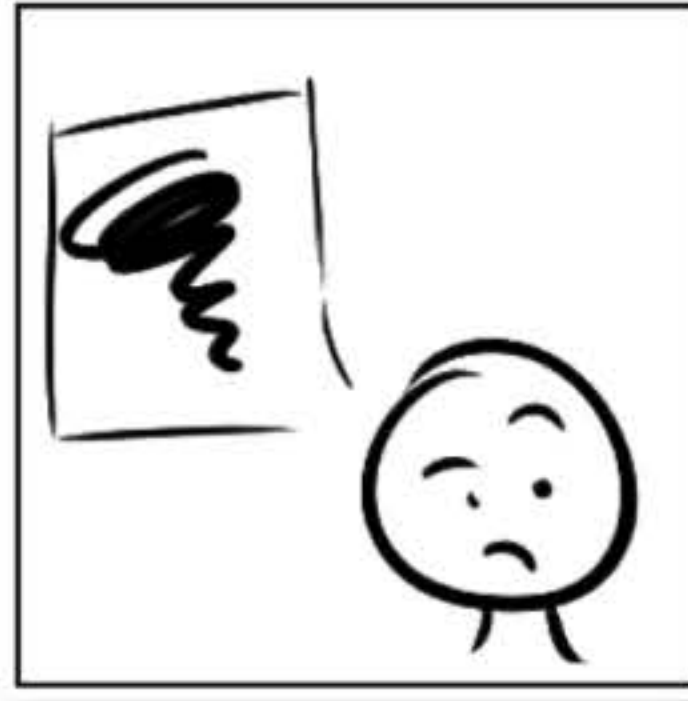
However, the clinician needs to leave the room before Issac can ask all of his questions. This leaves Isaac feeling confused about what happened to him and what his next steps are.
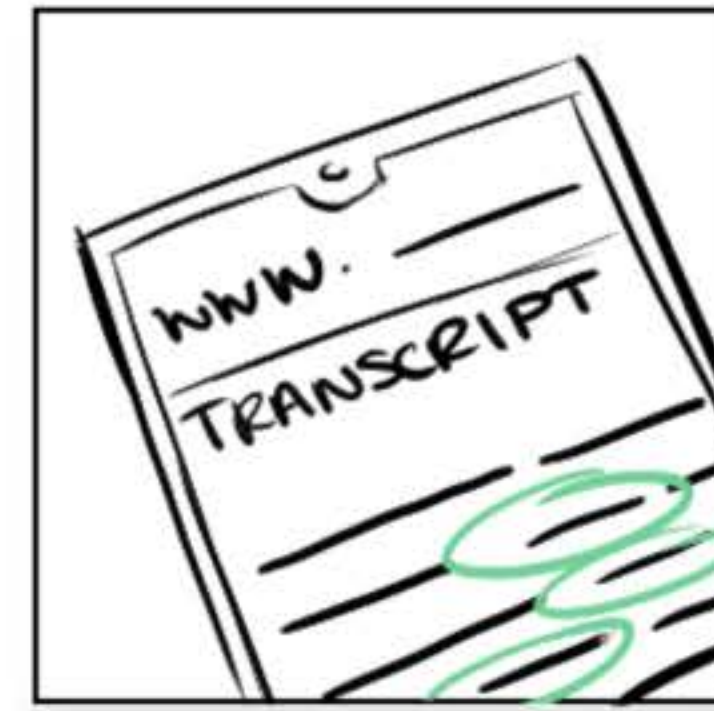
After recieving treatment and going home, Isaac reviews the transcript that shows him the parts of his conversation that he bookmarked. The app highlighted and defined complicated medical terms that aren't commonly known.

Isaac feels more informed about his health, and has a reference to review whenever he wants about his time at the hospital.

Concept 2   **Health Literacy Crash-Course**

REMDi

An app and product that gauges your initial health literacy level and creates customized lessons to help increase your health literacy for both short-term and long-term conditions. The physical device allows users to scan various parts of their bodies and displays information about common medical issues and procedures. The app involves consistent and gradual practice and trains users on their health, thus empowering them during clinician encounters.

HMW   Help patients positively interact with their clinician?

Encourage patients to take charge of their health and healthcare?

Aid clinicians in communicating information in a way the patient understands?

Features   Patient Literacy Test
Gamified Health Information
Empowerment Courses
Body Scanner

Functions   Educates patients on health conditions they have or want to learn about.
Lessons on patient empowerment.
Quizzes on content.
Physical interaction with body scanner.

Rationale

By creating a catered and progressive curriculum for patients, patients will increase their health literacy and become more empowered regarding their health.

Health Literacy Crash-Course

REMDi
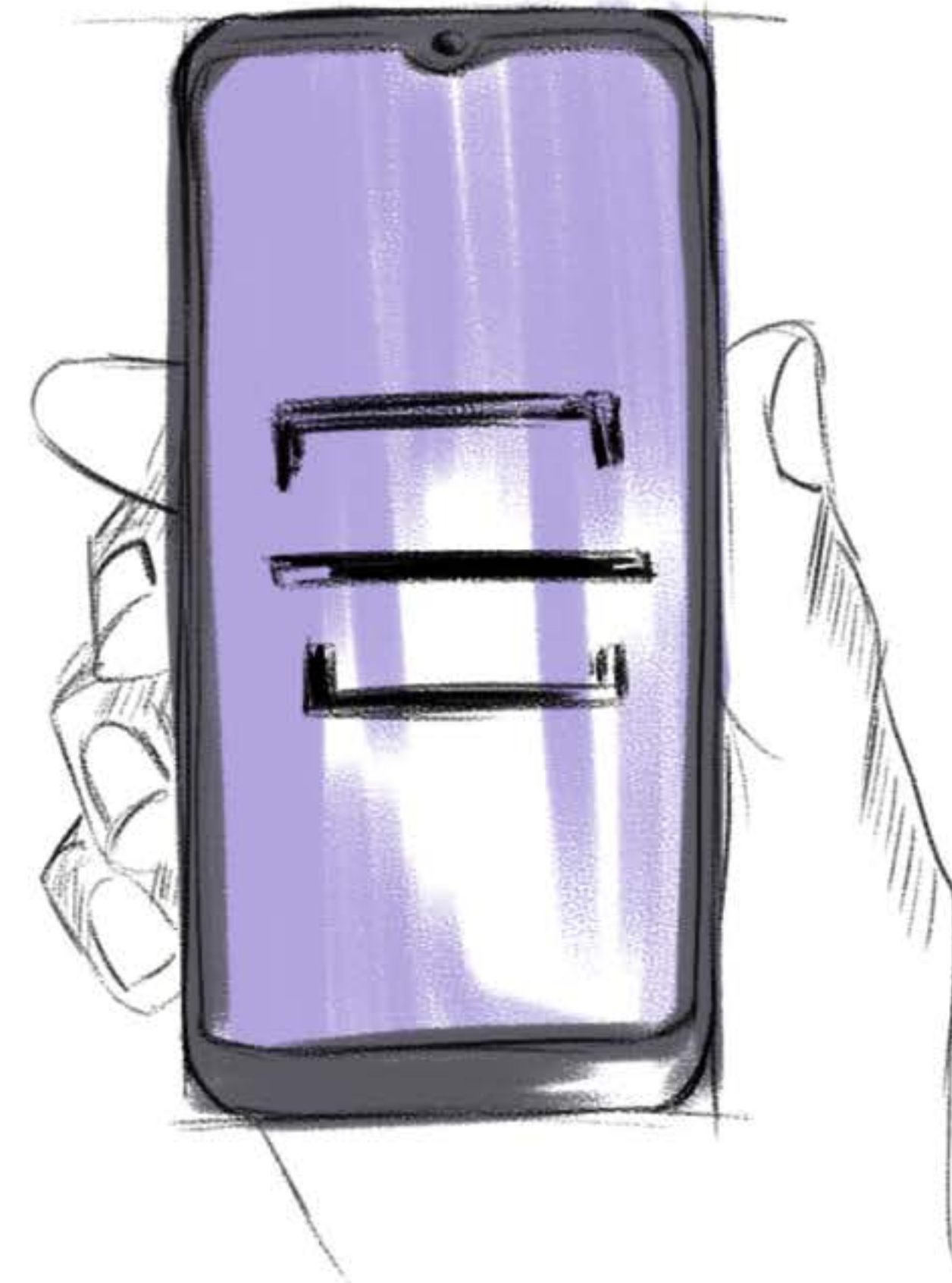
Storyboarding
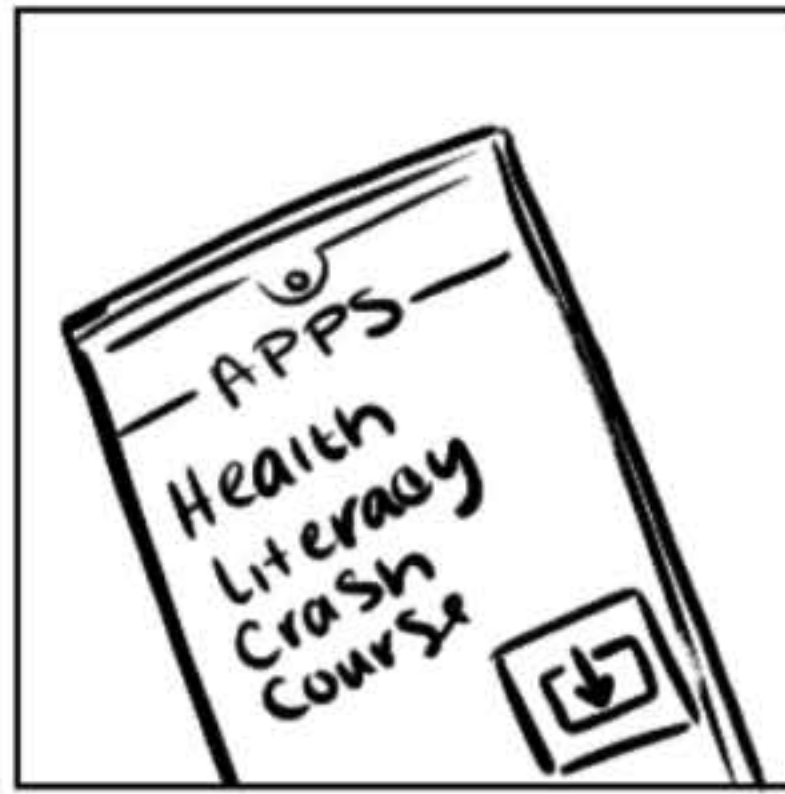
Isaac was recently diagnosed with pancreatitis and was told by his doctor to use Health Literacy Crash Course to learn more about his condition and any others.

He completes the initial health literacy quiz to set a baseline for the level of information provided to him.
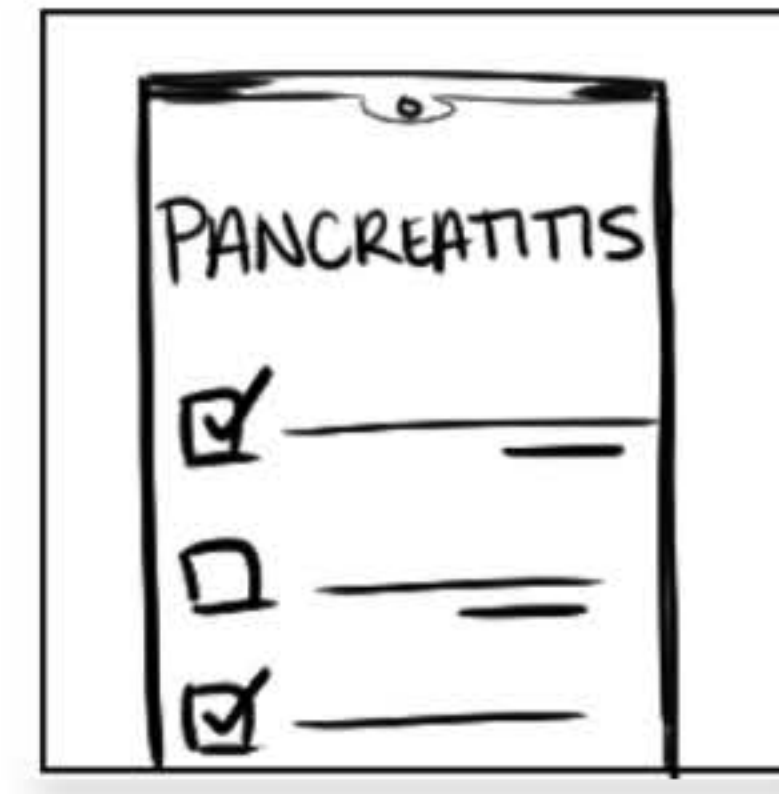
Isaac can select the conditions that he has been diagnosed with. In his case, it is pancreatitis.
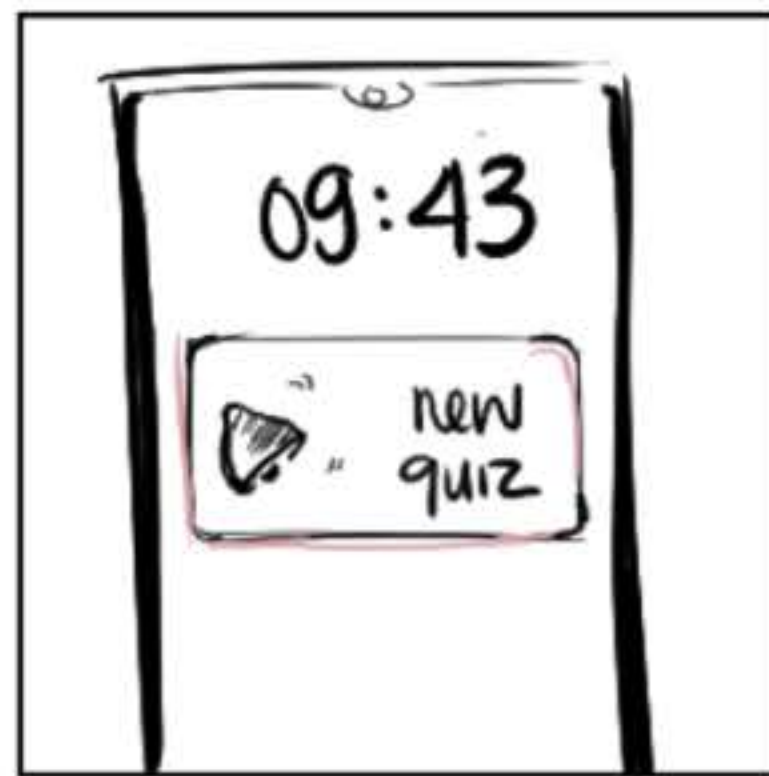
Over time, the app begins sending Isaac daily quizzes and bite-sized pieces of information about his body and condition.
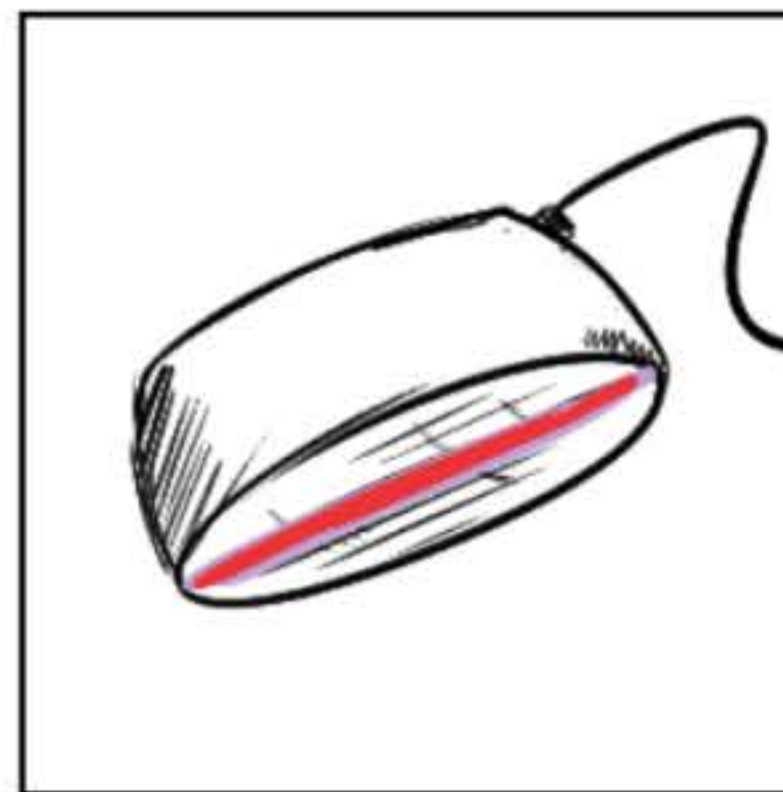
Using the additional body scanner companion device, Isaac can complete extra lessons by scanning parts of his body.

Isaac now attends appointments with more confidence and can have more informed conversations with his clinician about his health.

Concept 3 **Health Care Playing Cards**

REMDi†

Cards that split up the healthcare plan process into digestible segments to create a collaborative experience between patient and clinician. Cards will help create a plan that both patient and clinician agree upon and are scannable into the cooresponding app that will create a formulated outline and progress tracker for the patient.

HMW Ensure patients feel comfortable with their clinician?

Encourage patients to take charge of their health and healthcare?

Help patients put more effort into their healthcare and keep them from refusing to communicate with their clinicians?

Features
- Physical Card
- QR Code

Functions
- Segment the healthcare planning process into digestable portions.
- Scannable with the app to show expanded planning information.

Rationale

Patient health plans are critical for patient education and by creating a collaborative and digestable experience, patients will be more motivated to take an active part in their health.

Health Care Playing Cards

Storyboarding

Isaac has recently been diagnosed with Type-2 Diabetes. When consulting with his doctor, Isaac has many questions about what his life will be like now.

His clinician has a lot to cover and knows that the education process will take some time.

The doctor takes out a set of cards to show Isaac. The cards have blank spaces to write in the next steps of Isaac's health journey.
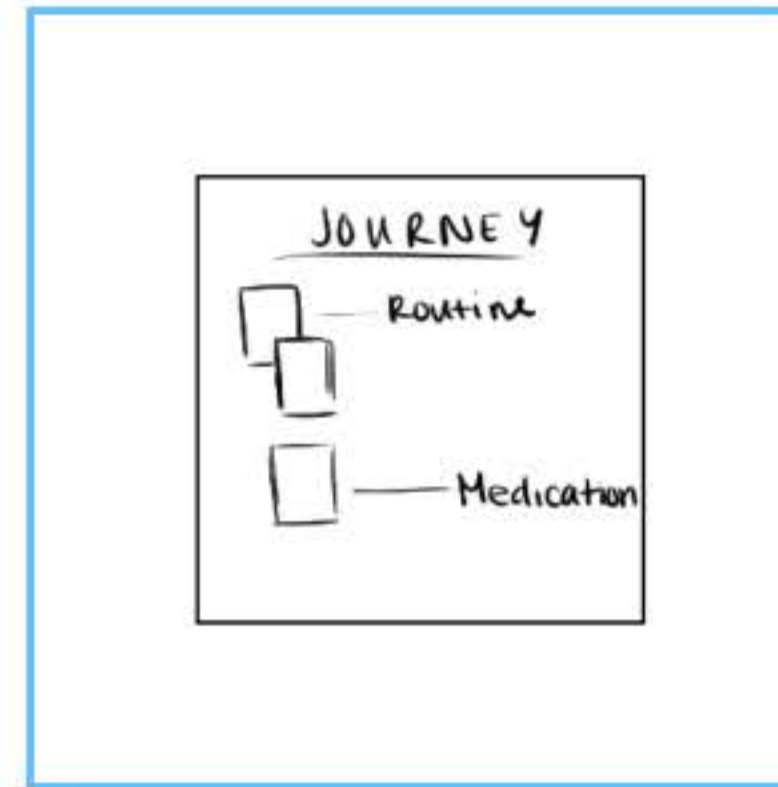
Together, Isaac and his doctor fill out his next steps regarding his care and address questions along the way.
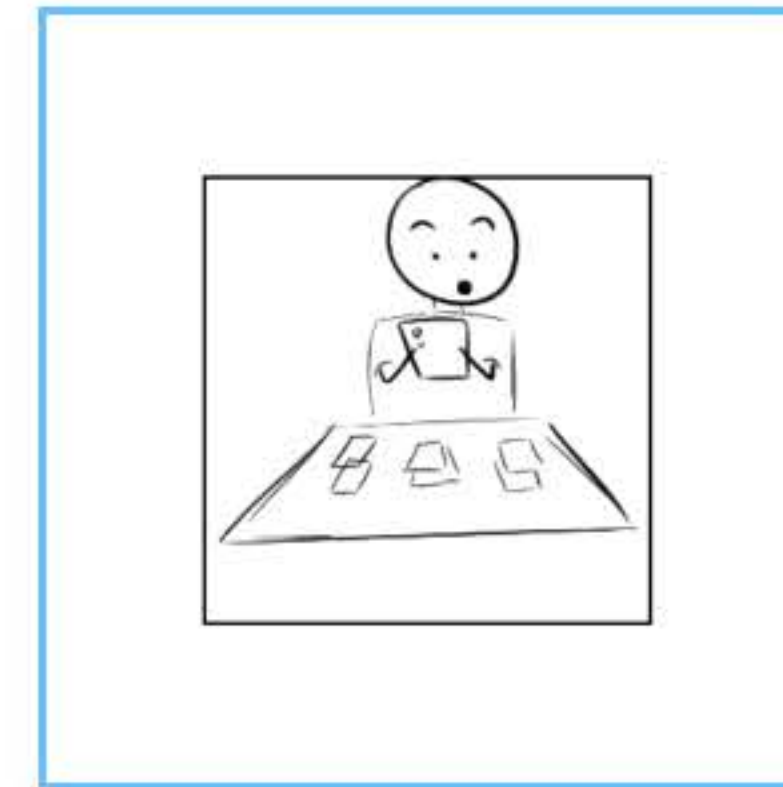
After creating a plan that Isaac is comfortable with, the doctor instructs Isaac to scan the cards using his smartphone in a companion app.

The app creates a digital record of his treatment plan and helps break it up in a convenient and easy-to-read way that he can refer to at any time.

This helps Isaac feel more informed about his health and simplifies his next steps in a way that is easy to follow.

Chosen Concept

MO Introduction

MO is a bedside companion that interacts with patients by speaking with them, comforting them, and answering questions they might have through verbal explanations or visuals.

MO has a corresponding app that helps patients review their past questions, view their discharge instructions, ask further questions, and monitor their progress.

Rationale

- Takes some burden of patient education away from the clinician.

- Helps calm the patient in stressful situations.

- Provides an extra reference for educational resources.

- Physical form adds presence to room.
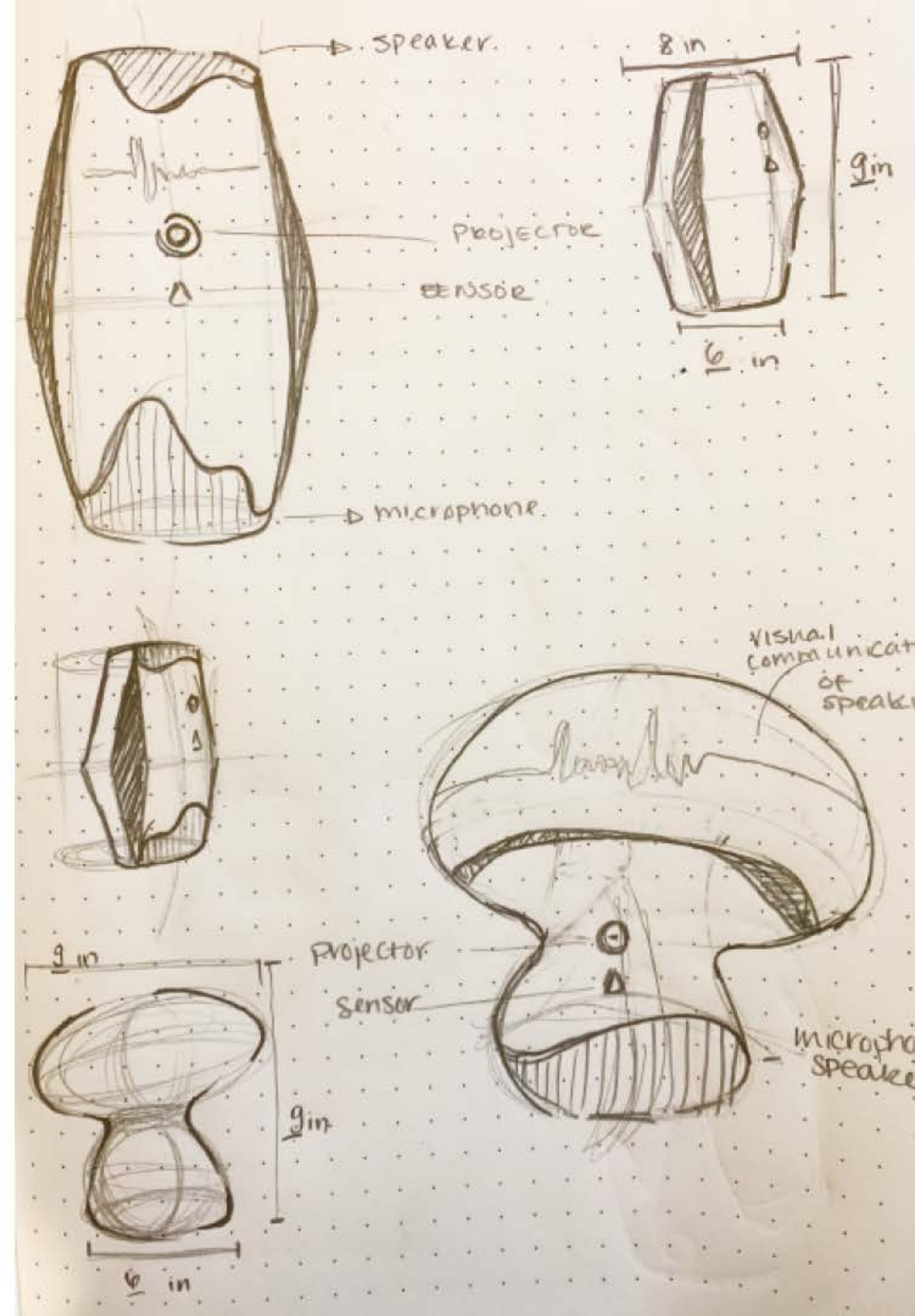
Mentor Evaluation Of Concept

Mack is a designer at IBM and the designer of Felo. We used her expertise in social robots and Arduino programming of voice recognition to gain some understanding and a more solid direction regarding MO.

Mackinzi Blank
User Experience Designer,
IBM Cloud Developer Tools

Feedback

Suggestion for a form perception survey to see what users want and don't want in terms of a physical form. Anthropomorphic forms can be difficult to find the balance between human and robot features.

Key Design Elements

REMDi

Physical

Features

Projector/Screen

Voice Recognition

Speaker

Microphone

Motion sensor/infrared sensor

Functions

Shows visuals

Analyze verbal instructions

Gives verbal feedback

Receive verbal feedback

Detect when someone is in the room

App

Features

Clinical Summary

Medication Lists

Lab and Test results

Medical History

Progress Tracker

Patient Education Material

Secure (HIPAA compliant) messaging

Functions

Patient profile

Medication functions

Lab and test description and purpose

See past visits, issues and medications

Track discharge progress

Learn about condition

MO Branding Styles

REMDi
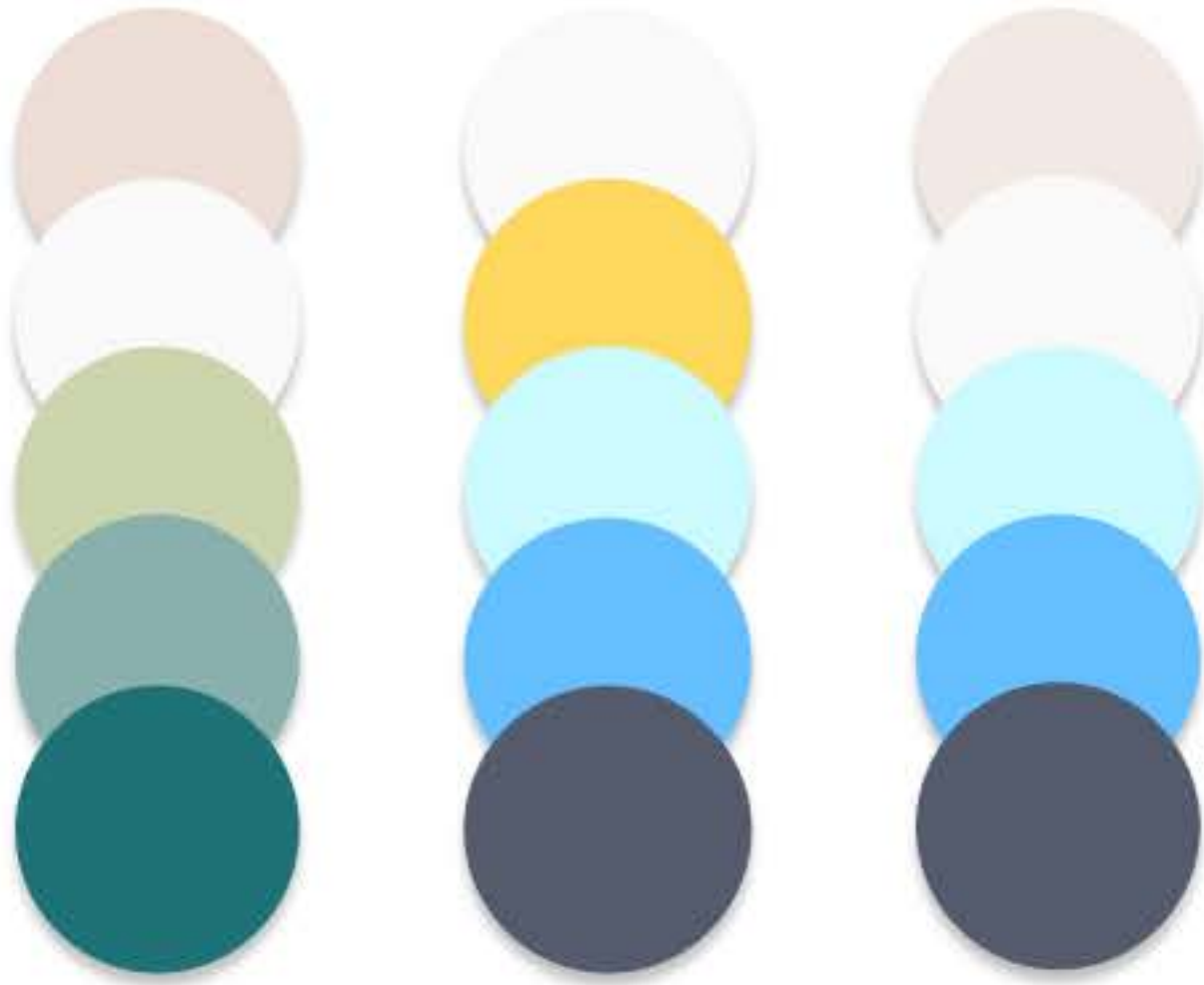
Header 1

Libre Franklin Bold 18 pt

Header 2

Sofia Pro Bold 64 pt

Header 3

Gilroy Semibold 48 pt

Header 4

poppins semi bold 36 pt, paragraph sub headings

Nav Titles – Header 5
poppins semi bold 24 pt

Subtitle – Nested Nav
poppins medium 18 pt

Body Text
poppins regular 14 pt

Header 4

graphik semi bold 36 pt, paragraph sub headings

Nav Titles – Header 5
graphik semi bold 24 pt

Subtitle – Nested Nav
graphik medium 18 pt

Body Text
graphic regular 14 pt

MO

Poppins

MO

Graphik

Form Validation - Survey
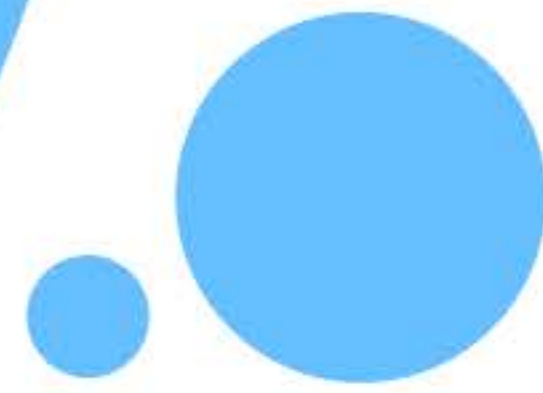
Questions

Explain your thoughts and feelings when looking at this robot.

Which robot would you trust more to deliver information?

Which robot is more approachable/comforting?

Robot 1

Robot 2

Robot 3

Robot 4

Form Validation - Survey
Results
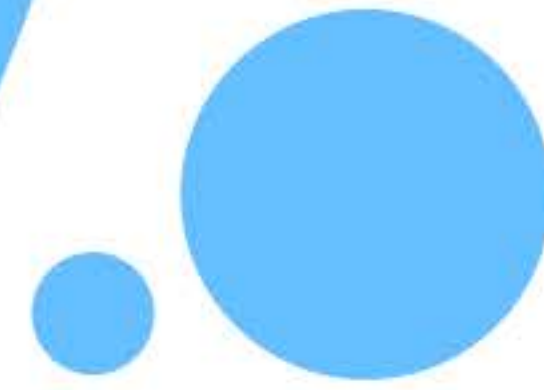
REMDi

N = 73

Users found slightly anthropomorphic forms such as eyes to be more trustworthy when delivering information

Users felt comforted by a small, round, and slightly curved form

Eyes are engaging to users without seeming too uncanny

Soft lights and features are more approachable for users

LG Hub Robot

WINNER!

MO Exploration Of Form

Rationale

A physical presence in the emergency room may comfort patients who are alone.

Social robots can be more approachable for patients.

A social robot's positive interaction with a patient will create positive correlation and lasting impact
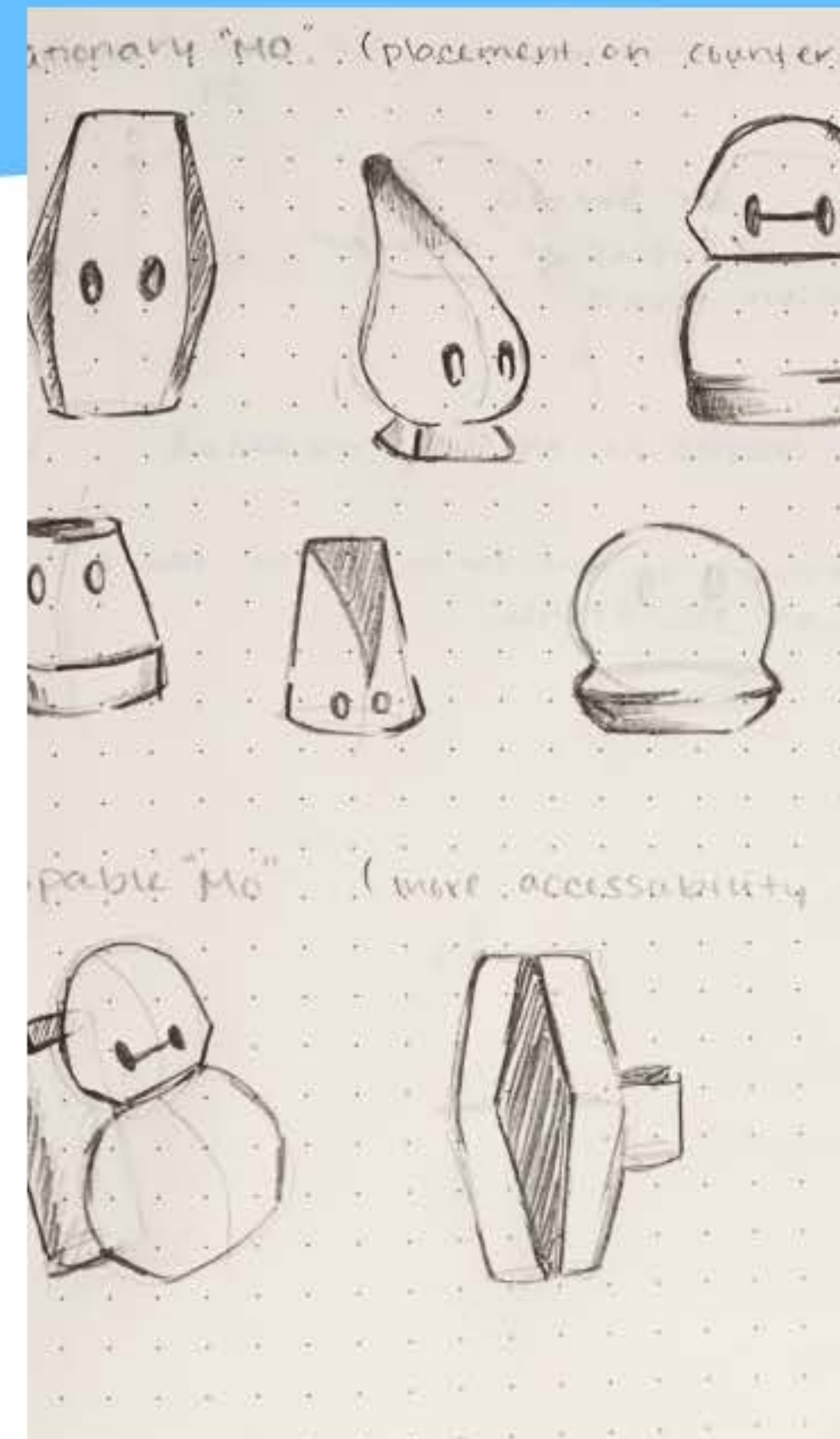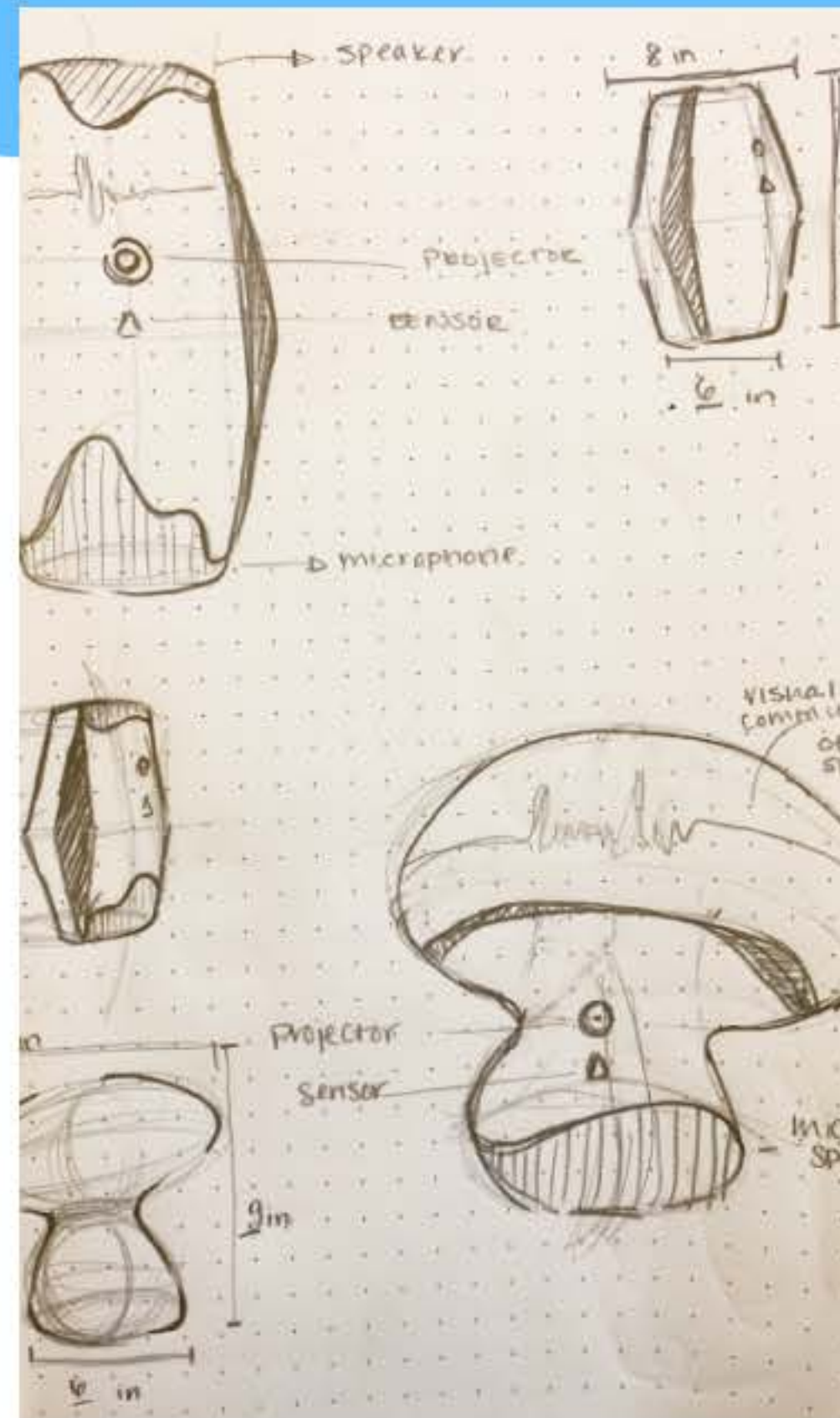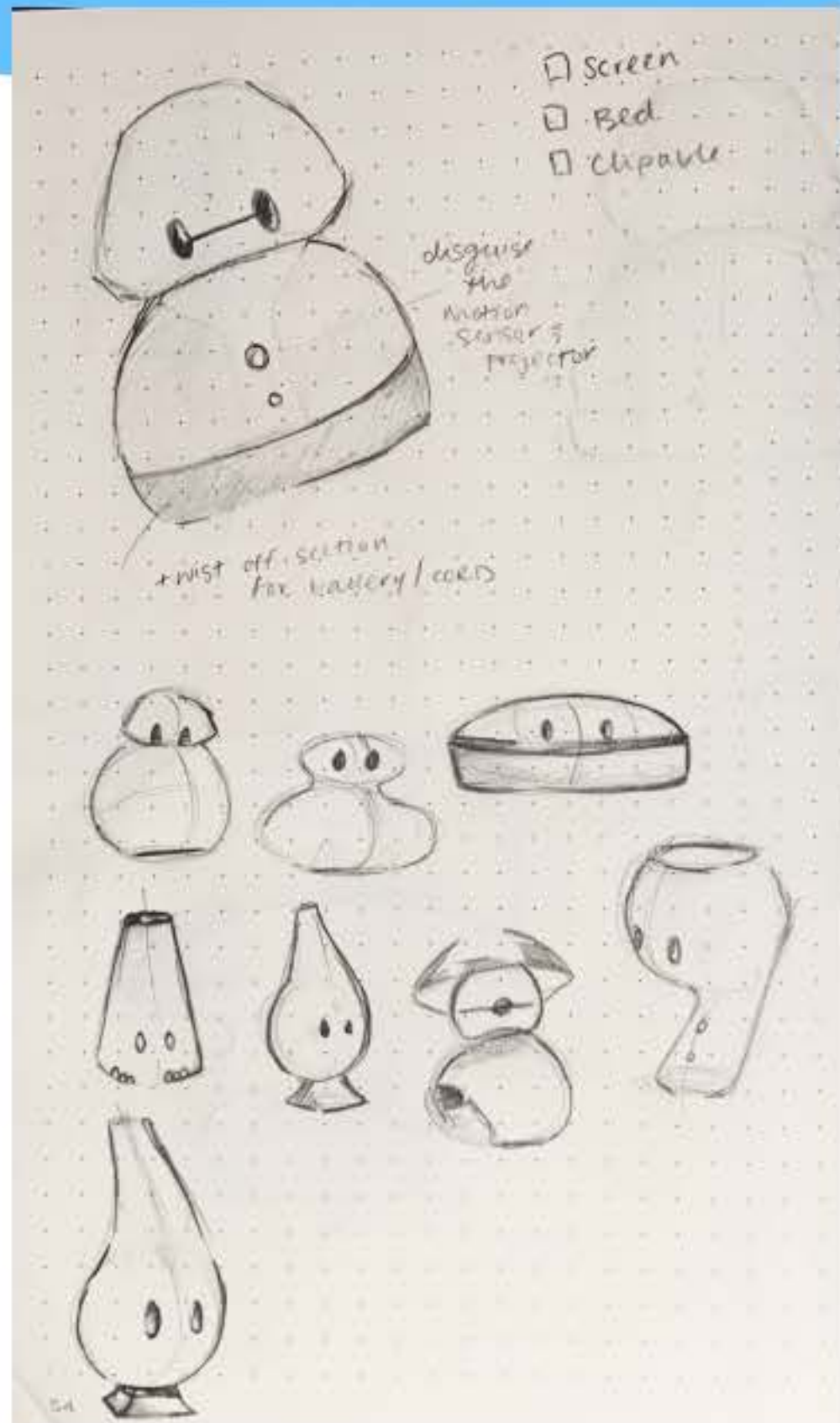
Ideation **Physical Form**

By taking into account the results from the forms perception suvey, here are some ideation forms we came up with...

Hello, I'm Mo

hello
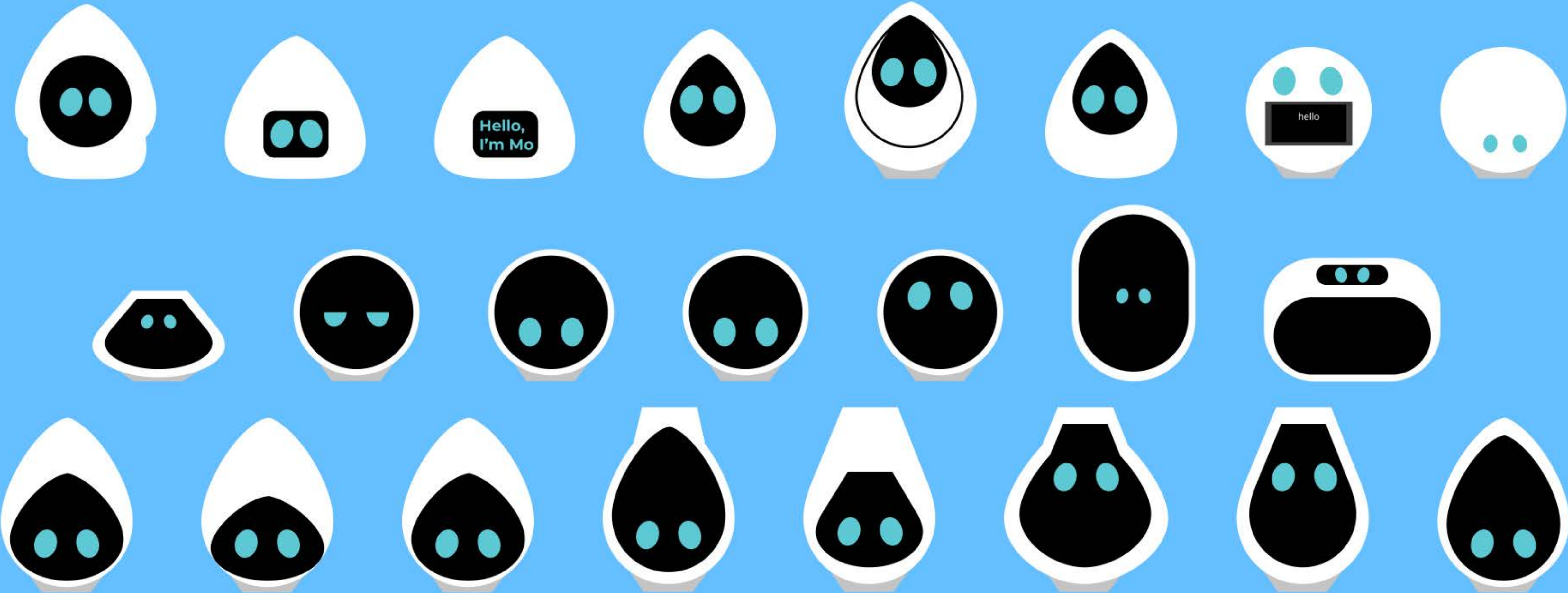
Ideation **Mobile App**

REMDi

Visits

Progress Tracker

Ability to see past visits, issues and medications

Treatment Plan

Health

Lab and Test results

Medication Lists

Medical History

Treatment Plan

Medication functions

Profile

Clinical Summary

Secure (HIPAA compliant) messaging

Ability to add family and/or PCP (Primary Care Physician) to your treatment plan and progress tracking

Patient profile

Treatment Plan

Learn

Patient Education Material

Lab and test description and purpose

Medication functions

Mobile App Wireframes

REMDi
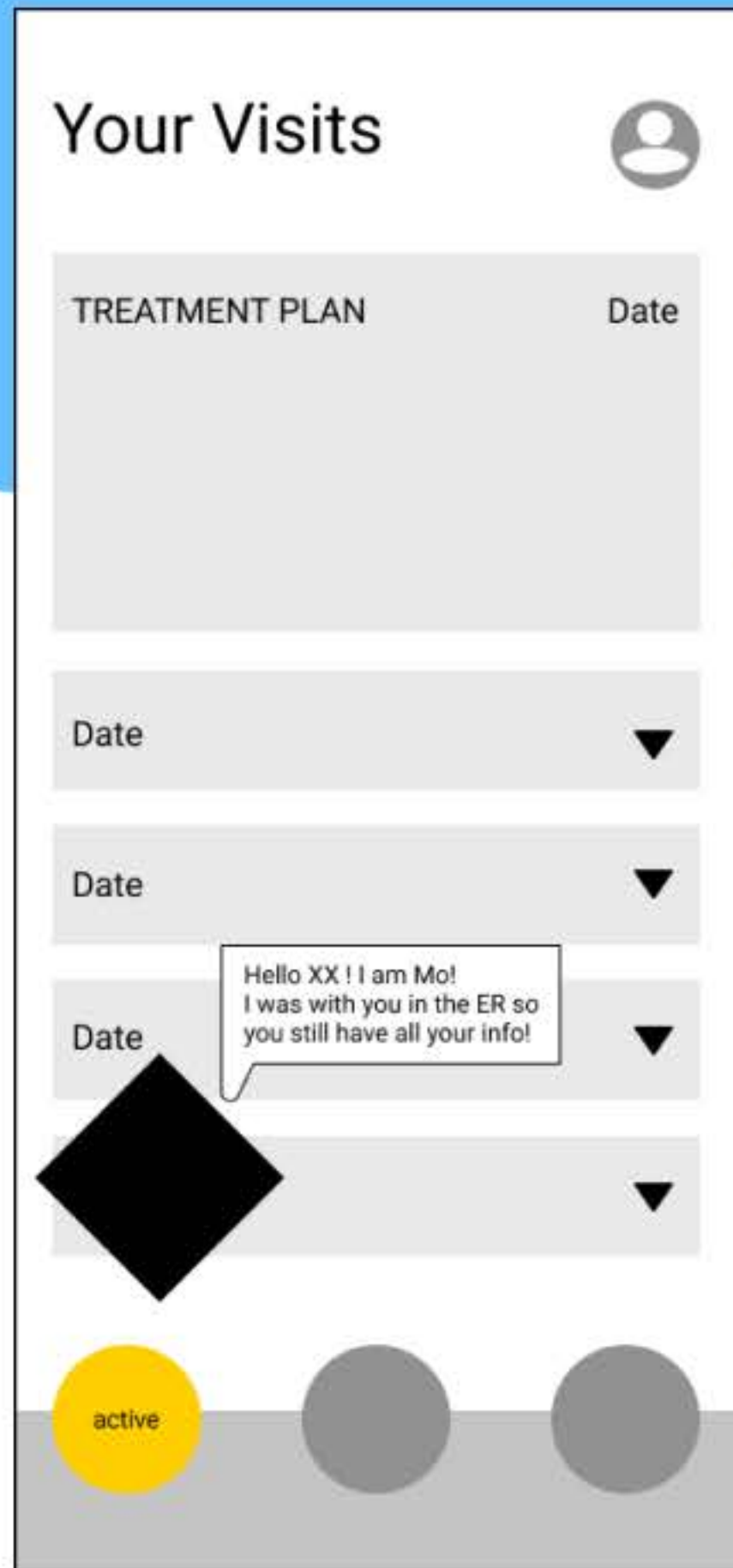
Visits
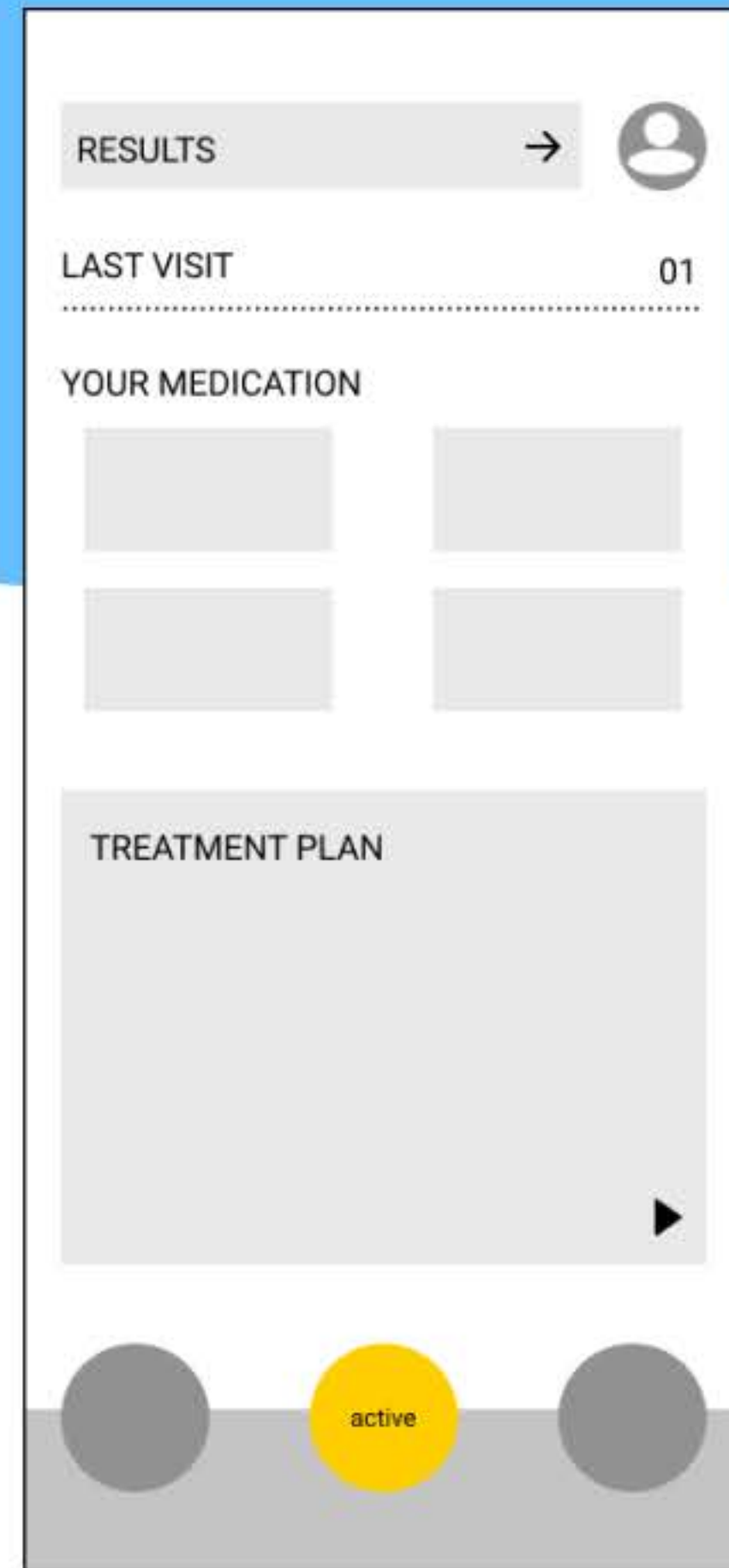
Health
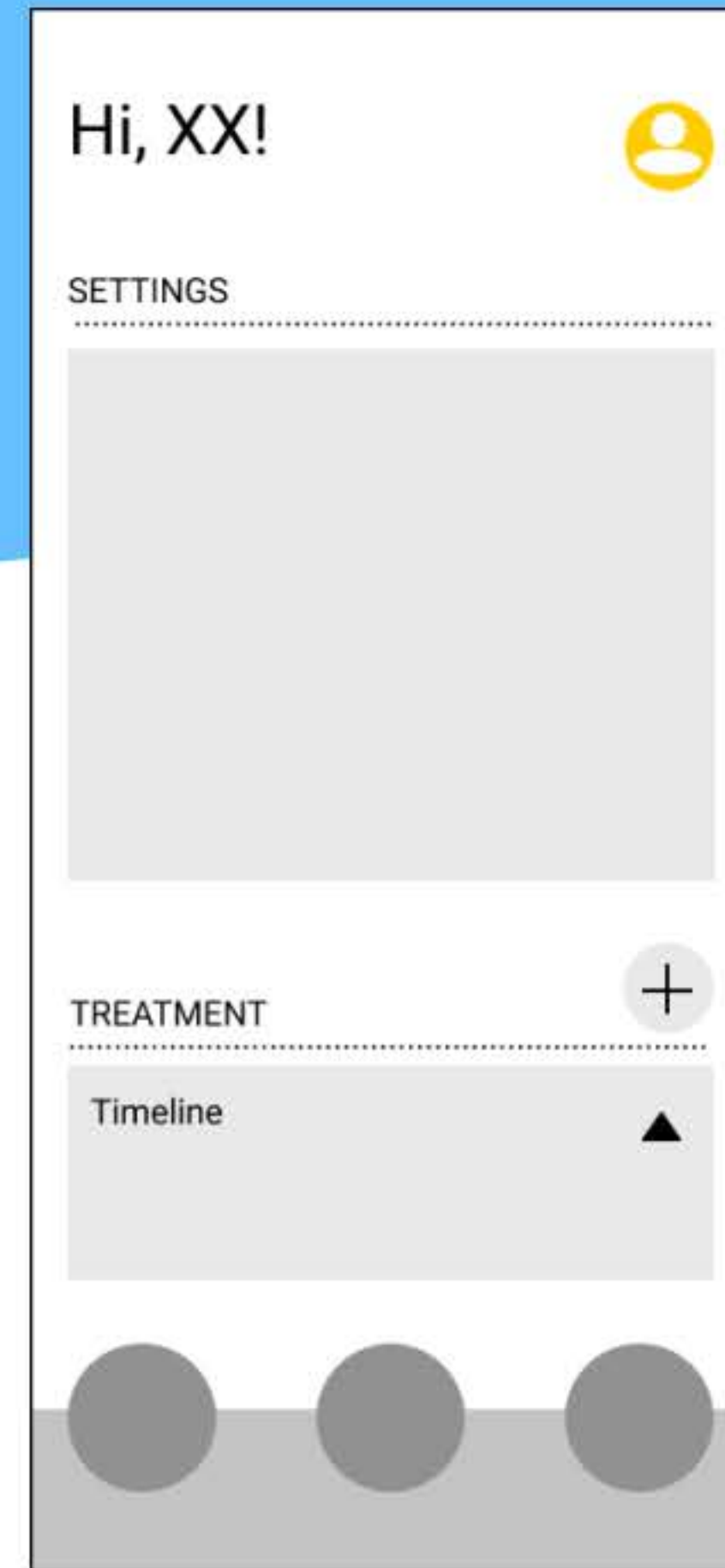
Profile

Learn

Interaction Map

Send ER visit recording & transcript

MO
In hospital use

*Individual

Educational platform
Primary at-home use

Answers & explains questions in a 6th grade level

Labs, charts, and data are exchanged

Ask questions & verbally interacts

Displays visuals & gives verbal analysis

Shows recordings & transcript of visits

User

Hospital Database
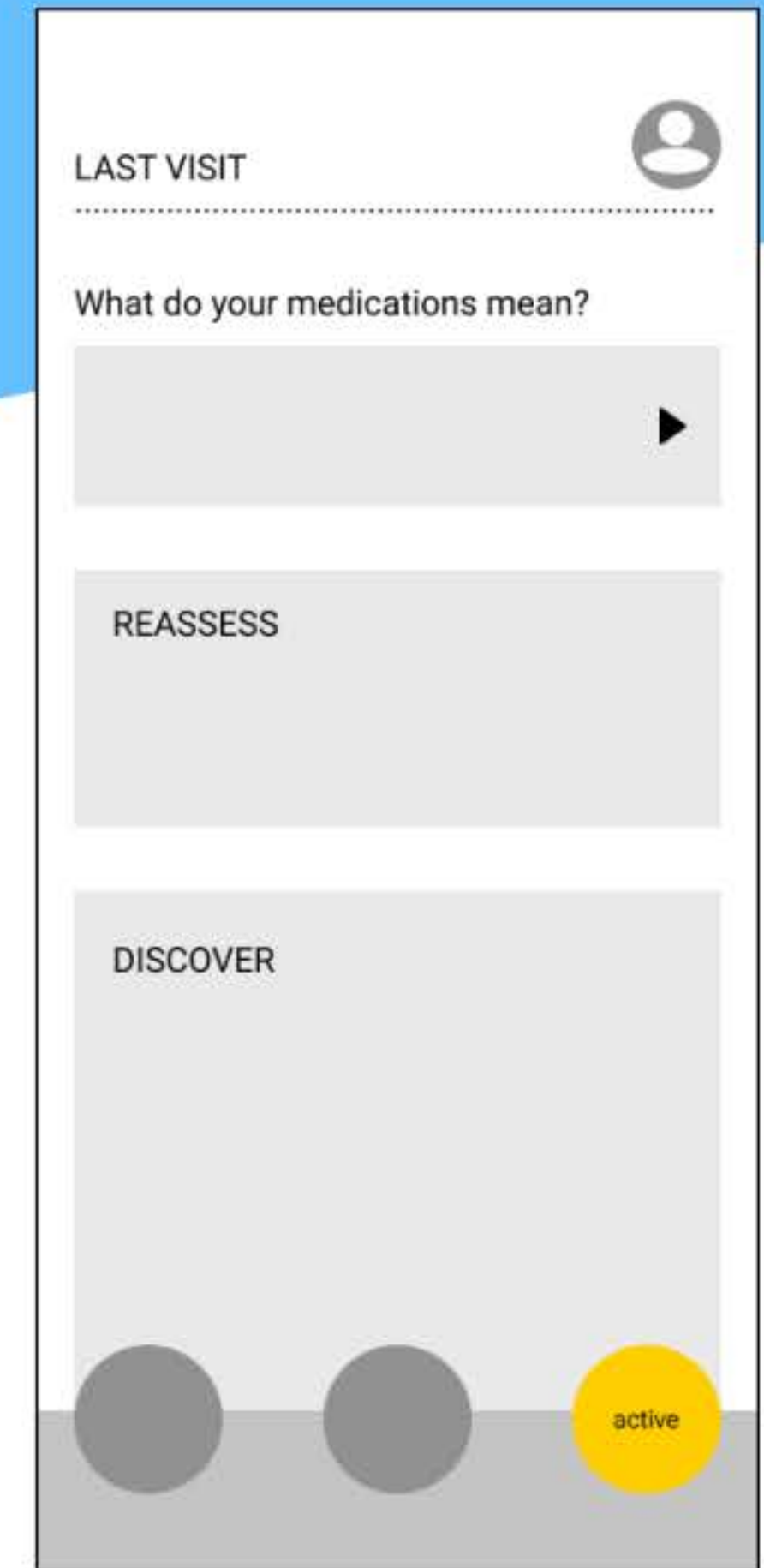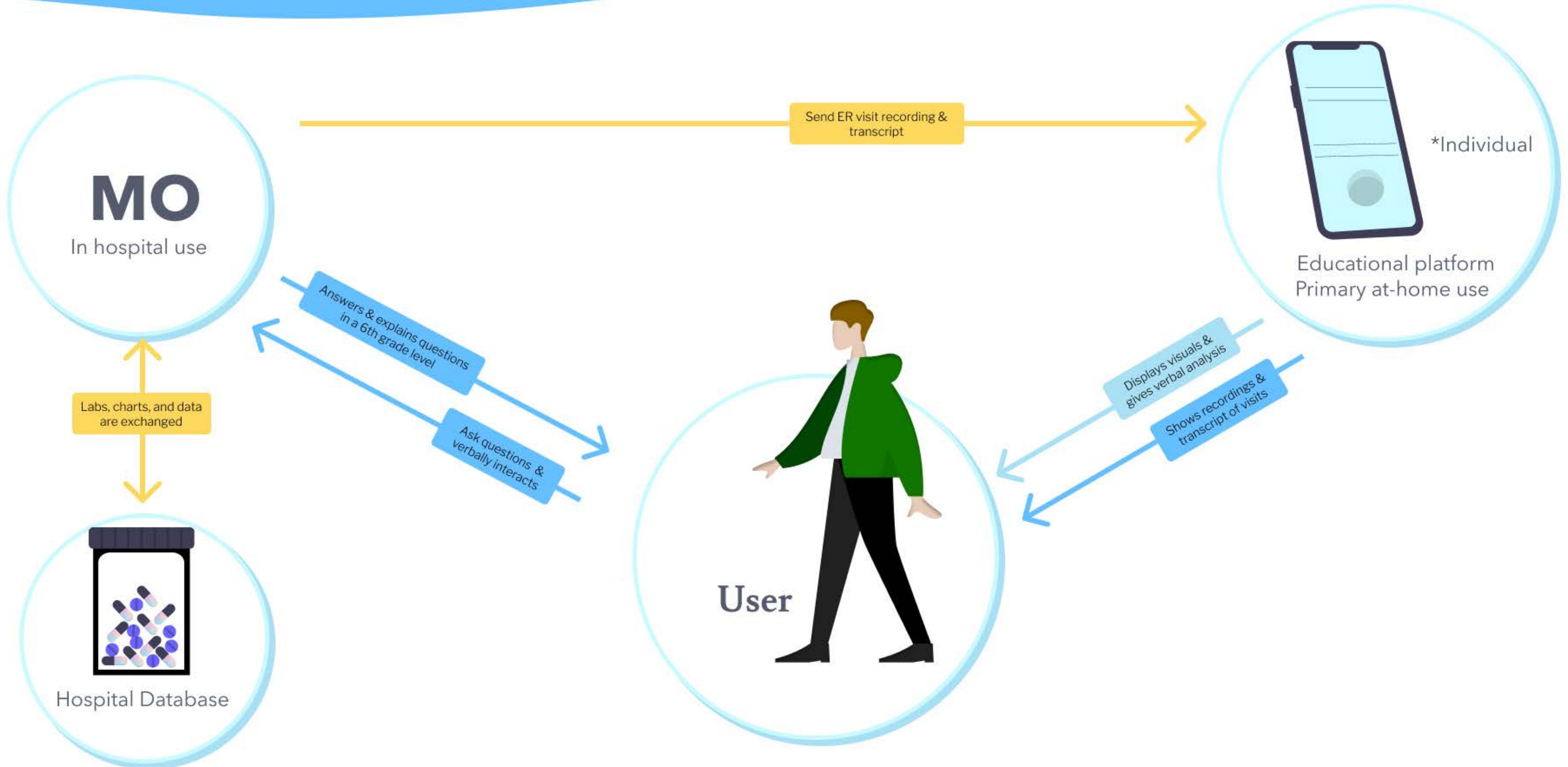
1
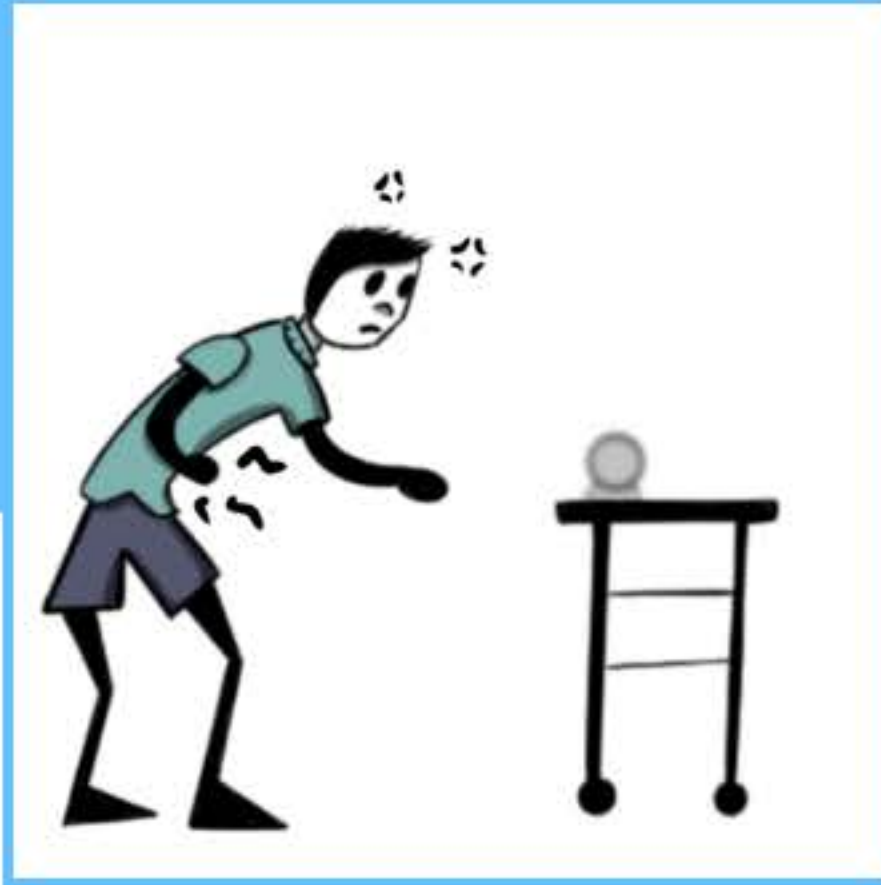
User goes to the ER because of sharp abdominal pain. In his room he notices MO.

2
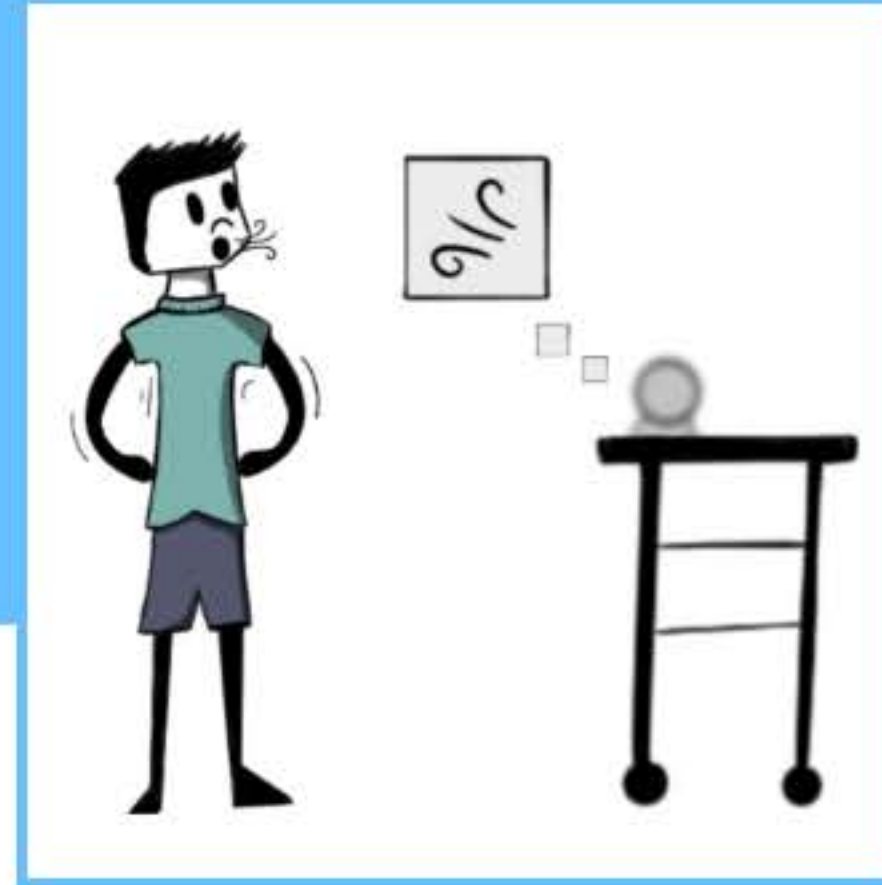
User asks MO to help with his pain, so MO guides User through a breathing exercise.

3

After User relaxes, he asks MO what might be wrong with him. MO lists the common causes of abdominal pain.

4
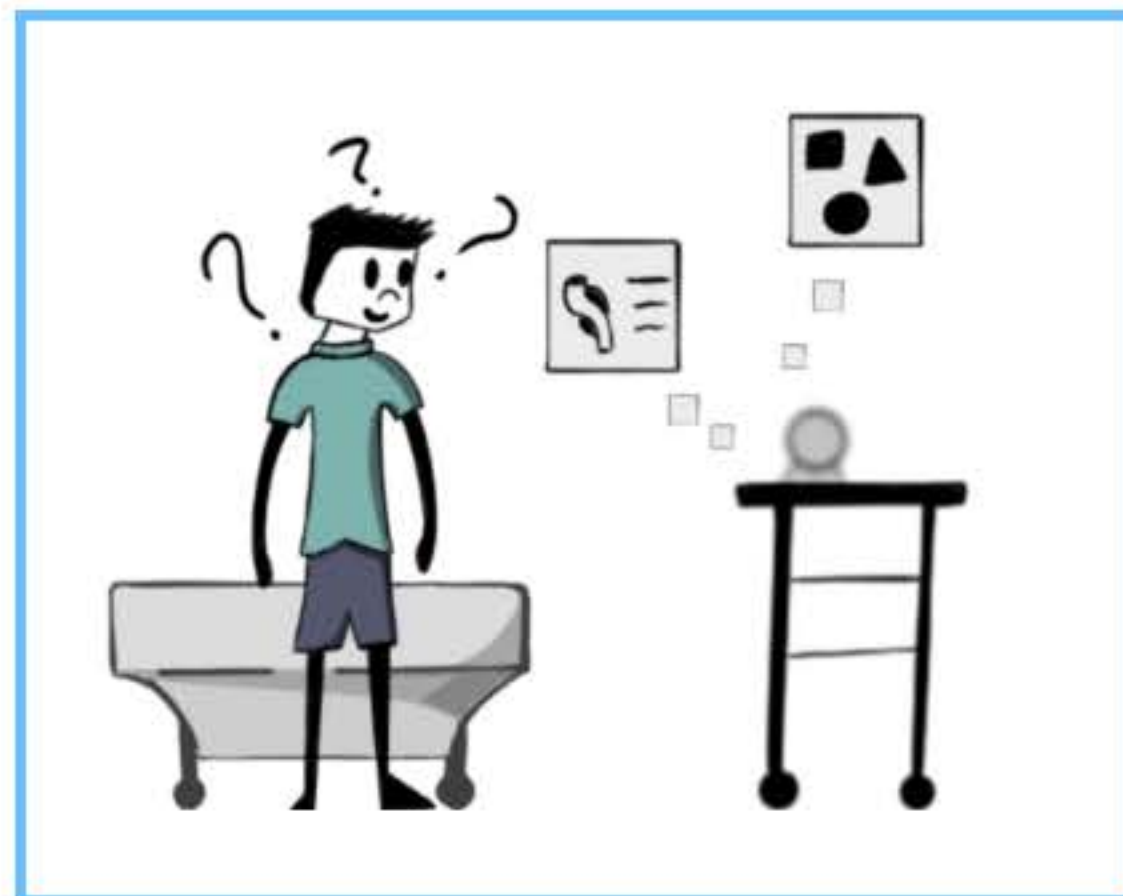
User receives a diagnosis of pancreatitis from his doctor. He isn't sure what this means, but asks MO and MO helps him understand with an explanation and visuals.

5

Before leaving the hospital, User downloads the MO companion app. It has a record of the conversations that he and MO had while at the hospital and allows him to continue to ask questions regarding his aftercare instructions from home.

Isaac Schrewber

Health Literacy   Basic
Occupation   Store Manager
Home   Cumming, GA

Isaac is beginning to worry that his lack of knowledge about his health is negatively impacting his decisions when it comes to taking care of his body. He doesn't understand most of what his doctors tell him and commonly makes mistakes when taking his medication which leads increasing health issues. Isaac wants to become more knowledgeable about his health, medications and communicate more effectively with his needs to his doctor.

Needs

- To understand how to take his medication as the instructions are difficult to understand at times.

- Become more knowledgeable about his needs when it comes to his physical health.

Current Feelings

Judged   Stressed

Curious   Tired   Anxious

Frustrations

- Often leaves the doctor with more questions than in the beginning.

- Dislikes not knowing where he is in the ER process.

"My doctor speaks to me like I understand what she's saying but I don't, and it just makes me feel stupid.

Isaac has been feeling pain in his foot for the last two weeks. He decides to head the ER after prolonged pain for help.

Isaac Schrewber
Cumming, GA
Store Manager

Stages

At the ER → **Back at Home**

Satisfaction (+)

Touchpoints & Action

He receives diagnosis and further treatment plan from the attending physician

Isaac checks into the triage desk at the ER and has to wait for hours

He is examined by the resident physician

At home, Isaac tries to follow the doctor's treatment plan

Isaac unsuccessfully tries to include his healing process in his routine

Isaac gets vitals taken with with nurse in examination room

Isaac is given discharge instructions by the resident and nurse

Isaac is debriefed on the tests they will run

He looks at the discharge instructions and has trouble separating prescriptions

Dissatisfaction (-)

Emotions

| Isaac is annoyed with the prolonged wait time. | Isaac is confused and unsure what tests the doctor is discussing, but he is afraid to ask. | Isaac is discharged from the hospital with a diagnosis and a prescription for medication. | Arriving home bewildered, Isaac has trouble remembering what the doctor said. | He has trouble fully comprehending the lengthy discharge instructions and mixes up the medications. | After two weeks, Isaac is not able to prioritize his health and forgets to take his medicine. |

Opportunities

| Isaac is unsure what is happening to him. | Isaac can be informed about the possible solutions the doctor has for him. | Isaac feels unsatisfied with his experience because he is unsure what happened to him and what his results mean. | Isaac could be reminded of his session with his doctor. | Isaac has difficulty recalling specific terms the doctor used as well as the protocol he assigned. | He has a lack of knowledge for how he needs to consider his health and its importance. |

Combination of Isaac working with MO

MO +

Stages

At the ER → **Back at Home**

Satisfaction (+)

Touchpoints & Action

He receives diagnosis and is able to learn more about his condition after the physician is gone

Isaac checks into the triage desk at the ER and has to wait for hours

He is examined by the resident physician and is comforted by MO

At home, Isaac can see his treatment plan with the MO companion app

Isaac learns more about his health and his condition while following the treatment plan

Isaac gets vitals taken with with nurse in examination room and is intrigued by MO

Isaac is debriefed on the tests they will run and MO gives him more information

Isaac is given discharge instructions and a MO pamphlet by the resident and nurse

He looks at the discharge instructions and can see what to take and when

Dissatisfaction (-)

Emotions

Isaac is annoyed with the prolonged wait time.	Isaac is confused and unsure what tests the doctor is discussing, but he is afraid to ask for clarification.	Isaac is discharged from the hospital with a diagnosis and a prescription for medication.	Arriving home bewildered, Isaac has trouble remembering what the doctor said.	He has trouble fully comprehending the lengthy discharge instructions and mixes up the medications.	After two weeks, Isaac is not able to prioritize his health and forgets to take his medicine.

Opportunities

Isaac is unsure what is happening to him.	Isaac is supported by MO and receives more clarity relating to his medical situation.	Isaac feels unsatisfied with his experience because he is unsure what happened to him and what his results mean.	Isaac remembers MO said he would help him with his treatment plan, so he downloads the Mo app.	MO guides Isaac through his treatment plan and sets him up with notifications from onboarding.	Isaac is reminded of checking in with his set treatment plan everyday and sets up his follow-up.

REMDi

The
M
Medical Network

THE
evaluation

Initial User Testing

First Iteration

Second Iteration

Third Iteration

MO

first iteration
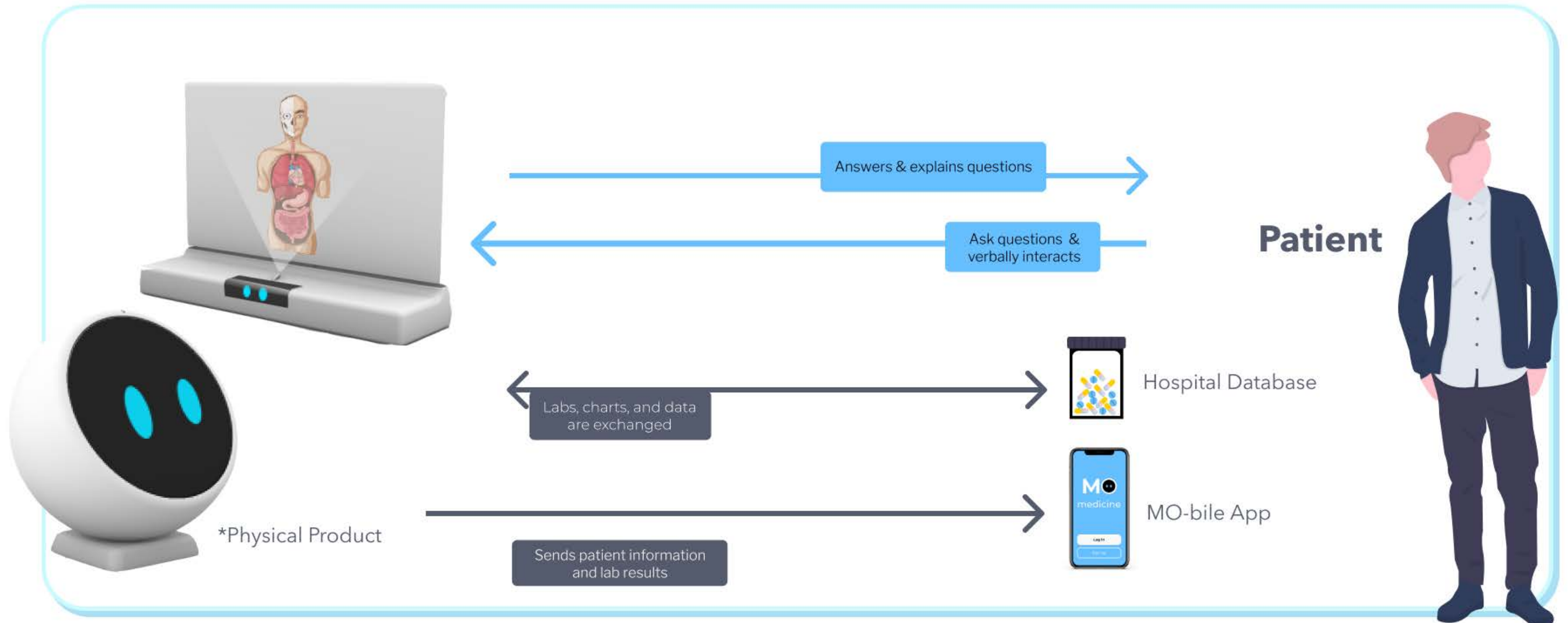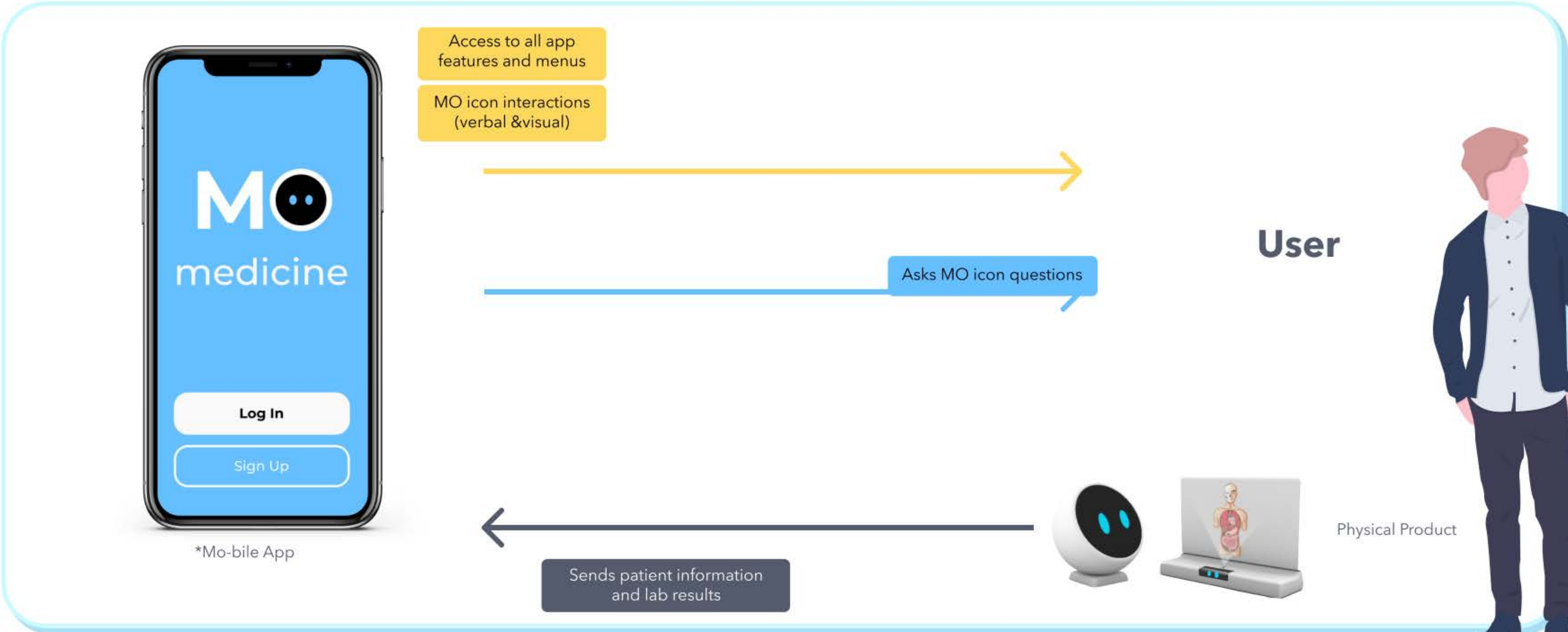
Initial **Components & Functions**

REMDi
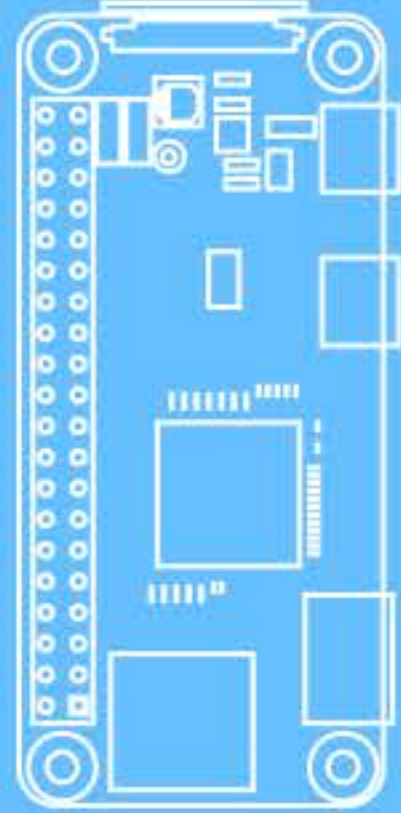
Raspberry Pi 4 / Raspberry Pi Zero W
Arduino is incapable of projecting high quality images

LCD Display
Display MO's eyes and encourage interaction
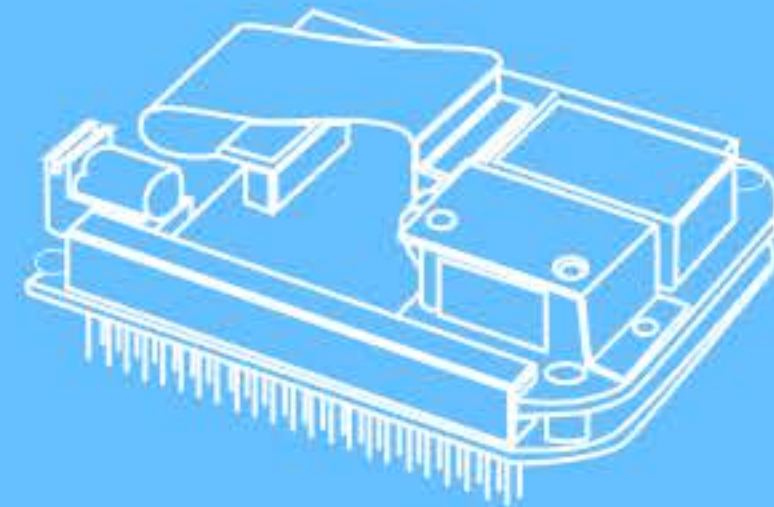
DLP Pico Projector
Projector allows MO to display visuals to the user on any surface

Voice Recognition Module or Software
Train MO to respond to voice commands
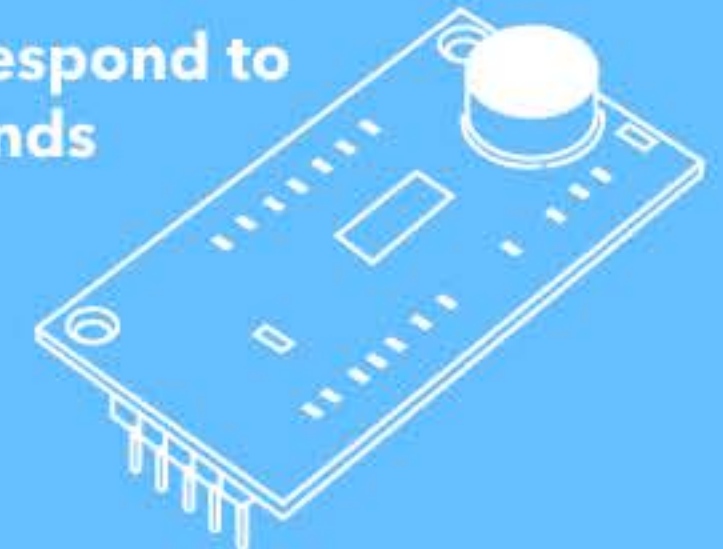
Infrared or Lidar Camera
Detect when user enters the room

Speaker
Allow MO VUI (voice ui) to respond to user inputs

INITIAL MO

physical form

MO is a bedside companion that interacts with patients by speaking with them, comforting them, and answering questions they might have through verbal explanations or visuals.

- Projector display for visuals
- LCD display for MO's eyes
- Microphone & Speaker for verbal interaction

Sensory Cue Kit for Form Factors

Users evaluated MO's physical form in a simulated emergency room scenario. They expressed their emotions and thoughts regarding each form as well as ideas for improvement.

7 participants

"MO's face makes me feel comfortable and less anxious."

"I would want a bigger display to see the visuals."

"I would trust MO more if I saw a nurse or doctor using it."

REMDⁱ

Mobile Platform

Patients can learn more about basic health concepts and how it relates to their own body, by offering a virtual companion that is with you every step of the medical journey, inside and outside of the Emergency Room.

Daily Treatment plans & Tracking

Visit Summaries

Records of MO questions & responses

Information Architecture
V1

MO-bile App

Profile
- Edit profile
  - Basic Patient Information
  - Settings
  - Notifications
  - Legal Documentation
    - HIPAA & NDA
    - Terms & Conditions
- Health Literacy Status

My Health
- Treatment
  - Treatment Progress Bar
  - Diagnosis
  - Discharge Intructions
  - Lab & Tests Results
  - Prescribed Medication
    - Medication Description
- Past Visits
  - ER/ Urgent Care near you
  - Summary of last visit
    - Discharge Intructions
    - Lab & Tests Results
    - Medications & Descriptions
    - See visit costs and fees

MO Button
- Past Questions
- Search Bar
- FAQs

Discovery
- Search Bar
- Diagnosis
- Last Left Off Article
- Learning Activities
- Health Literacy Status
  - Health Literacy Quiz
  - About Health Literacy
- Discover Health Topics
- Patient Education Material

REMDi

Mobile App **Features**

REMDi

Keep track of your daily treatment plan and current medications.

- See medication already taken & medication that needs to be taken

- Stay motivated & on track with your treatment plan

Mobile App **Features**

REMD
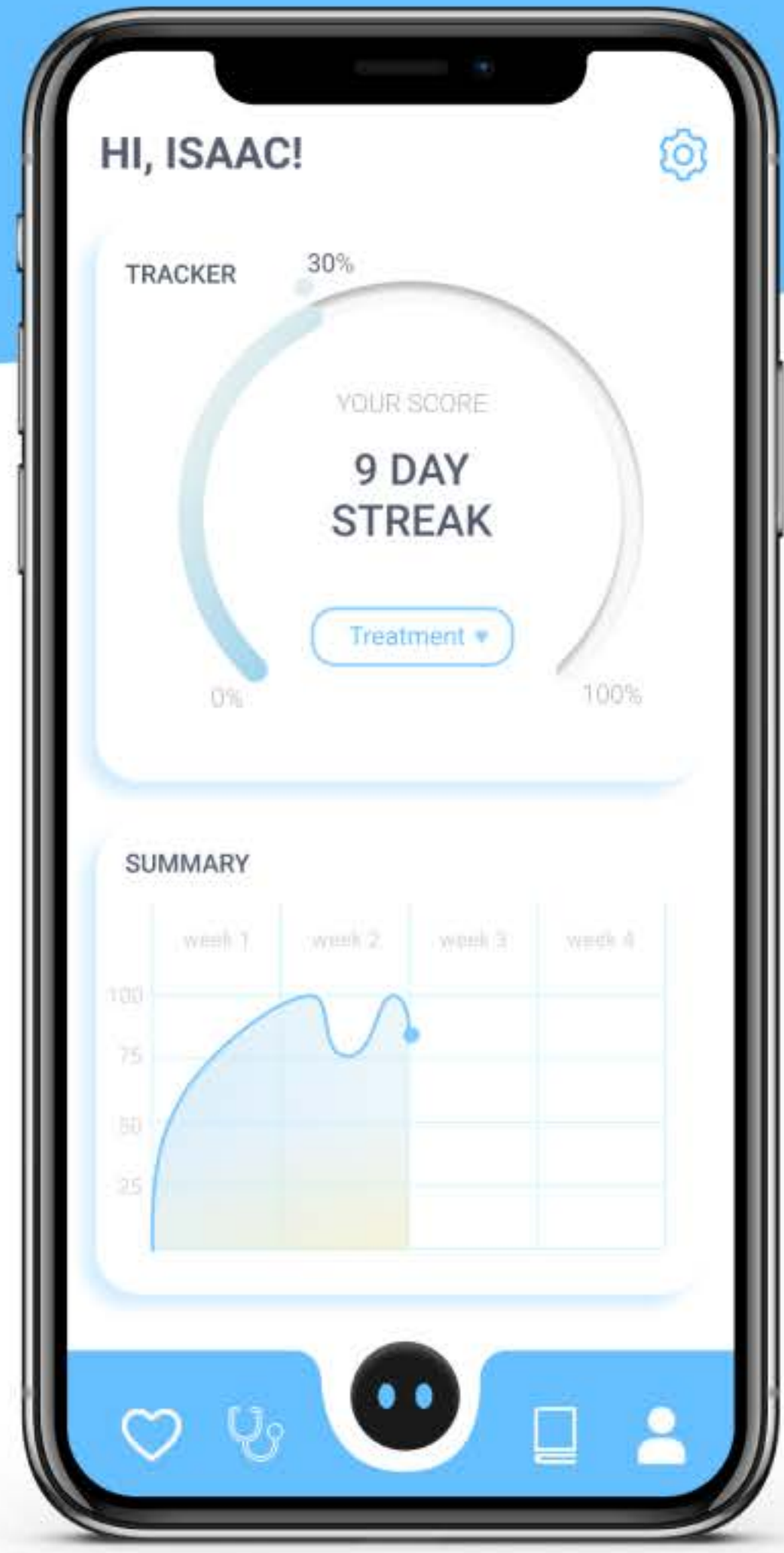
Look back on your past visits and overall treatment plan assigned by your clinician.

- Detailed information on all past visits

- Lab & Test descriptions and results

- View medical history from ER charts

Your **Visit**

14 FEB 2021
Reason
Abdominal pain
Prescriptions
Codeine
Omnipen
Results
Pancreatitis

02 OCT 2020
Reason
Lesion
Prescriptions
Results
Stiched thumb.

Lab Results   Medical History

Treatment Plan
- Take Codeine when needed.
- Take 1 Omnipen pill in morning and 1 pill at night.

Mobile App **Features**

REMDi
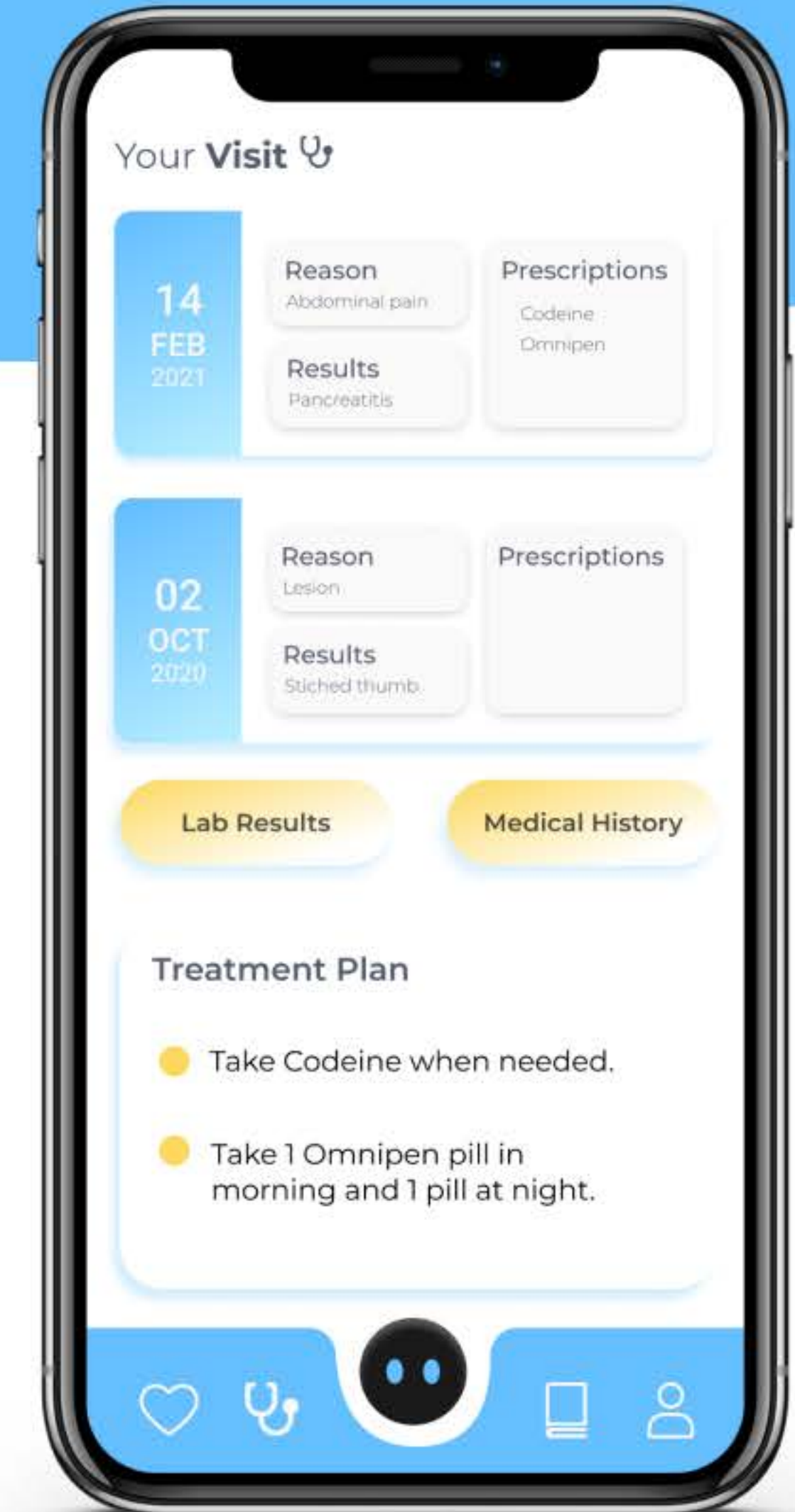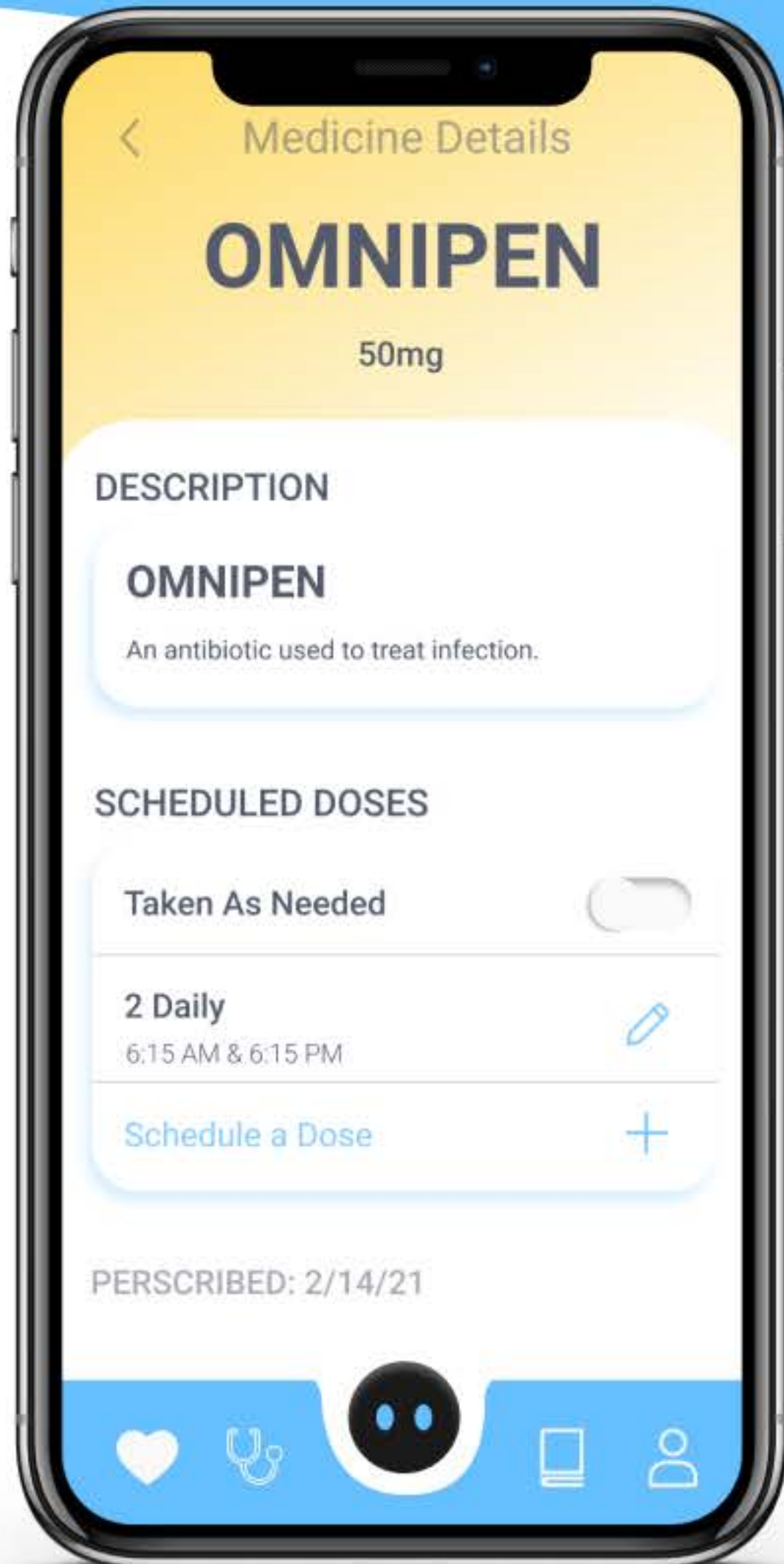
Learn about your medication, concepts that apply to you, and look back on your previous questions with MO.

- Detailed information on all past MO interactions

- Opportunity to expand knowledge on related topics

- Medication purpose and functions

Mobile App **Features**

REMDi

When you have questions, contact MO, they'll be there to help.

Use voice or press the icon to activate MO at home

"Hey MO"

Hello Isaac, what can I help you with?

Speak outloud or type

MO
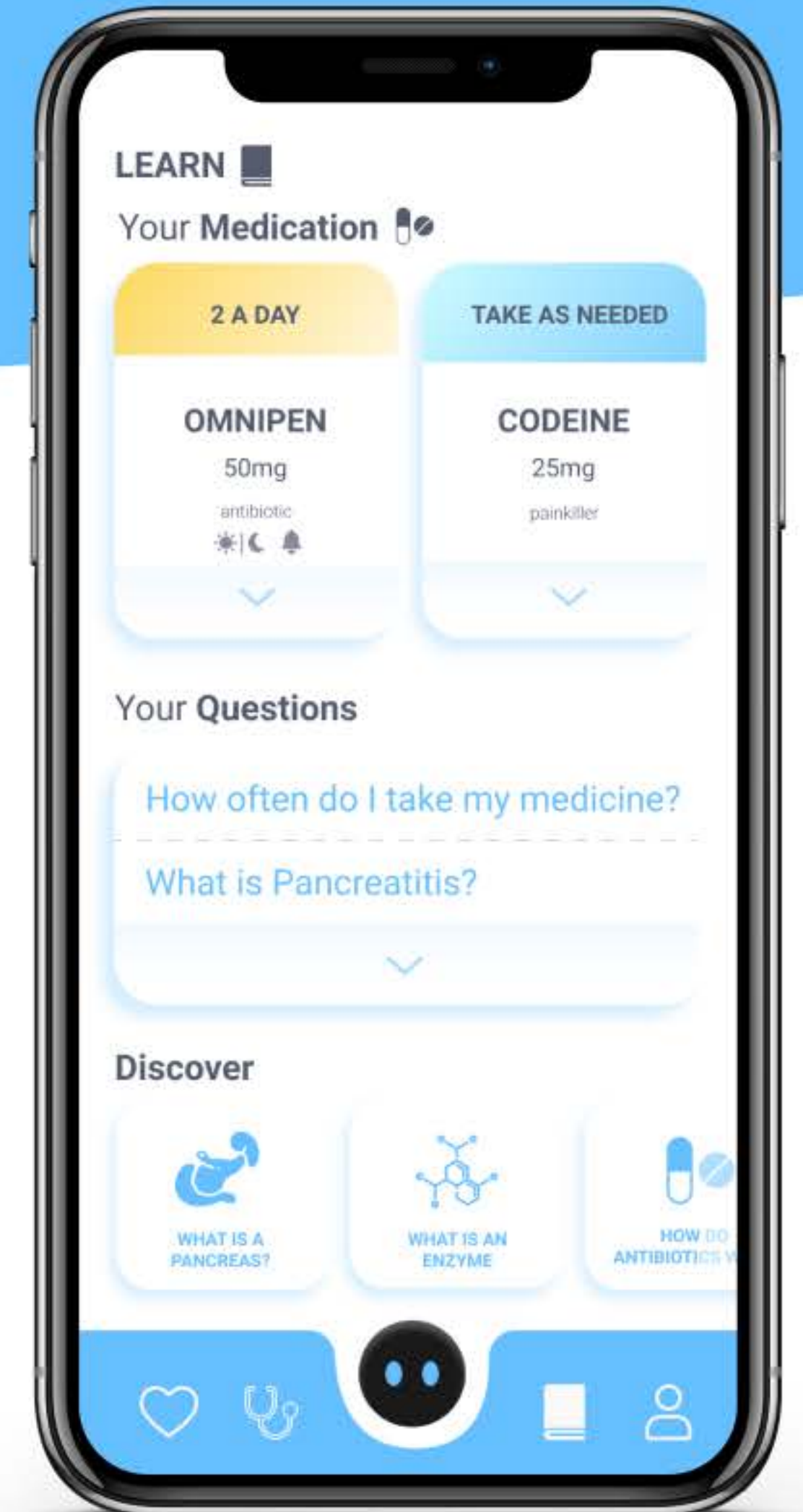
second iteration

INITIAL MO

in-home app

Patients can learn more about basic health concepts and how it relates to their own body, anywhere they want to. The MO app serves as a companion with you every step of the medical journey, inside and out of the Emergency Room.

- Daily Treatment plans & Tracking
- Visit Summaries
- Records of MO questions & responses
- Activities to learn about relevant health concepts

Card Sorting for In-Home App

REMDi

6 Females

3 Males

9 participants

header — MO Button · Profile · Visits · Health · Learn · Explore · Empower

subheader — Treatment Plan · History of Visits · Medication Description · Treatment Progress Bar · Edit Profile · Past Questions · About Health Literacy · ER Progress Bar · HIPAA/ Legal Privacy Concerns · Discover Health Topics · Where you left off when reading an article · Search Bar · Patient Health Condition/ Diagnosis · Your Health Literacy · Summary of Last Visit · Recent Lab and Test Results · Frequently asked questions (FAQs) · Share treatment plan button · Discharge Instructions · Set Reminders · Patient Insurance Info · Prescribed Medication · Learning Activities · Pay Bills · See Visit Costs/Fees · MO Mission Statement · Patient Education Material

description

MO-bile App

My Progress

Health
- Treatment
  - Diagnosis
    - Diagnosis summary
    - Role Inside of the Body
  - Treatment Progress Bar
    - Interactive Calendar
  - Discharge Instructions
  - My Medications
    - Prescriptions
  - Test & Lab Results
    - Tests & Lab info
- Past Visits
  - Summary of Visit
    - Past Medications
    - Past Tests & Labs

Settings
- Account info
- Notifications
- Terms & Conditions
- Your Patient Rights
My Health Literacy Level
My Diagnosis
- Diagnosis summary
Progress Summary
Health Literacy Quiz

MO button
- Random Suggestions
- Speak aloud or type

Discover
- Search
- Last Article Left Off
  - Article Link
- Articles
  - Related
  - Recommended
- Activities
  - Diagnosis Activity (Categories)
    - Category Activites
      - Activity Description
        - Activity Demo & Begin
  - Other topics
- Learn
  - My Diagnosis
    - Diagnosis summary
    - Role Inside of the Body
  - My Medications
    - Prescriptions
  - My Progress
- Your Patient Rights

REMDi

Information Architecture
V2

Card Sorting

REMDi

initial navigation

7 headers

27 subheaders

42 descriptions

MO button

Profile

Visits

Health

Learn

Explore

Empower

improved navigation

4 headers

4-5 subheaders
*per individual header

infinite descriptions

MO button

Profile

My Health

Discover
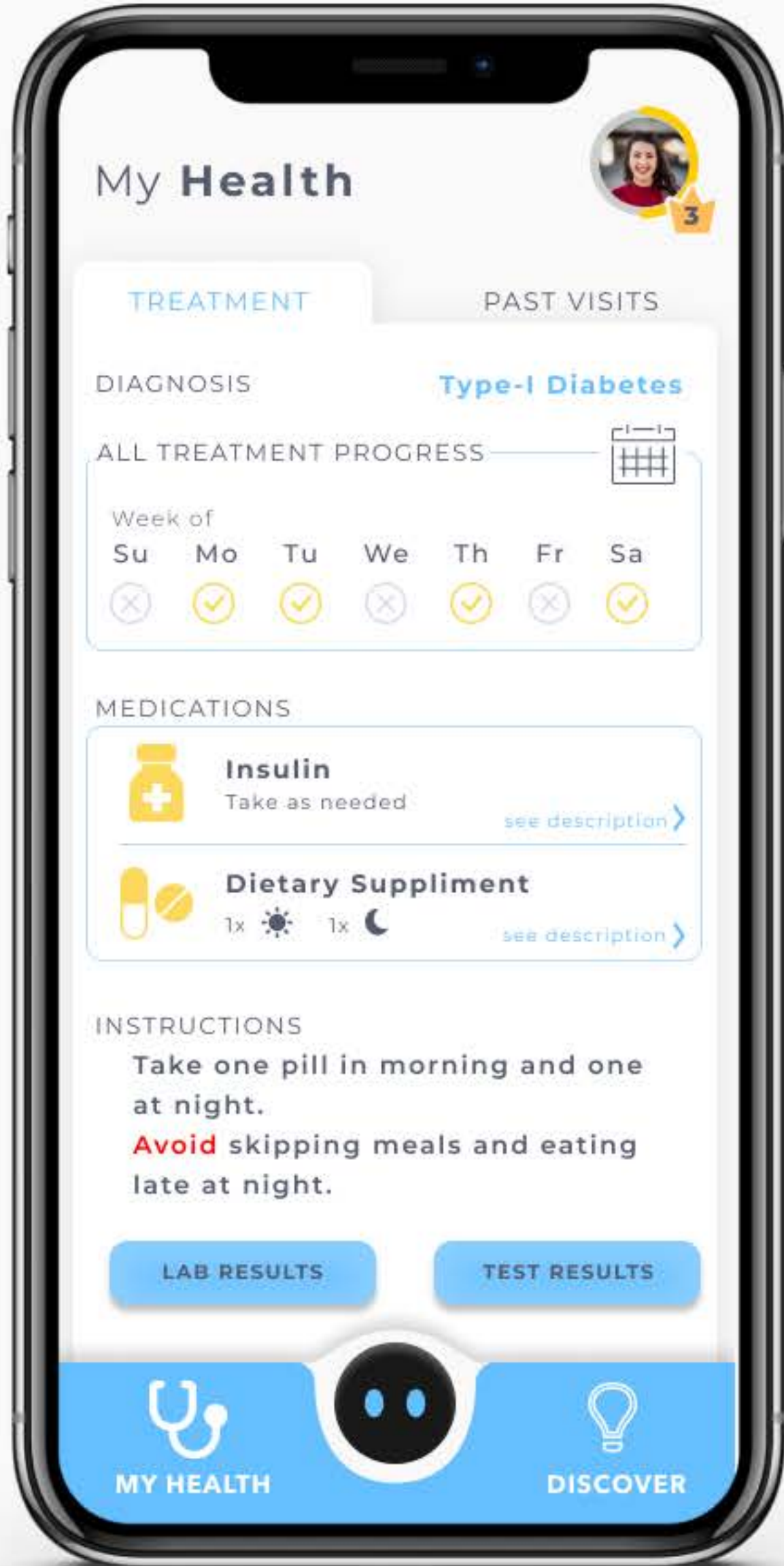
Revised

My Health: Treatment

My Health shows patients their current diagnosis, treatment plan, and past visits.

Changes

My Health and My Visits are **combined**.

Condensed so that the app follows the **mental model** of present and past.
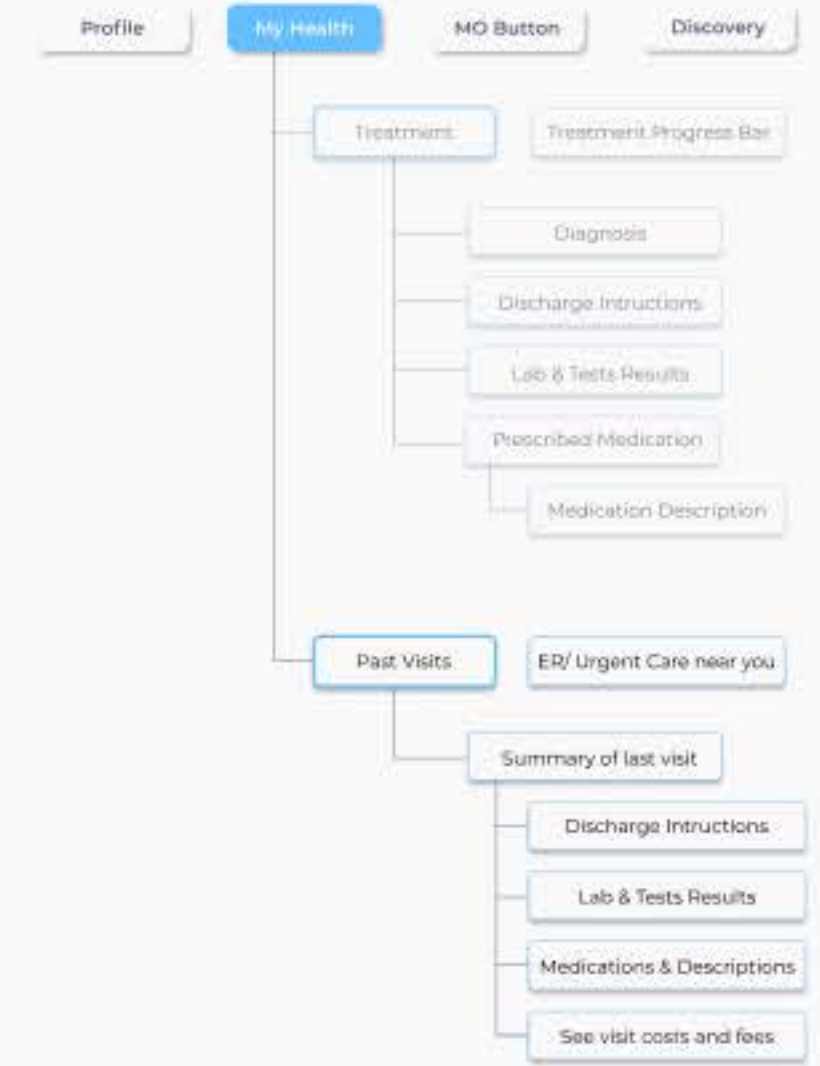
Discover

Discover allows patients to take control of all the information regarding their physical health.
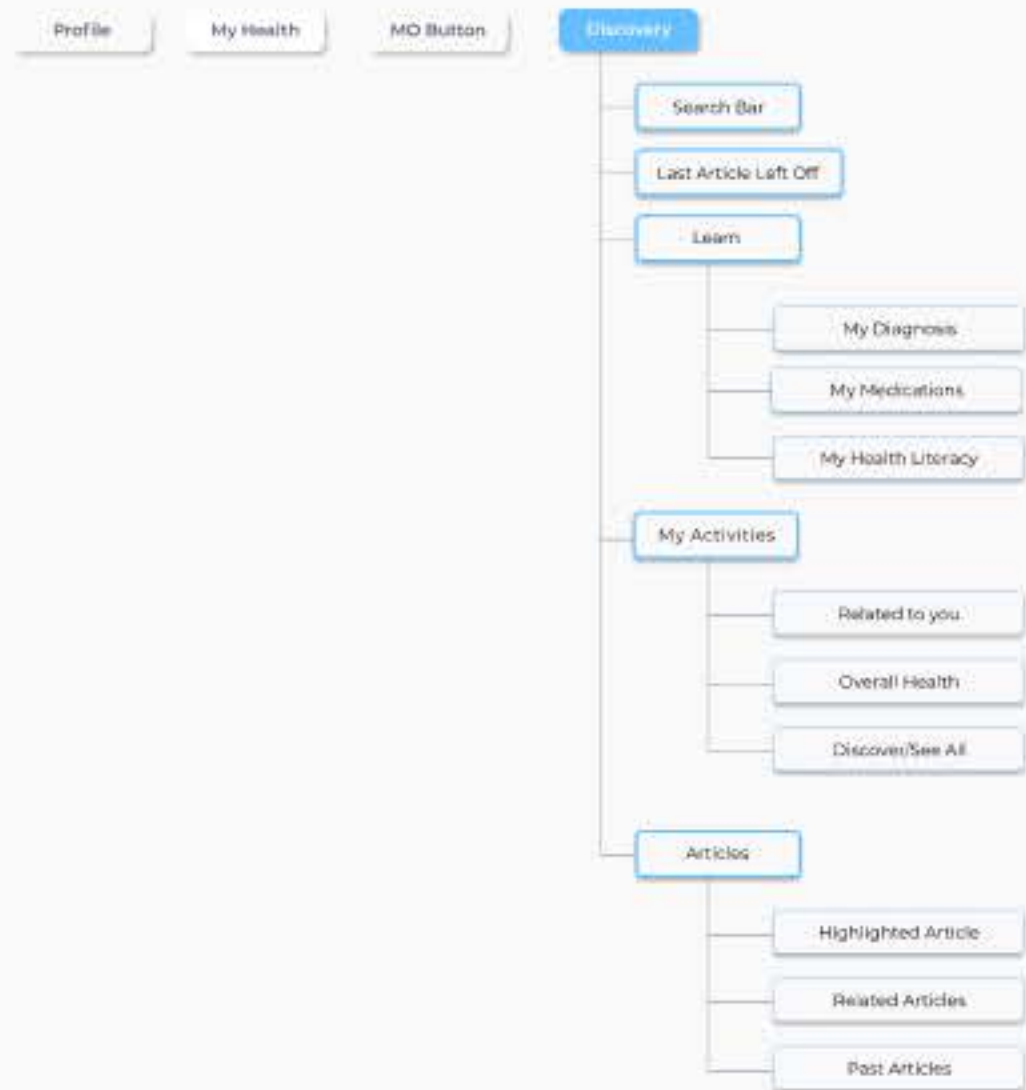
Changes

New features and content were added to facilitate more **user engagement and retention.**

Features are interactive and **related to patient diagnosis.**
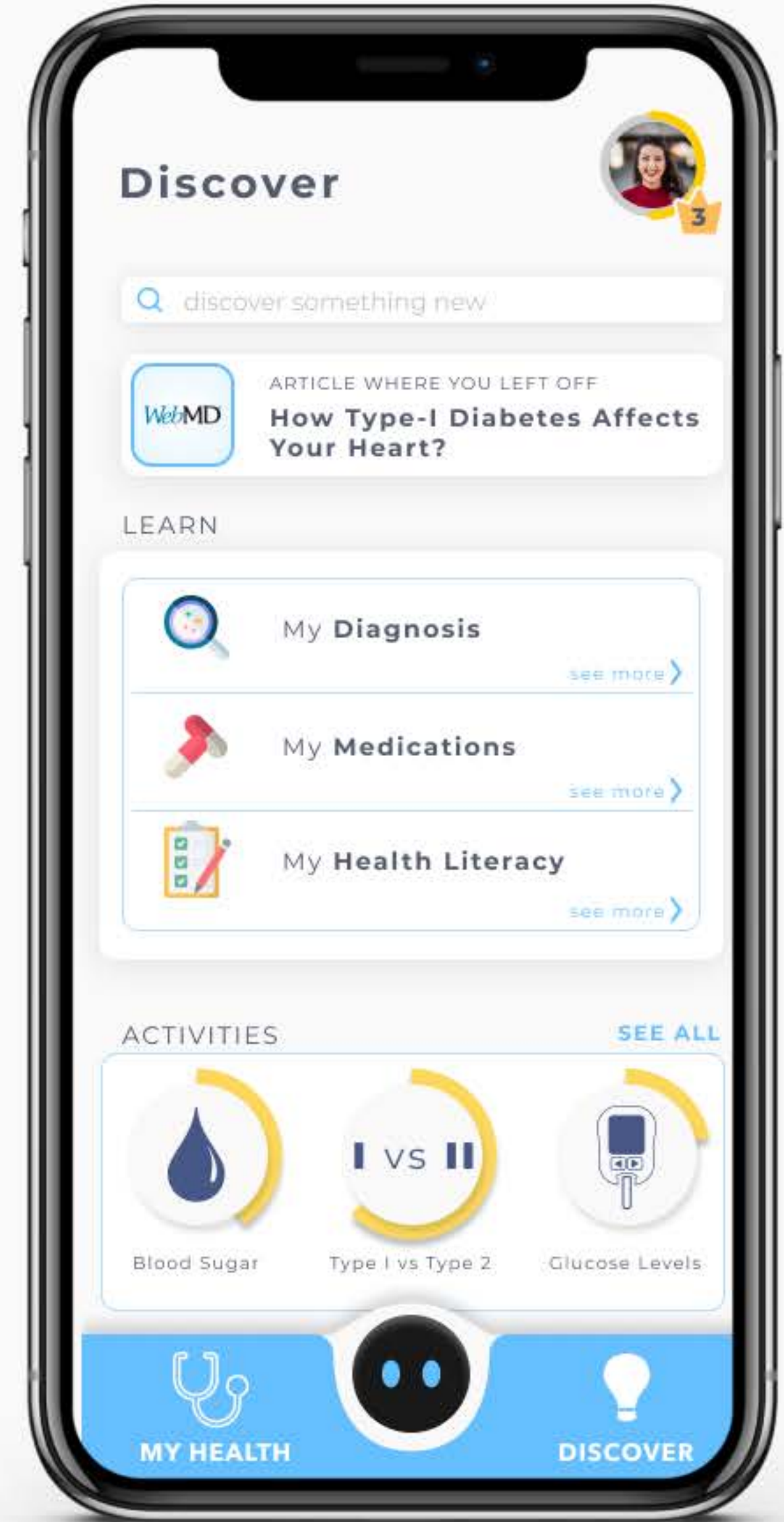
Discover

Discover allows patients to take control of all the information regarding their physical health.

Changes

Expansion on patient diagnosis and related health concepts.
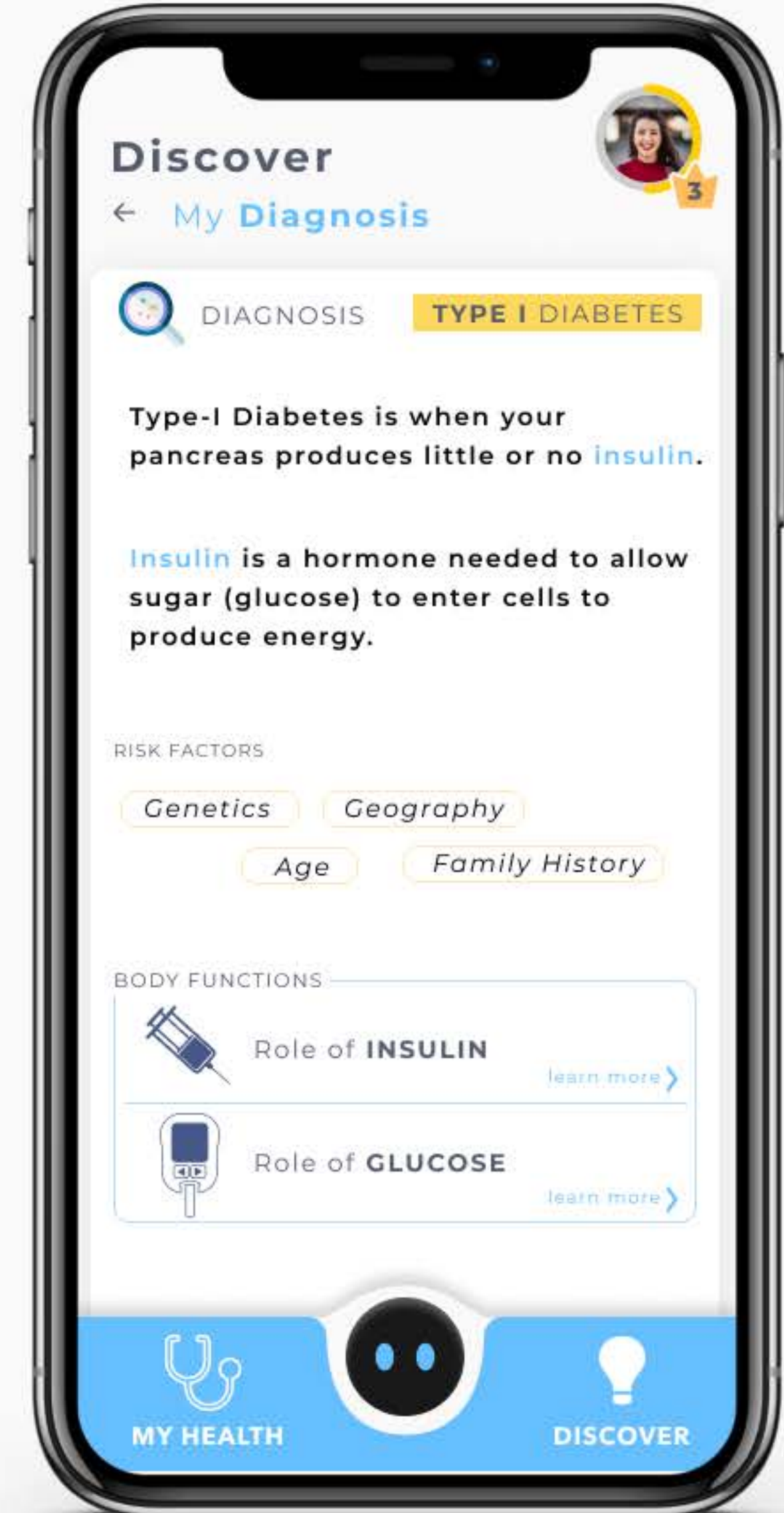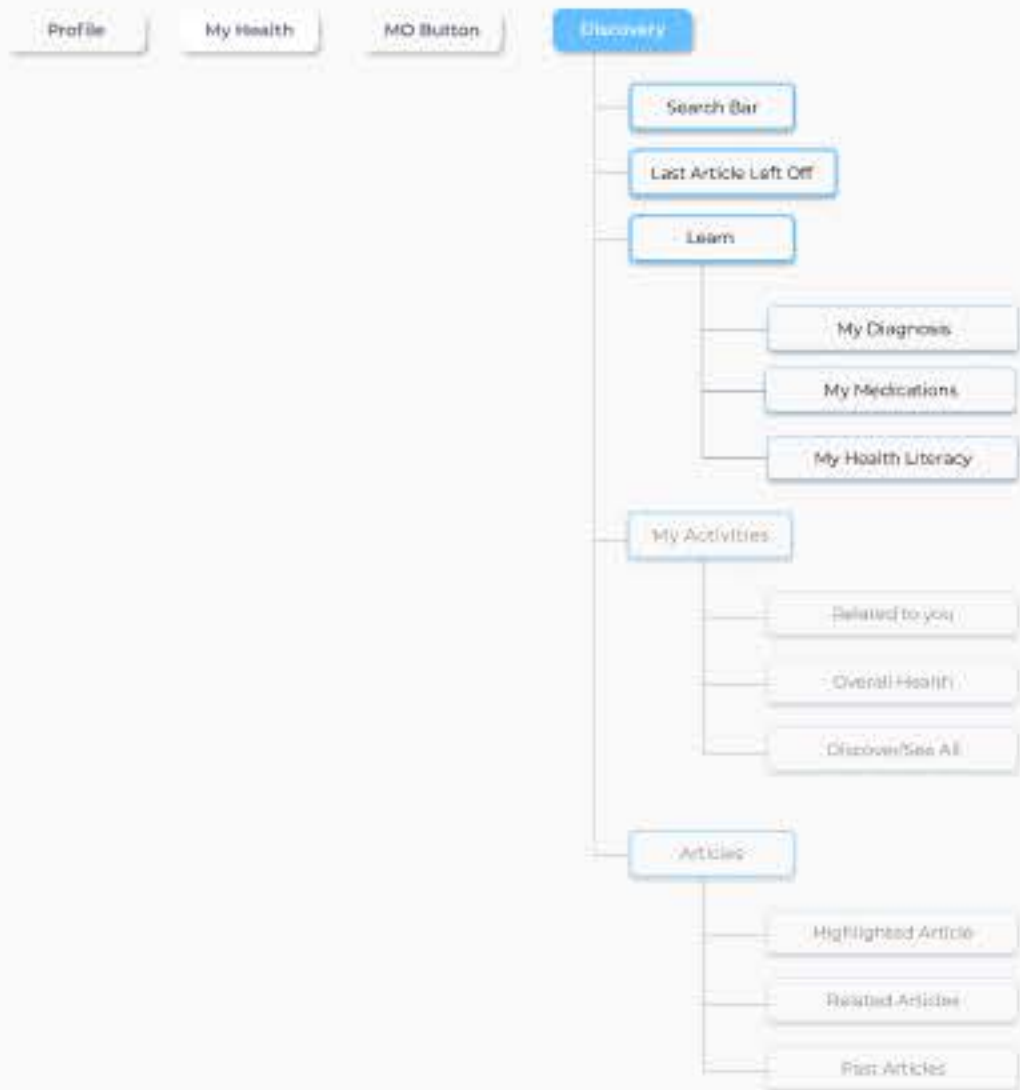
Discover

Discover allows patients to take control of all the information regarding their physical health.
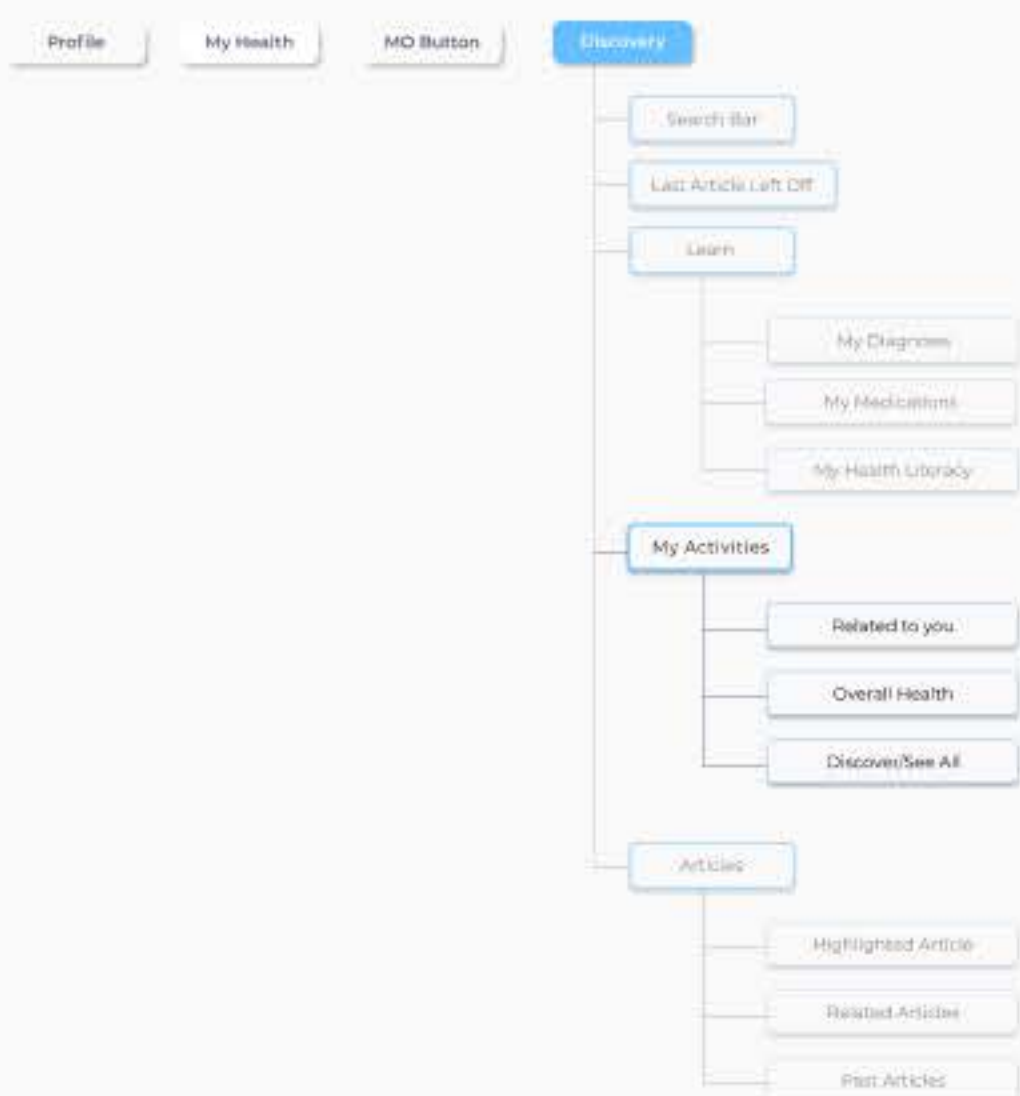
Changes

Access to direct or related health concepts from trusted medical sources.

Share content and discuss health factors with those around you.

In Hospital | At Home

REMDi

MO

MO App

MO
medicine

LOG IN
SIGN UP
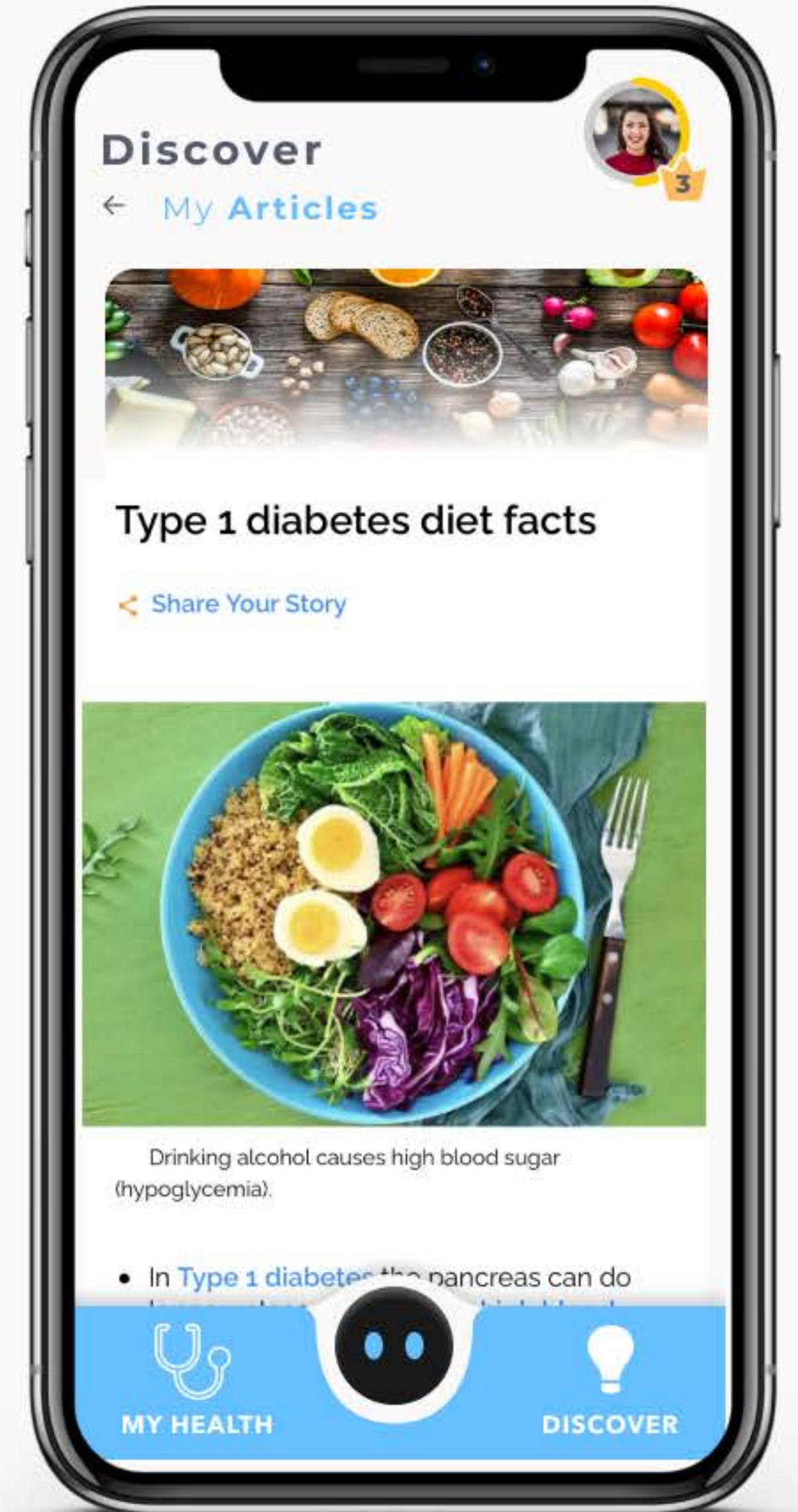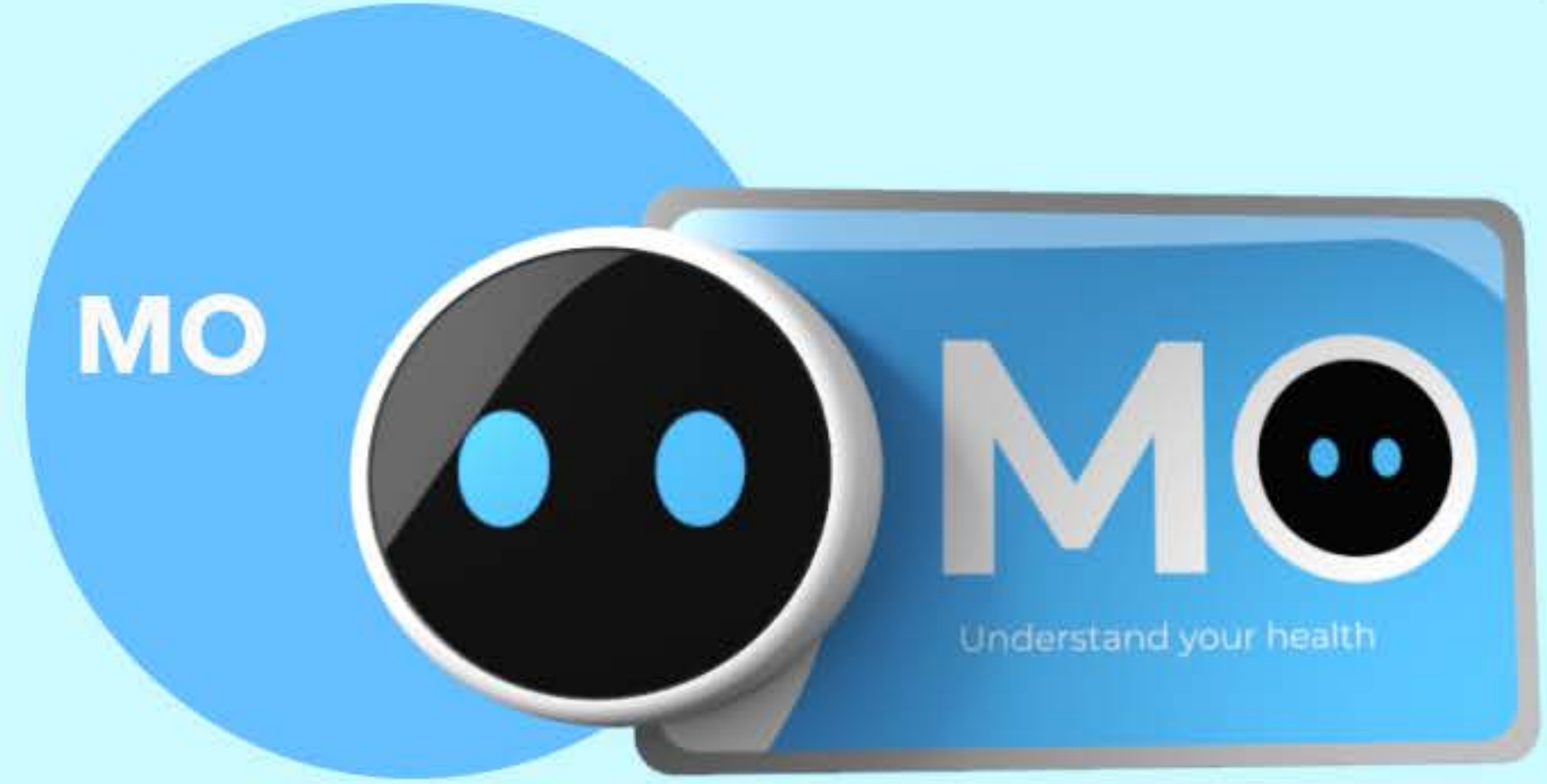
Patient asks MO questions regarding their health

User logs in and views their healthcare plan.

MO answers the patient's questions in a way that they can understand.

MO App provides information, learning activities, and easy to understand discharge instructions.

User

MO
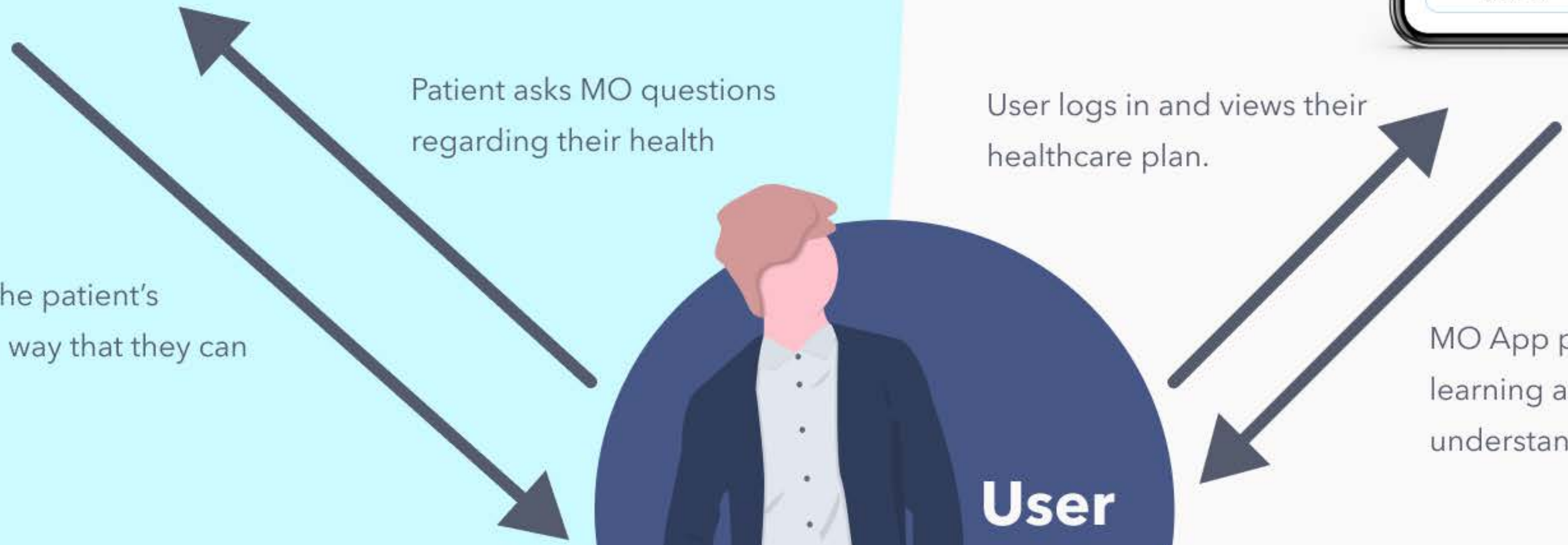
third iteration

MO in the **Hospital**

The in-hospital MO interface was created to give patients an **outlet** to ask their questions and recieve accurate, easy to understand answers, **without taking essential time away from clinicians.**

REMDi

the
physical changes

Integrated tablet for **easy visuals.**

Clamp for adjustable bed **placement.**

Flattened back for easy placement.

We conducted moderated user tests to evaluate the
MO in-hospital tablet interaction screens.

5 in-person **users**

Tablet **UI**

menu

Patient: Schrewber, Isaac
DOB: 03/17/1995

What would you like to do?

🔍 search

my health chart

my questions

discover

help
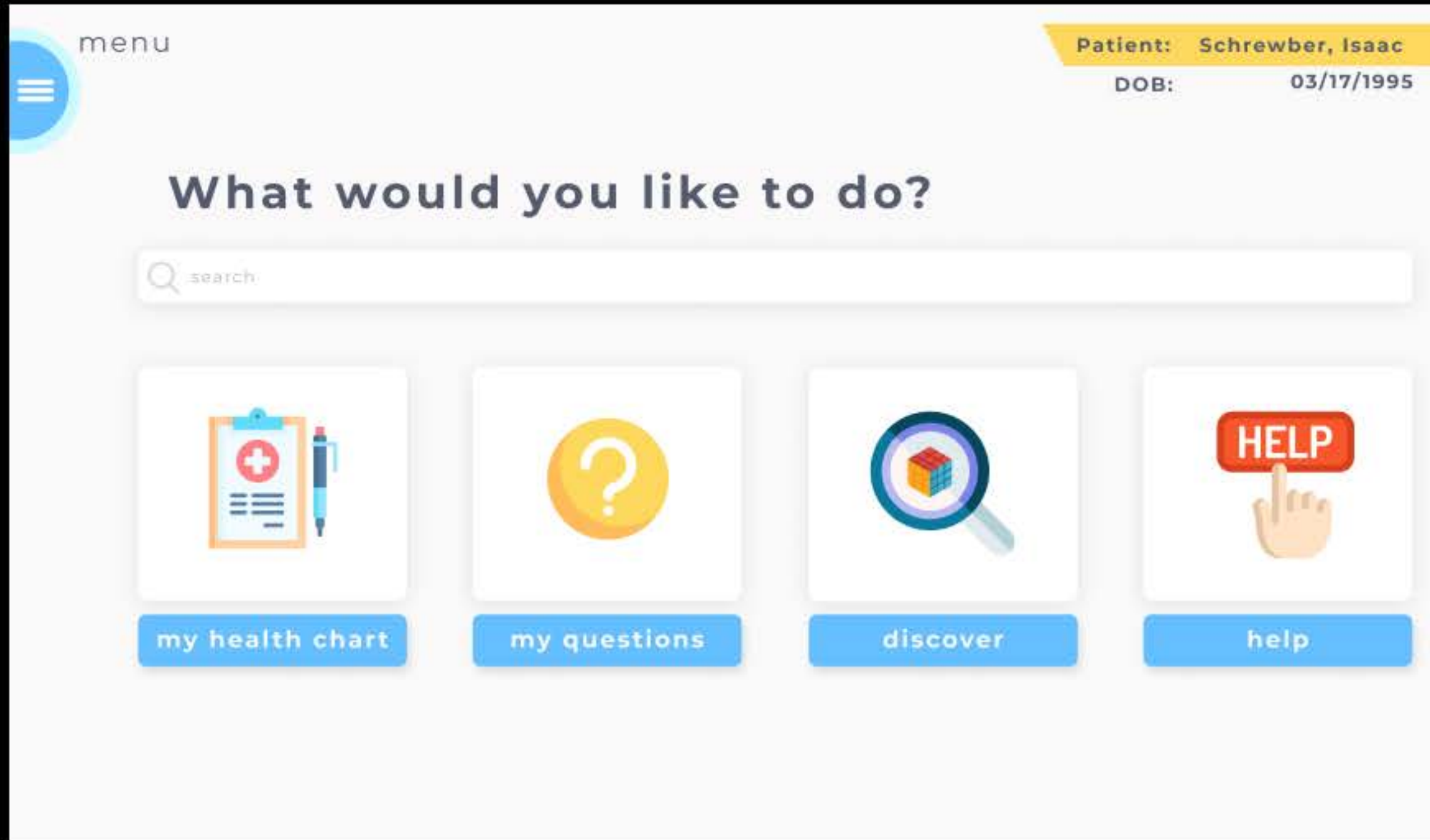
Users suggested some minor changes regarding labelling.

Users wanted another section to explore terms express their symptoms.

Tablet **UI**

REMDi
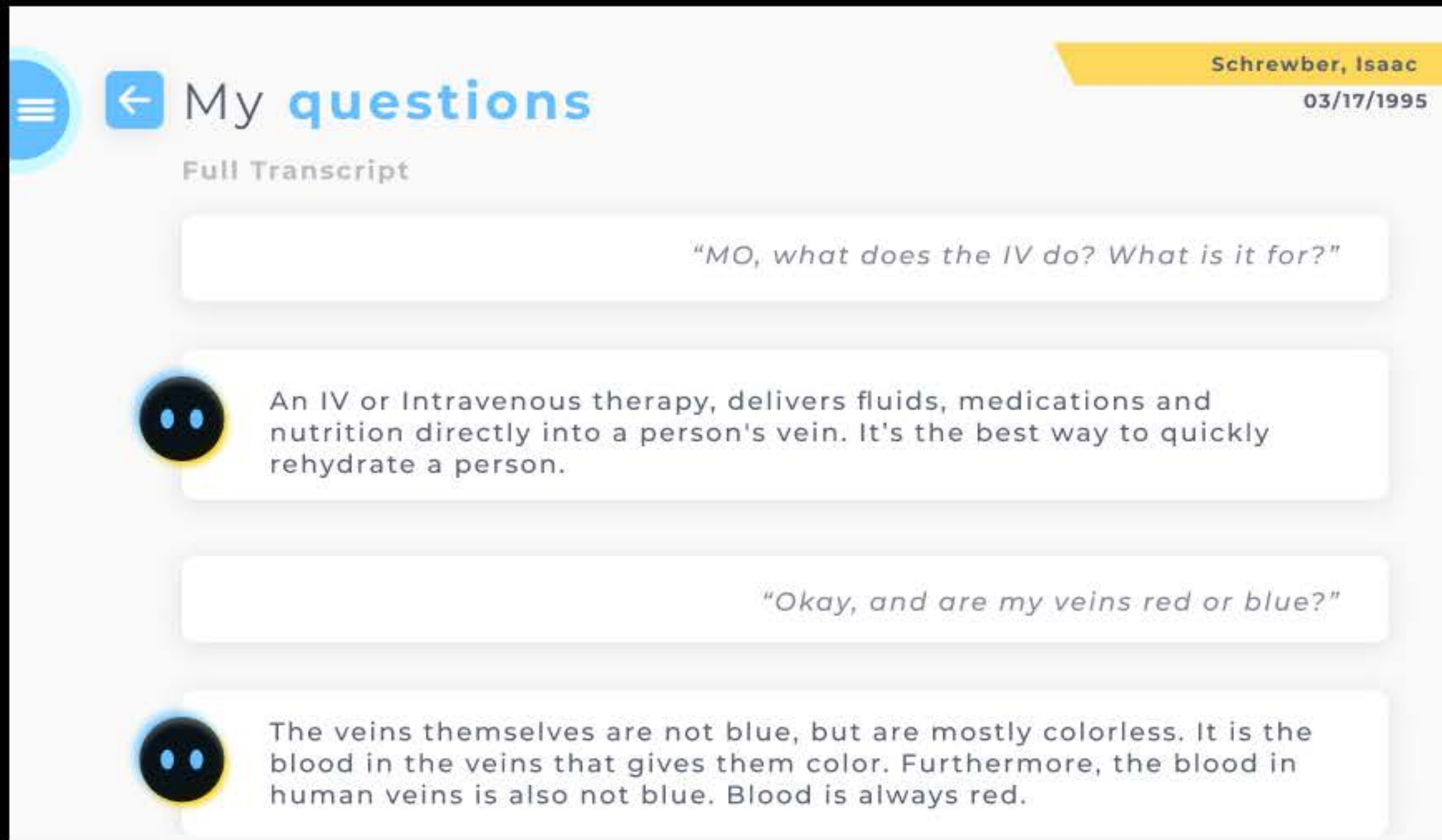
Users will be able to look at their past questions to MO that they have asked during their visit.

Final **Components & Functions**

REMDi

Features	Functions
7" HDMI_LCD Screen	Shows visuals
KingTech Round LCD	
Google API & Python	Analyze verbal instructions
HONKYOB USB Mini SPeaker	Gives verbal feedback
USB Lavalier Lapel Microphone	Receive verbal feedback
UDOO X86 II Advanced Plus	Run the system
CPU Fan for X86 Heatsink	To keep the system cool

MO at **Home**

The in-hospital MO interface was created to give patients an **outlet** to ask their questions and recieve accurate, easy to understand answers, **without taking essential time away from clinicians.**

REMDi

MO
medicine

LOG IN

SIGN UP

6 User Missions

23 Unmoderated User Tests

49% Direct Successes

42% Indirect Success

8% margin of error
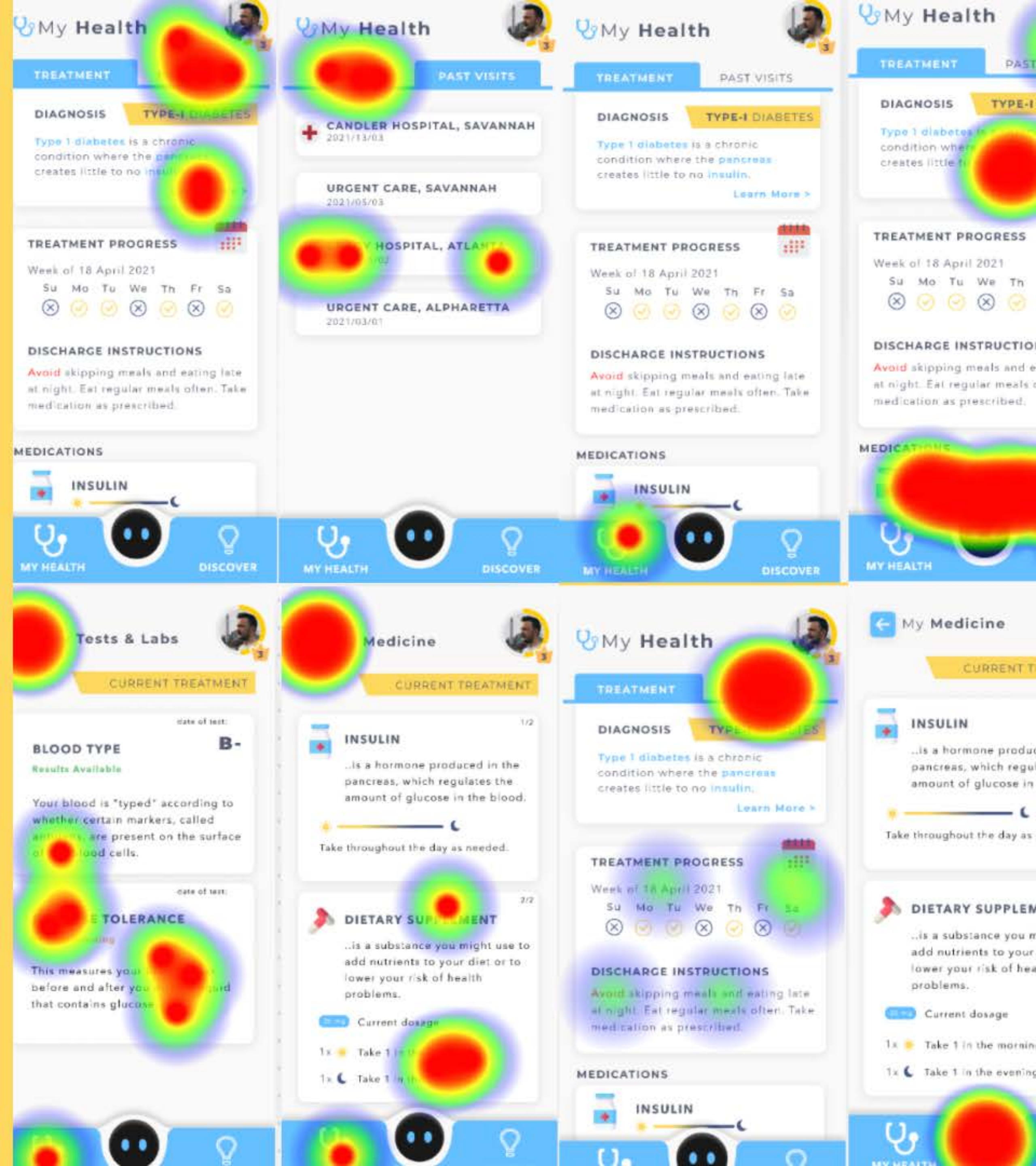
9 Moderated User Tests

7 Patients, 2 Subject Matter Experts

9 Mission Tasks
in Round 1

Hueristic user testing evaluation to review the visual and interactive design of the second iterative prototype.

8 Mission Tasks
in Round 2

USE Questionnaire Follow-up

REMDi

Information
Architecture
V3

MO-bile App

My Progress

Health

MO Button

Discover

Settings
- Account Info
- Notifications
- Terms & Conditions
- Your Patient Rights
- Hospital Code

My Health Literacy Level

Progress Summary

My Diagnosis

Health Literacy Quiz

Treatment

My Diagnosis
- Diagnosis Summary
- Role Inside of the Body
- My Medications

Treatment Progress Bar
- Interactive Calendar
- My Medication Checker
- My Medications

Discharge Instructions

My Medications
- Prescriptions

Test & Lab Results
- Tests & Lab info

Past Visits

Summary of Visit
- Past Medications
- Past Tests & Labs
- Doctor's Notes
- Insurance On File

My Medications

Search with Speak Aloud or Type
- Relevant Activities
- Relevant Articles

My Diagnosis

My Past Questions

Search

Last Article Left Off
- Article Link

Articles
- Related
- Learn

Activities
- Diagnosis Activity (Categories)
  - Category Activities
    - Activity Description
      - Activity Demo & Begin
- Other topics

Learn
- My Diagnosis
  - Diagnosis Summary
  - Role Inside of the Body
- My Medications
  - Prescriptions
  - Past Medications
- My Progress

Your Patient Rights

Your **personal currator** at the tap of a button.

Using the MO button patients can ask MO questions like before, but now MO offers suggested articles and activities related to user questions to encourage them to continue exploring.

REMDi

Hello Isaac, what can I help you with?

My Diagnosis

My Medications

My Past Questions

Speak aloud or type
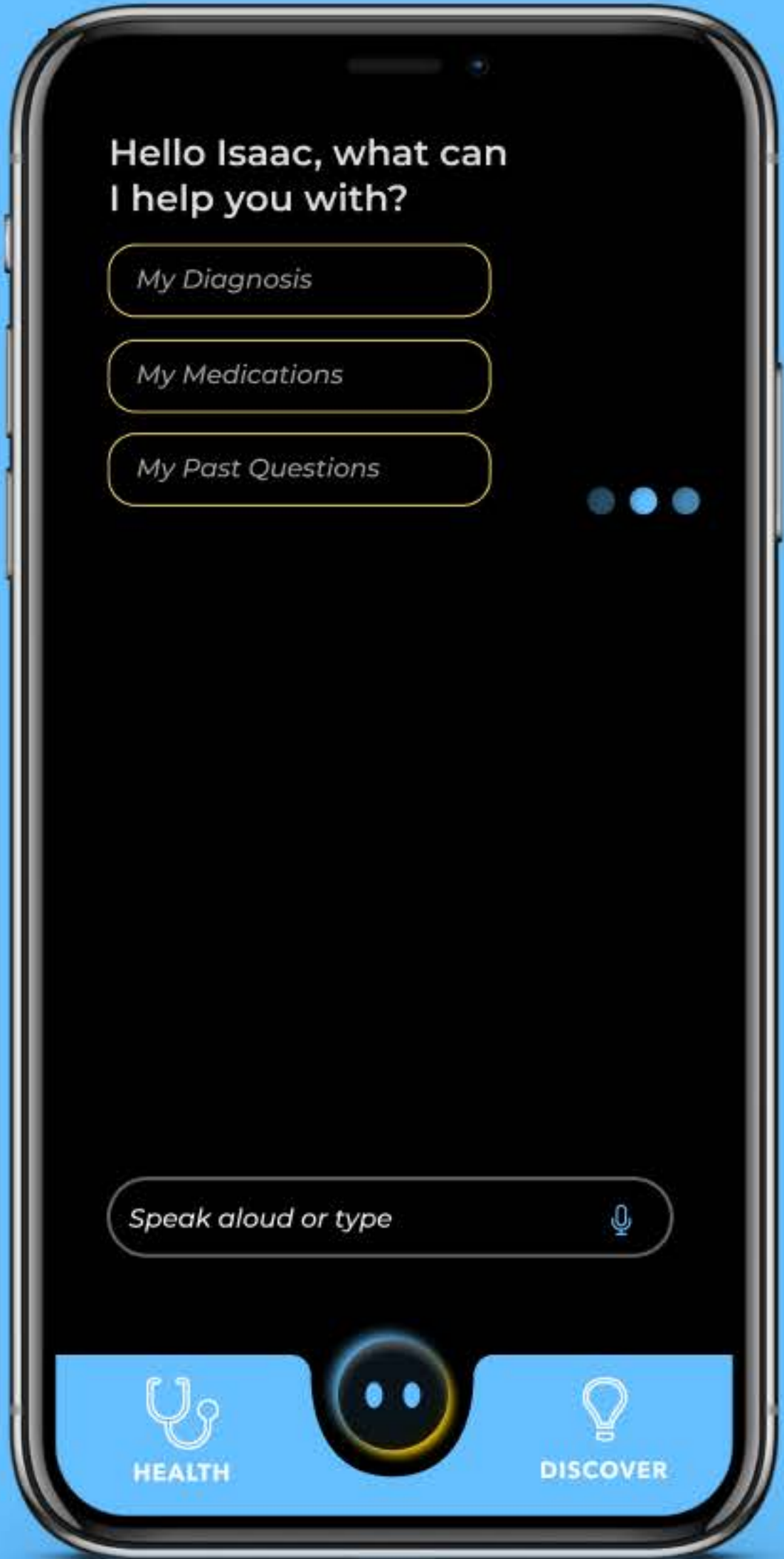
HEALTH   DISCOVER

New learning activities for increased learning.

The discover page now has 6 new activities for patients to play and increase their health literacy rate!

REMDi

REMDi

The
MO
Medical Network

THE
final design

MO Physical Form

MO Final Application

Final Impact

Business Model

Deliverables

In the **hospital**

Conversational AI

Ask MO questions at any time regarding their health and hospital progress.

In the **hospital**
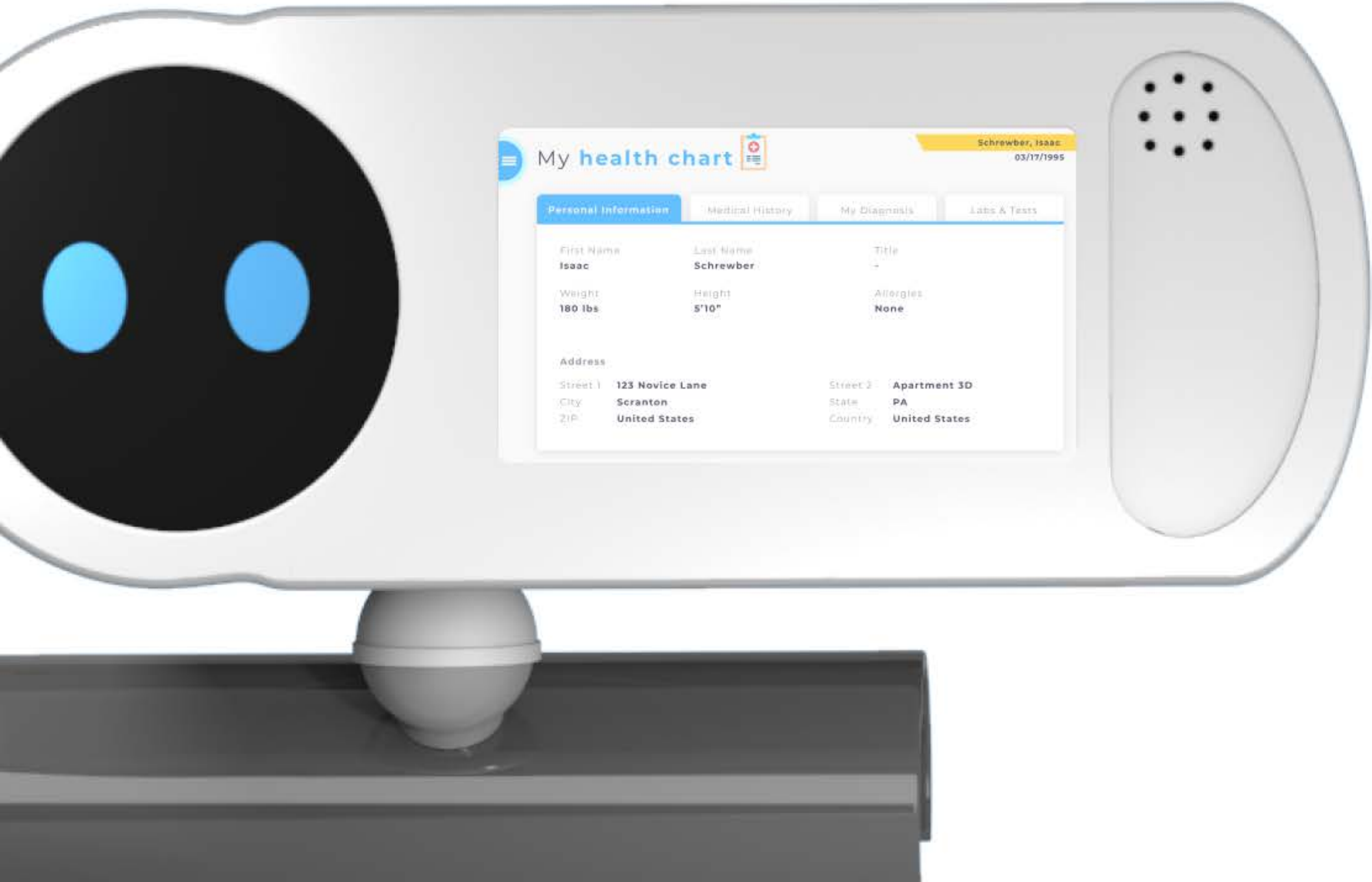
REMDi
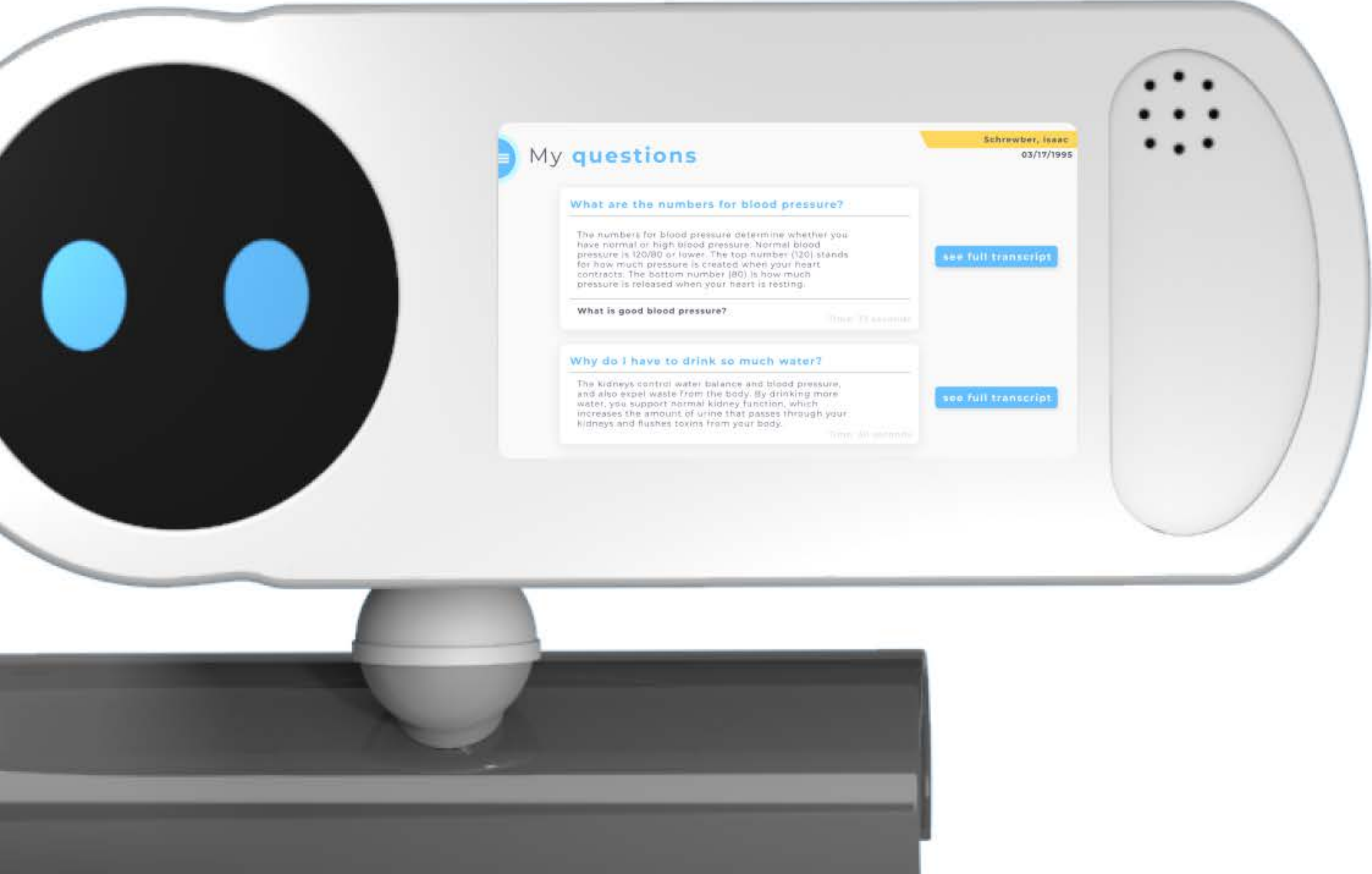
Entertainment Hub

Discover health related

games, shows, and articles

while they wait.

In the **hospital**
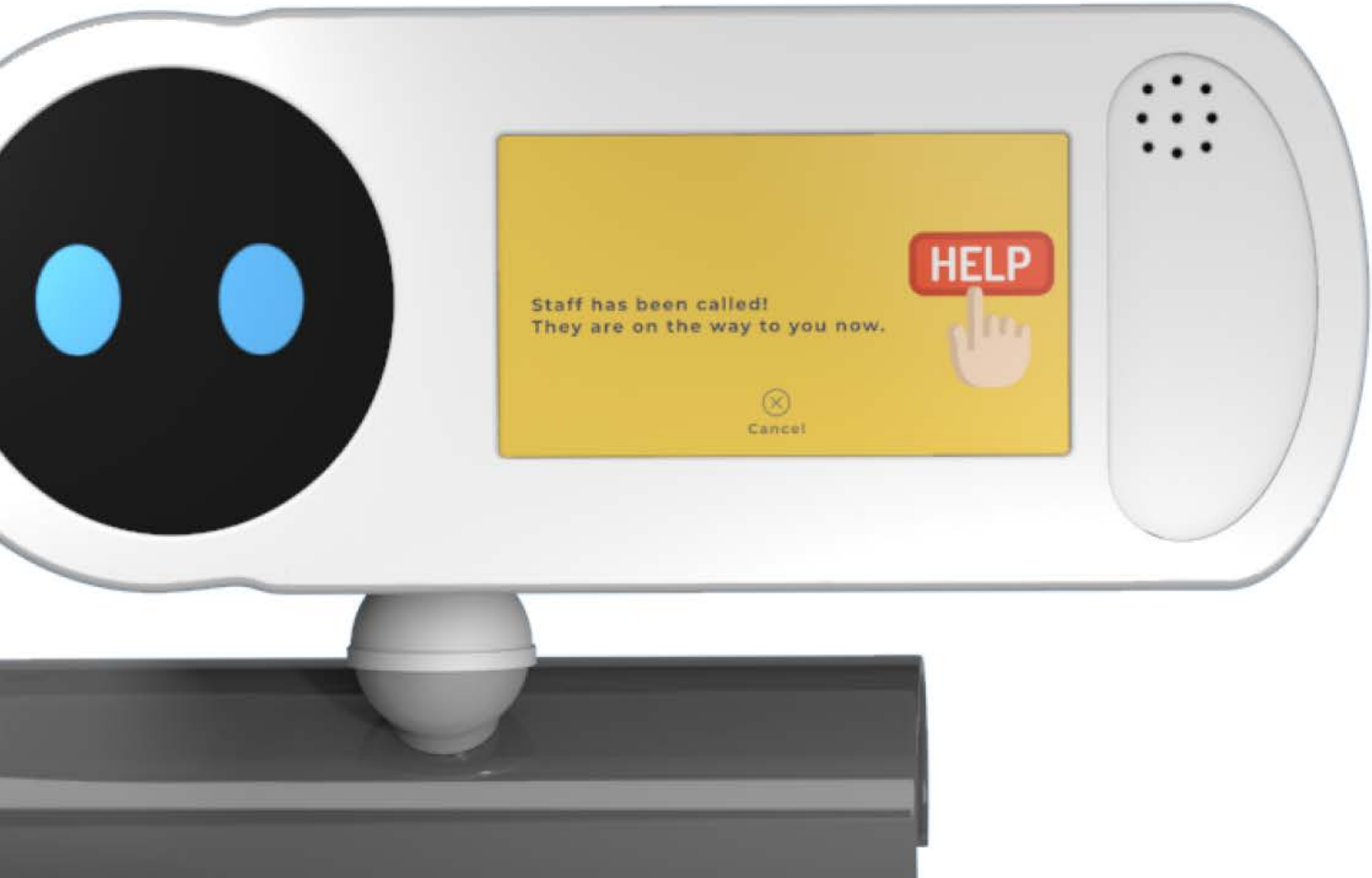
Immediate Relief

Call for help from hospital

staff without the hassle.

MO's key feature is its **interactive Voice UI** that is available for patients both within the hospital and when they return home. MO ensures that patient questions are not only listened to but are actually answered in the simplest way a patient can understand.

The **value** of **VUI**

Patients have a **medical assistant** present whenever they need them.

MO **informs and entertains** patients while they wait in the ER, maintaining **patient satisfaction**.

Patients have an outlet to ask questions **without disrupting clinicians** in emergency situations.

REMDi

REMDi
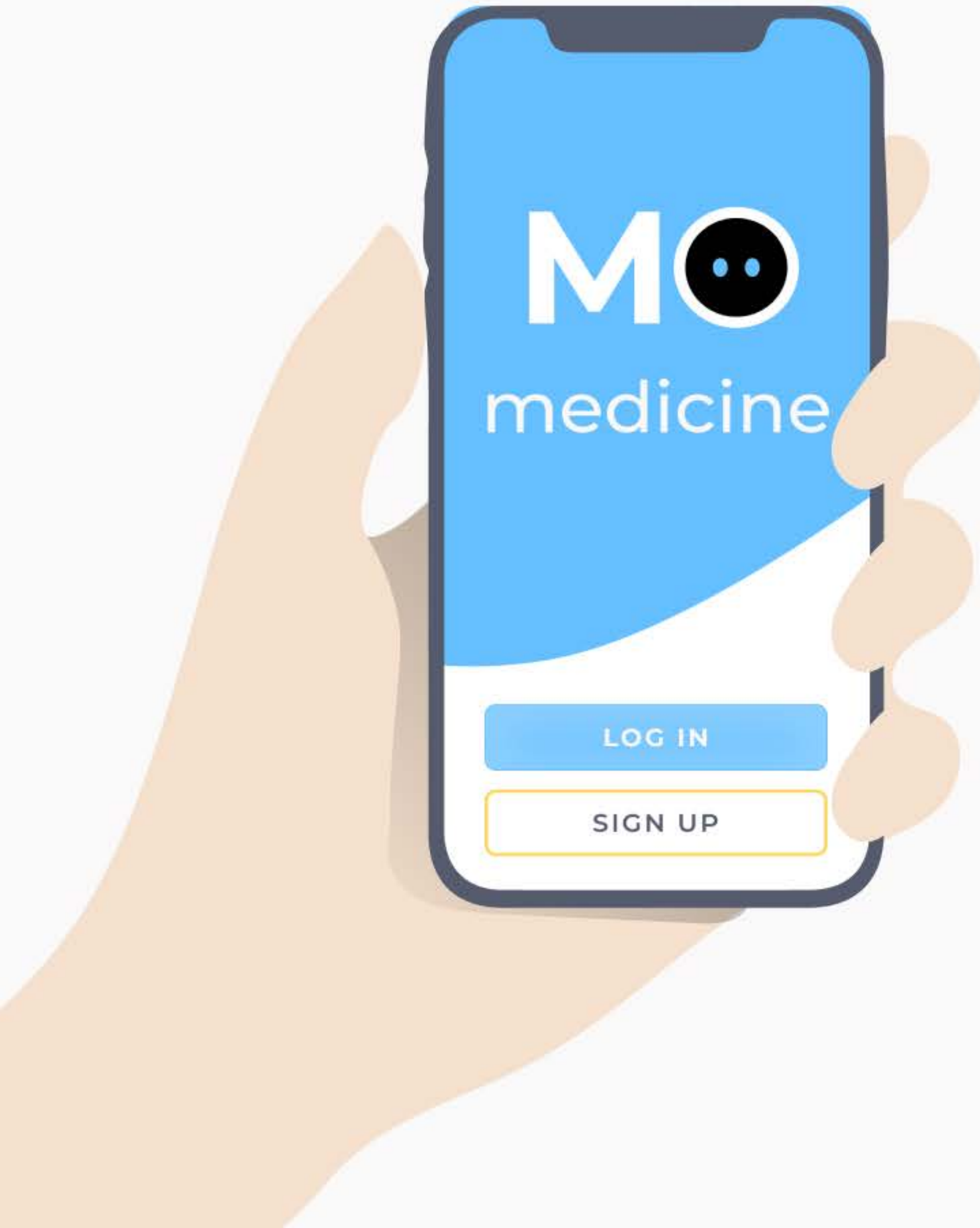
Available **in hospital** and **at home**
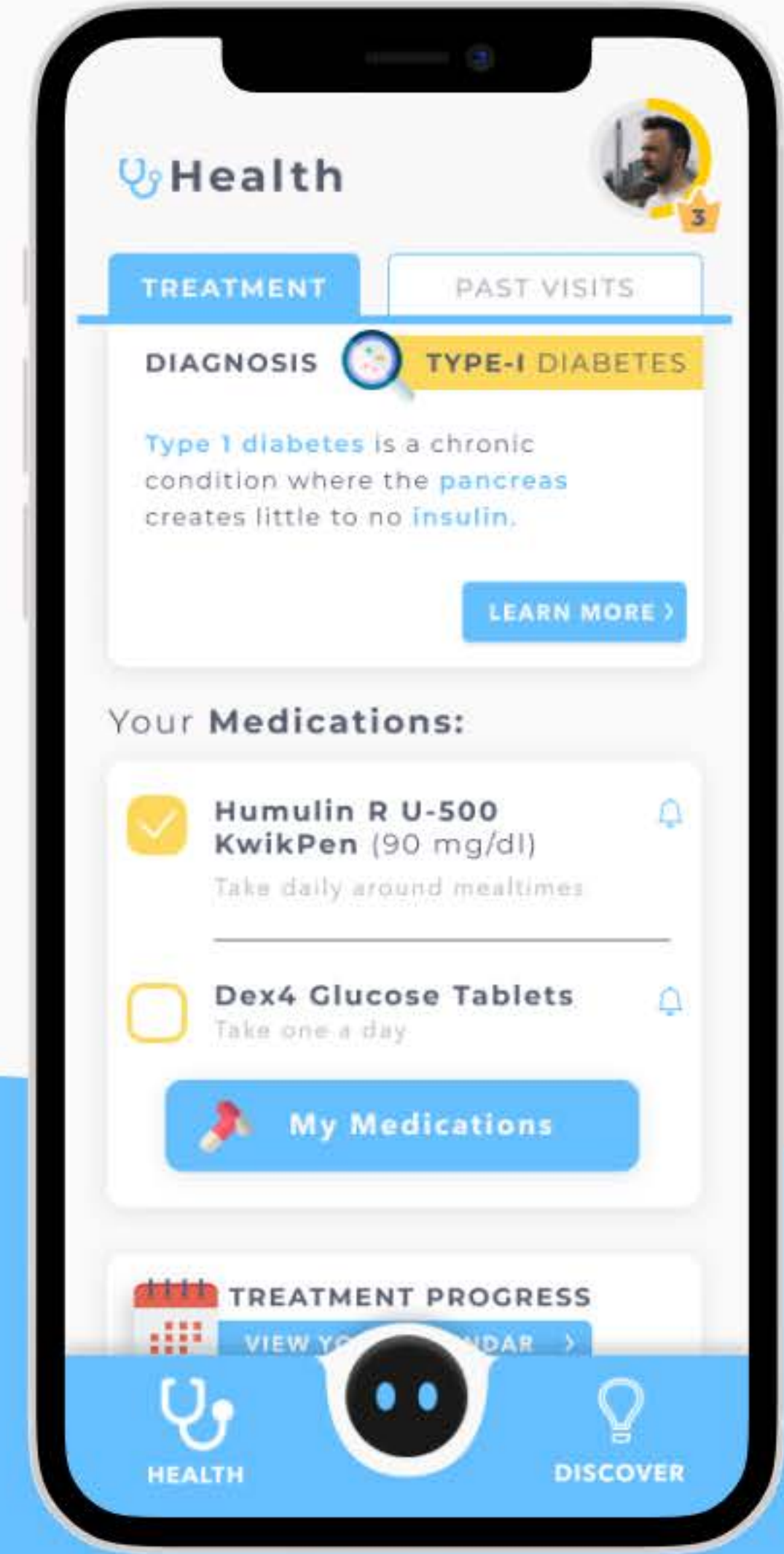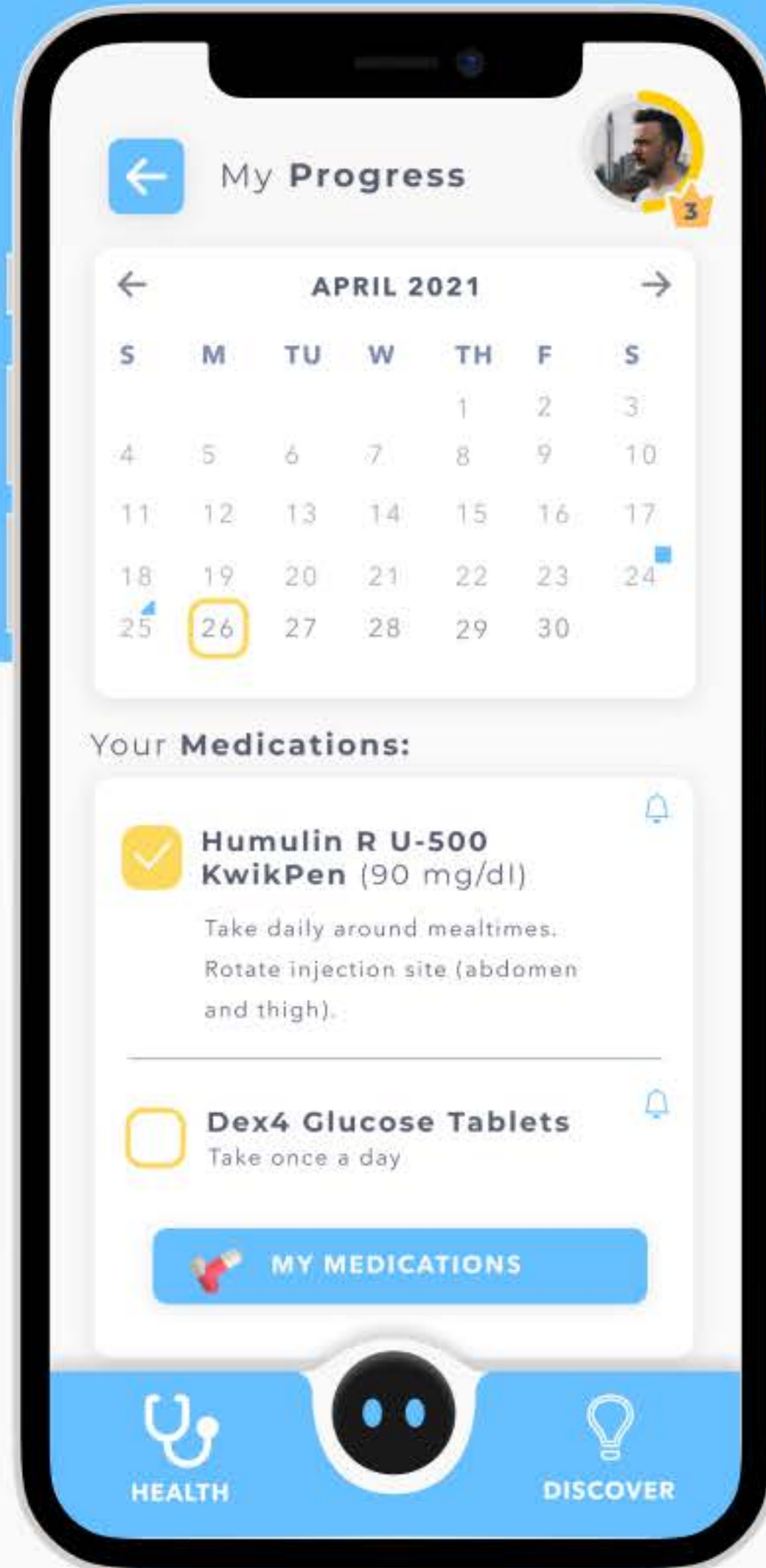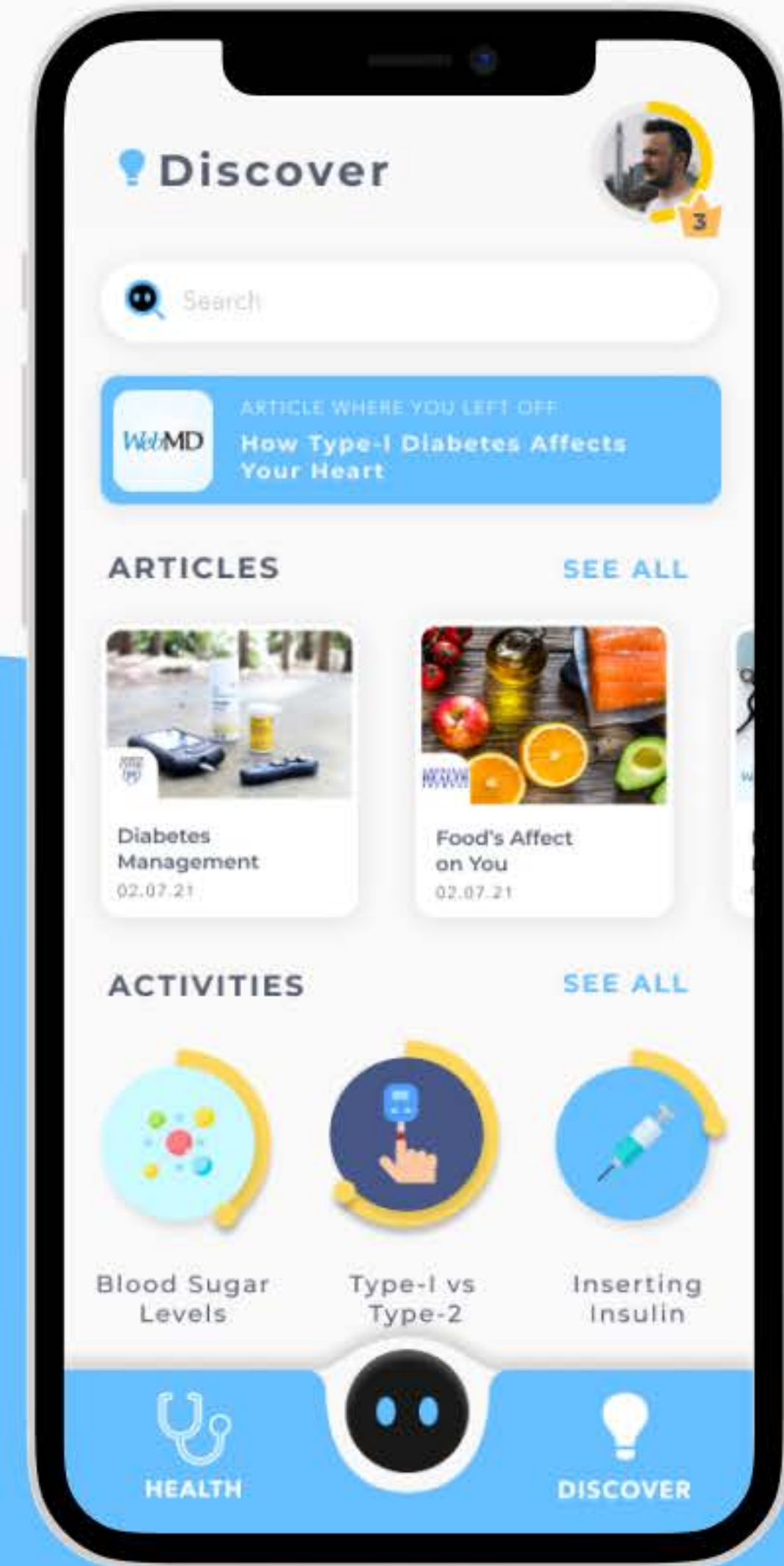
In the **At-Home App**

Your **personal curator** at the tap of a button.

In the **At-Home App**

REMD†
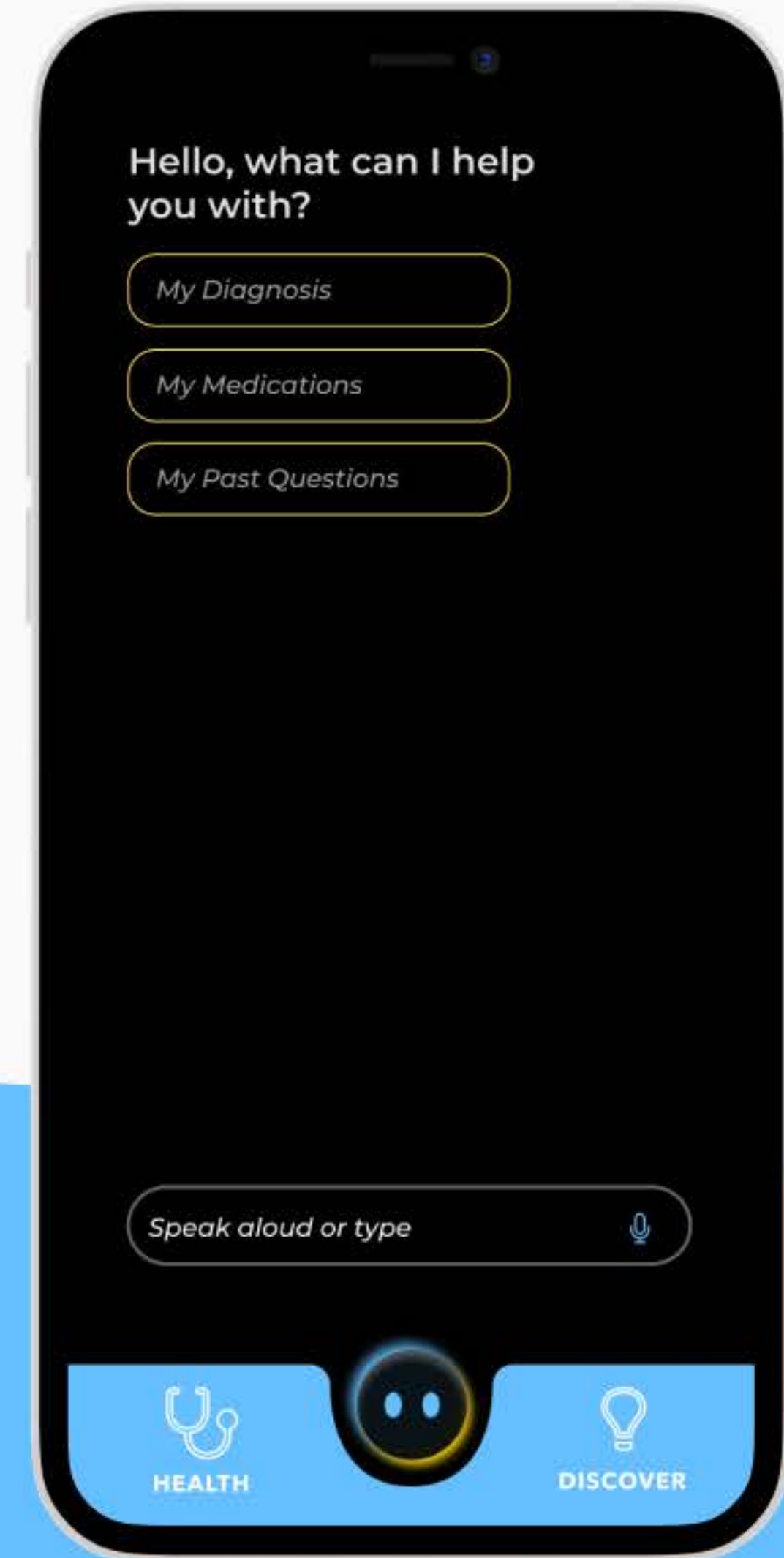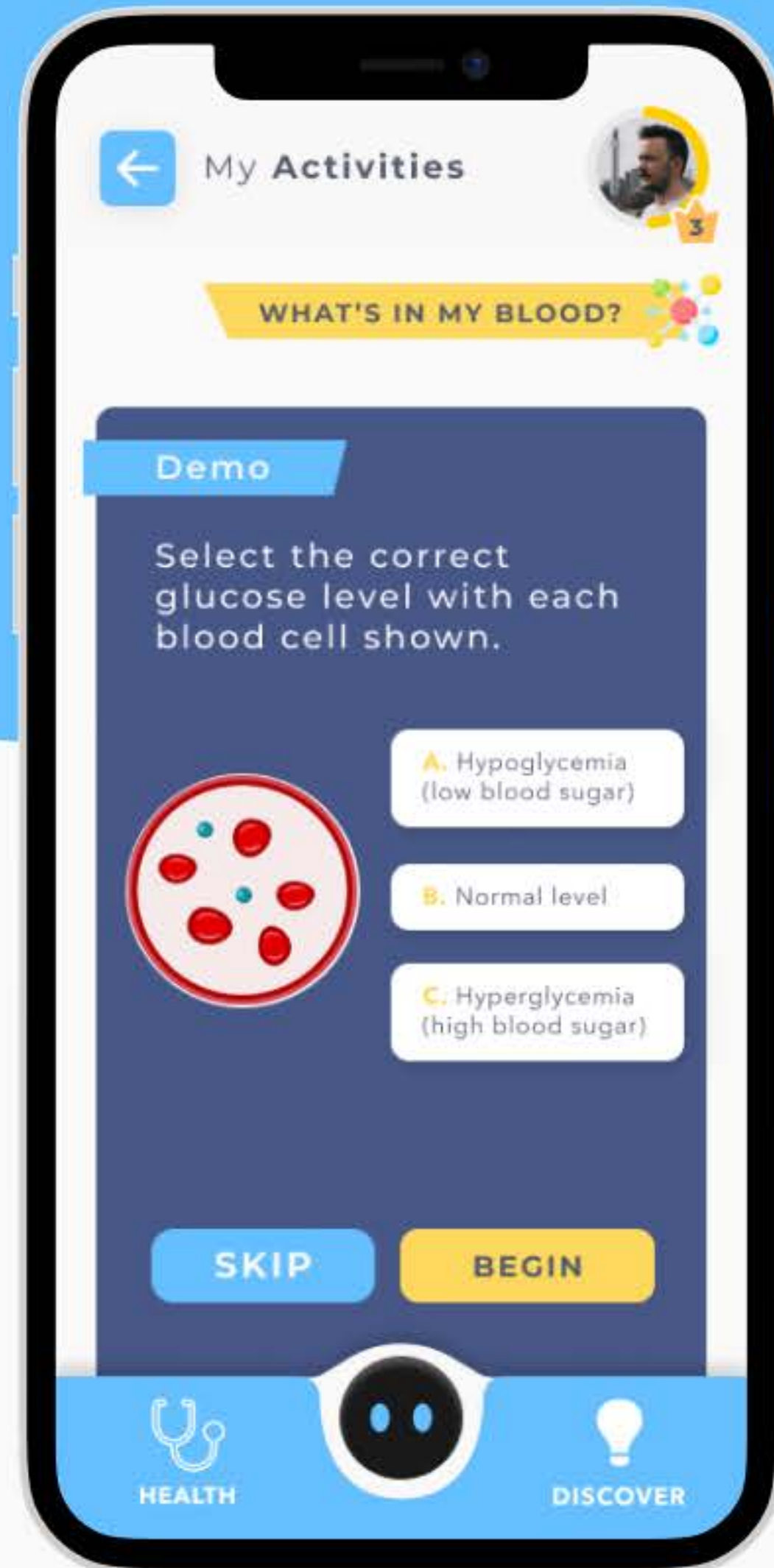
Maintains and increases patient engagement to stay informed on bodily health.

Entertaining education to increase **patient satisfaction.**

REMDi

MO Medical Network works with **you**

Contract based service

Holistic system for your **patients and staff**

By using MO Medical Network, hospitals will see

Decrease in **return ER visits**

By using MO Medical Network, hospitals will see

Increased patient satisfaction
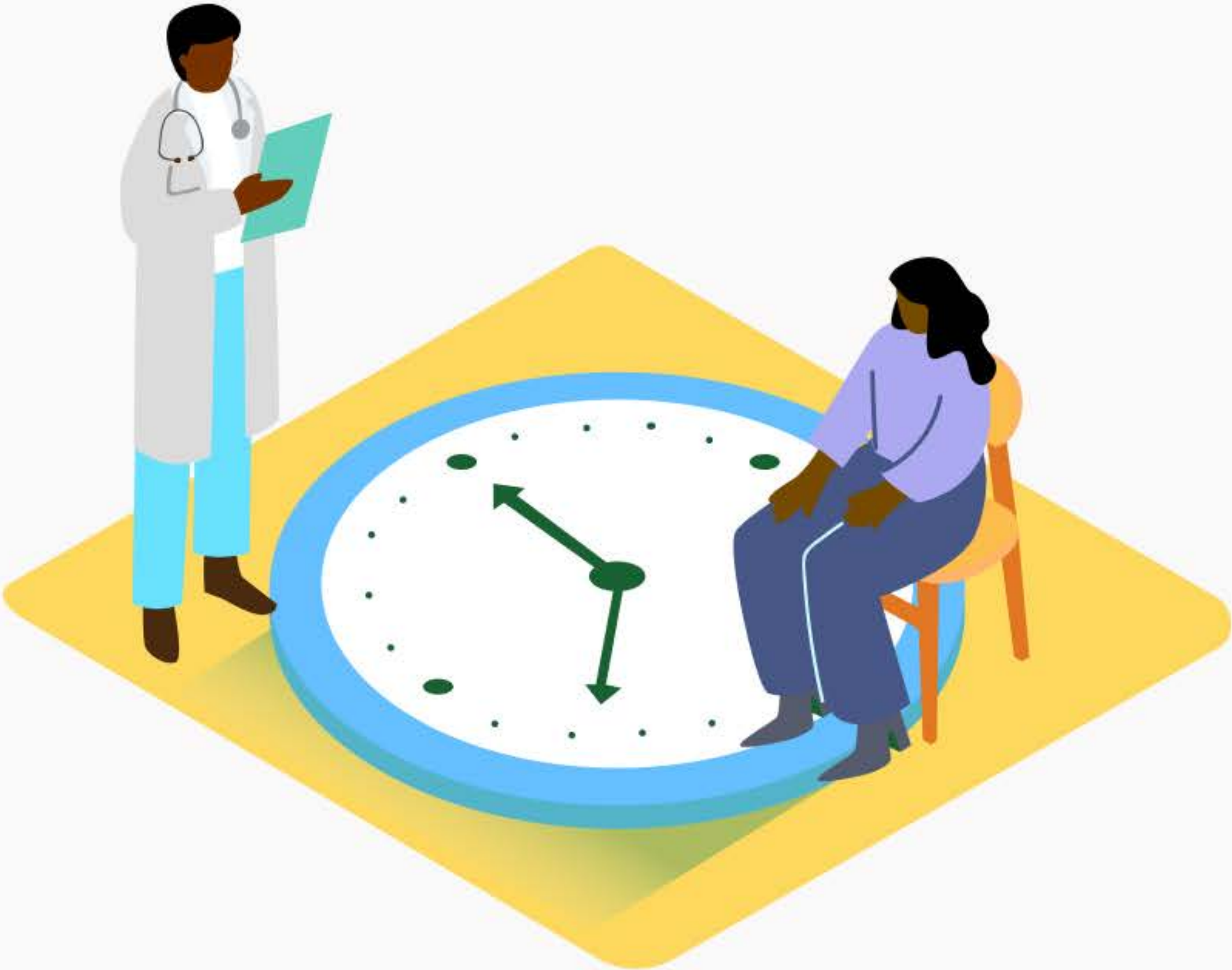
our **value**

MO will **increase patient satisfaction and comfort** by supplying easily digestible and catered information **at the patient's pace.** MO will **decrease the amount of non-essential time** clinicians spend with patients, allowing clinicians to **focus on priority situations.**

what makes
us different

MO focuses on **comforting** and **educating** patients on their conditions in an individualized way. Unlike our competitors, MO is available both **in and out of the hospital**, and focuses on **longterm patient education.**

Updated Business Model

REMDi

Key Partners

- Hospitals
- Clinicians
- Community Organizers

Key Activities

- Community participation
- Clinician cooperation
- User testing for platform
- Clear health literacy evaluation method

Value Proposition

Reducing healthcares costs, risks, and concerns by fostering better communication and understanding between patient and clinician and increasing long term health literacy of patient and community.

Custom Relationships

- Long Term
- Dedicated Personal Assistance
- Communities
- Co-creation

Customer Segments

- Multi-sided
- Niche (Medical Field)

Cost Structure

- Value Driven

Key Resources

- Health literacy experts
- Clinicians
- Patient education material experts

Channels

- App
- Physical Product

Revenue Streams

- Customizable pricing plans

End the confusion,
Understand your health.

The MO Medical Network is a network designed to help you understand your health through the use of catered content and resources. Stop the confusion caused by inaccessible healthcare information; the MO Medical Network helps you take your health into your hands.
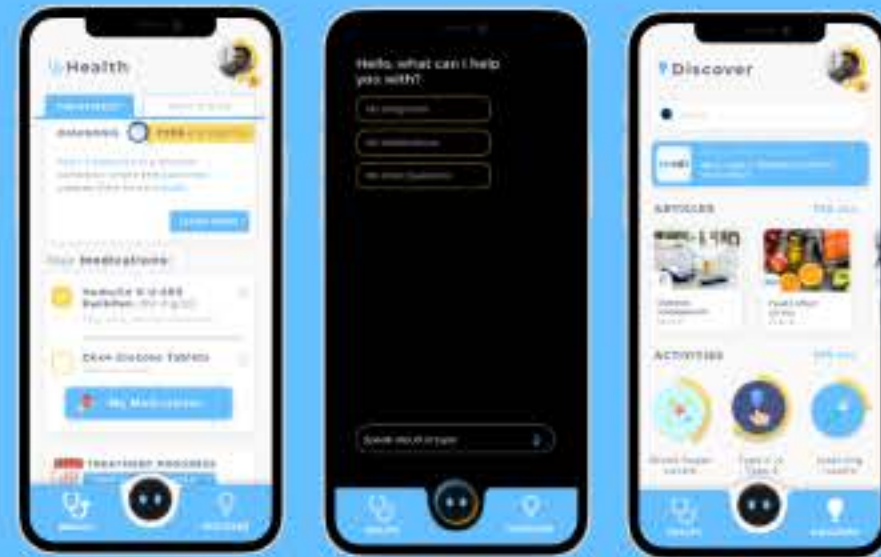
MO
medical network

MO
medical network

LOG IN

SIGN UP