



Pre-Clinical Intake & Care for **Urgent Medical Needs**

Decision Support, Intake, Preclinical Care, Transport, and Transfer.

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Master of Design, Experience Design | San José State University



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Abstract

With the advent of a new era in AI and robotics, highly automated driving technologies are reshaping how we experience both personal vehicle use and public transportation. AI may also challenge how we access medical services today. Through speculative and discursive design practices, my thesis aims to start a conversation about how these technologies — particularly self-driving cars and AI in healthcare — might augment our lives. Specifically, I want to explore the potential of autonomous vehicles as transportation services for urgent medical needs.

My starting point is an observed gap in current medical transportation options — between calling an ambulance and driving oneself /asking a family or friend to drive. By deploying mature autonomous vehicle technologies for medical transport, a new type of service could utilize the mobile space as an extension of hospitals and clinics, enabling patient pickup, remote check-in, and patient transfer.

The mobile care space also presents opportunities to integrate tele-health technology, which could initiate patient assessment before arriving at a hospital or clinic. With this future mobility capability, patients looking for urgent medical care could benefit from both the convenience of on-demand transport and access to medical support en route.

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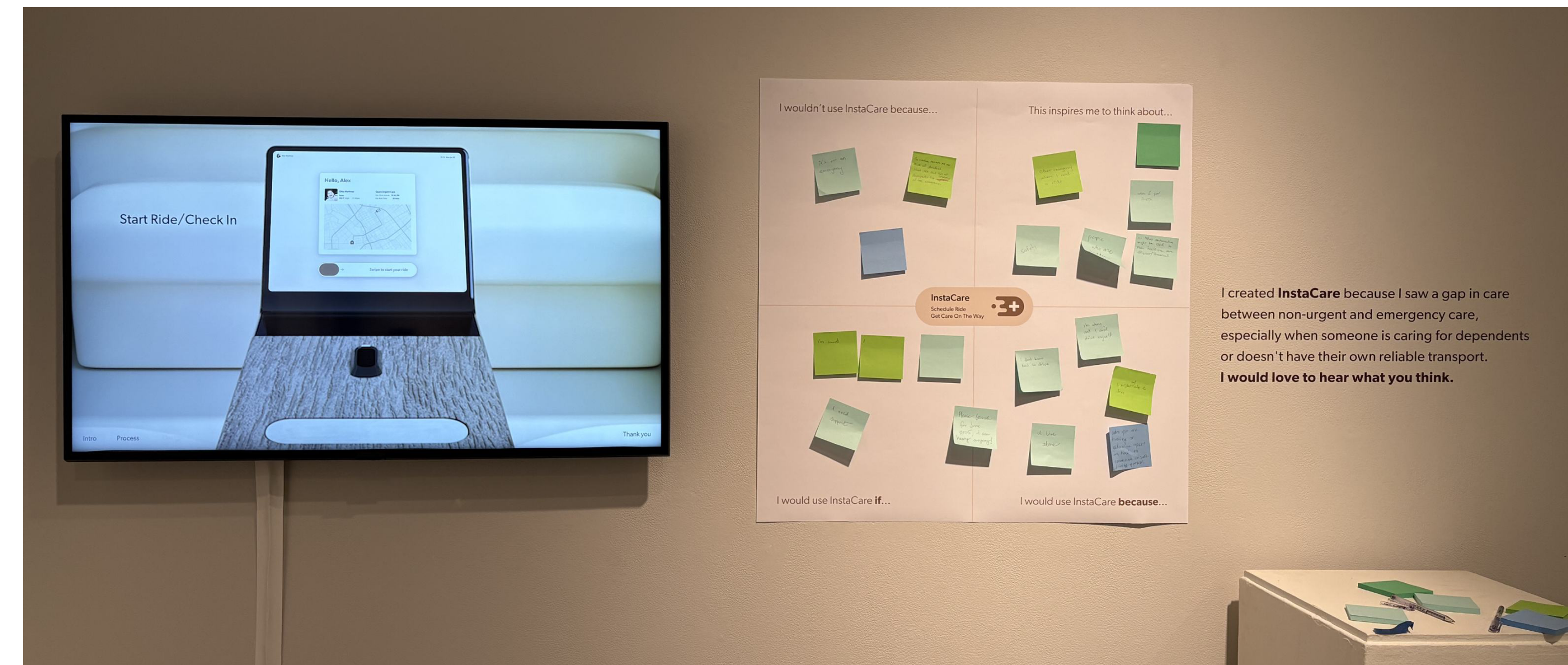
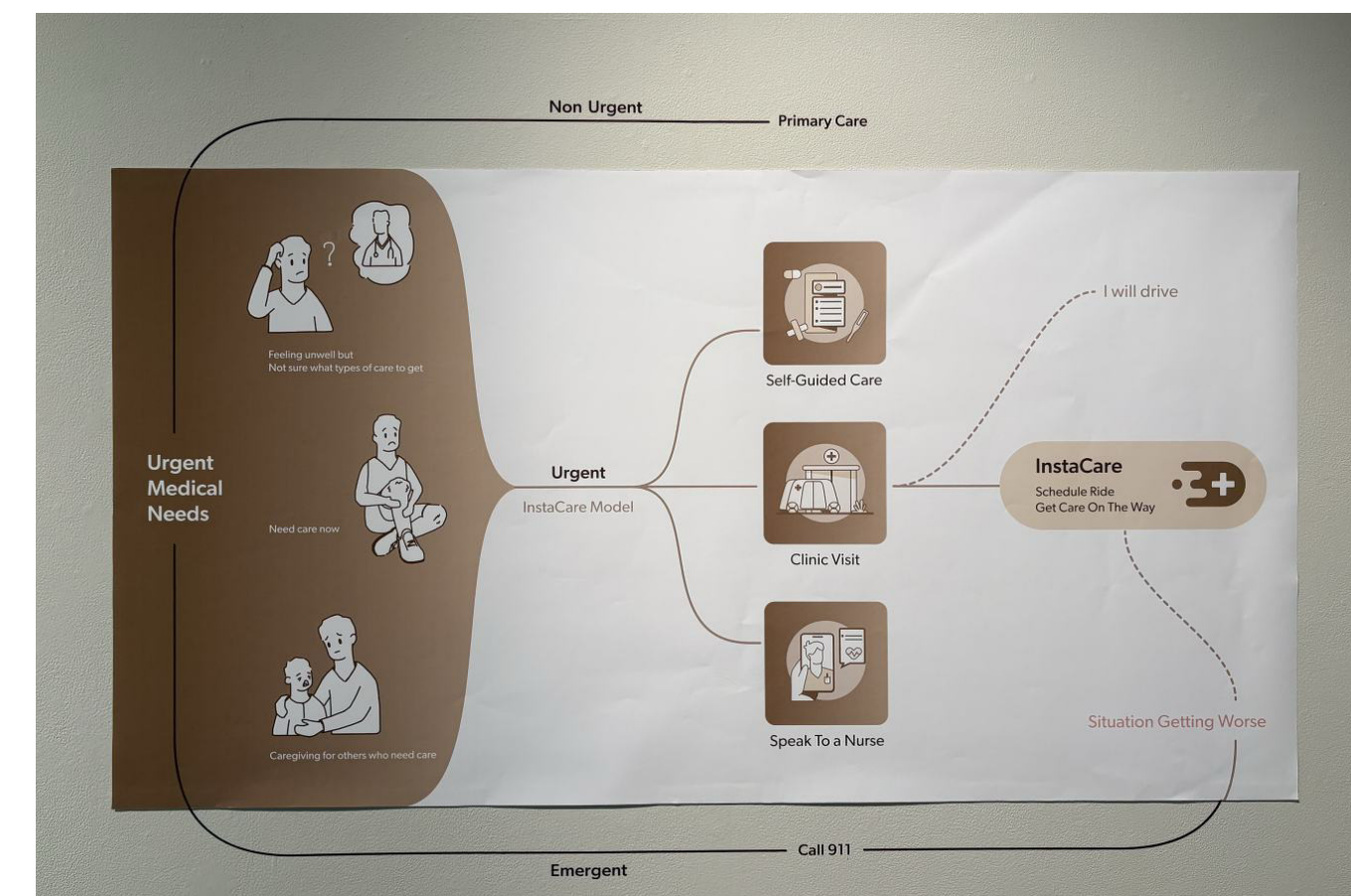
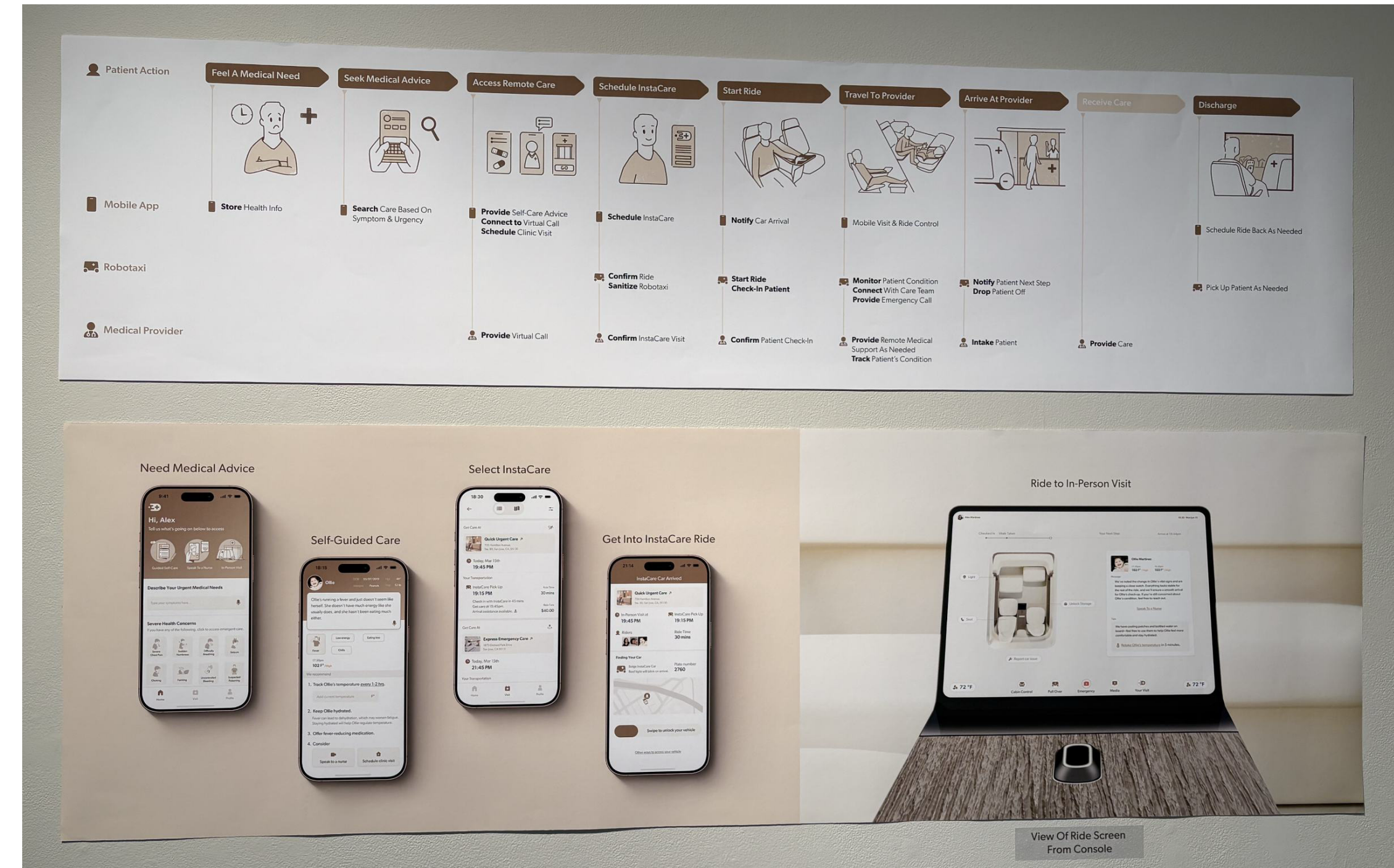
Thesis Advisor
Industrial Design and MDes faculty

I would like to sincerely thank my thesis committee for your guidance and support throughout this journey. Your feedback encouraged me to think more critically and inspired me to approach design challenges with more confidence and creativity.

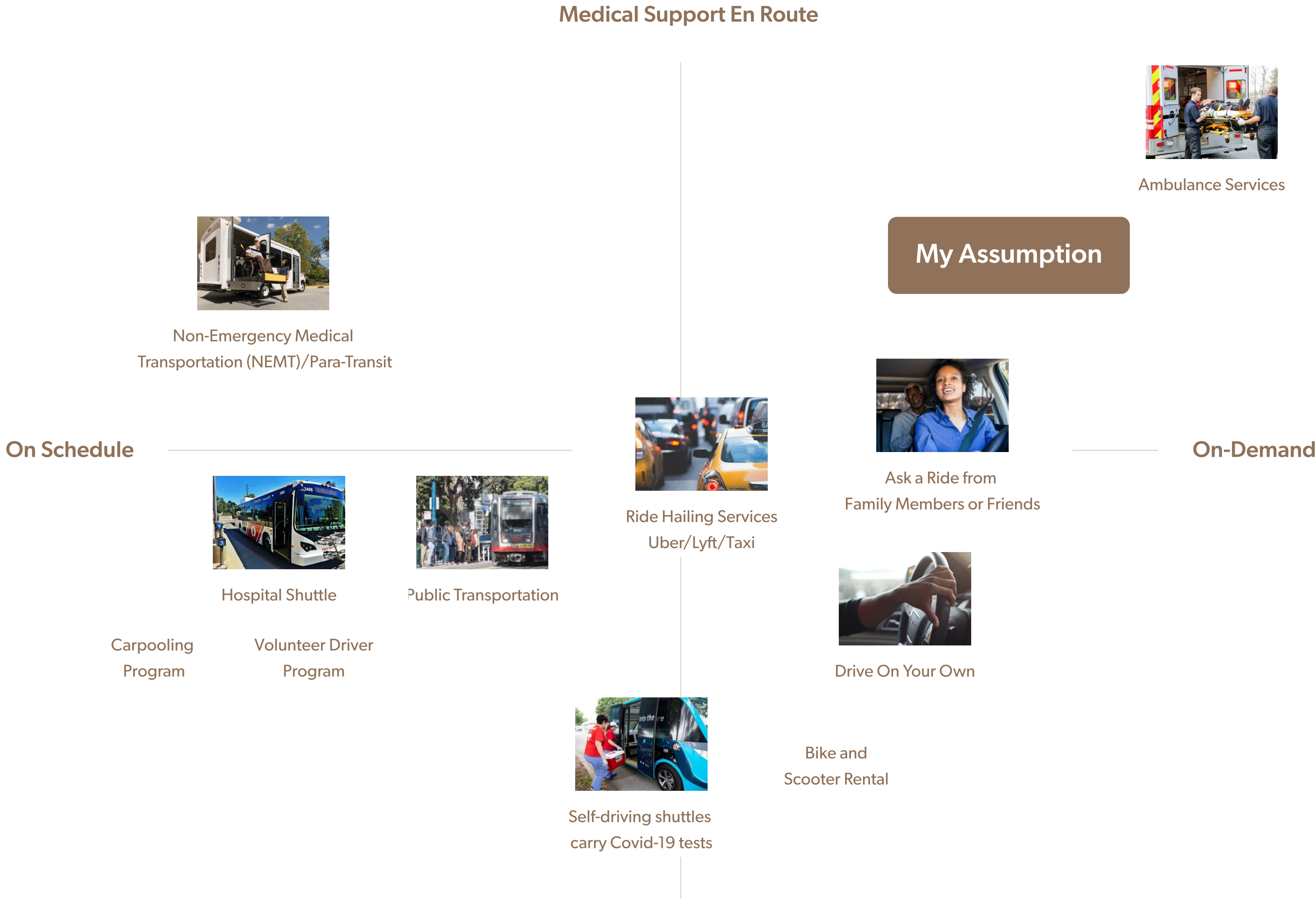
Special thanks also go to many cups of coffee and tea that fueled me early mornings and late nights.

Thesis Exhibition

May 5 – 9, 2025



The Problem



My Assumption

Within the spectrum of current medical transport services, people face a gap in care when they have an urgent medical need but lack transport.

Known

- Making a doctor appointment takes time.
- Calling an ambulance draws attention and can risk a large fee.
- Autonomous vehicles have the potential to increase personal mobility and provide a private mobile space.

Unknown

- What factors affect people’s decisions when accessing timely medical care?
- What if someone is physically able to drive but is in distress, or caring for a dependent?
- What are the capabilities and limitations of autonomous vehicles as a transport?

Project Scope

My thesis project was developed over the course of three semesters, from February 2024 to May 2025. It explores the intersection of three aspects: human experience, health services, and technology. Inspired by IDEO design thinking, this framework will guide my research in the following areas:

Human & Technology

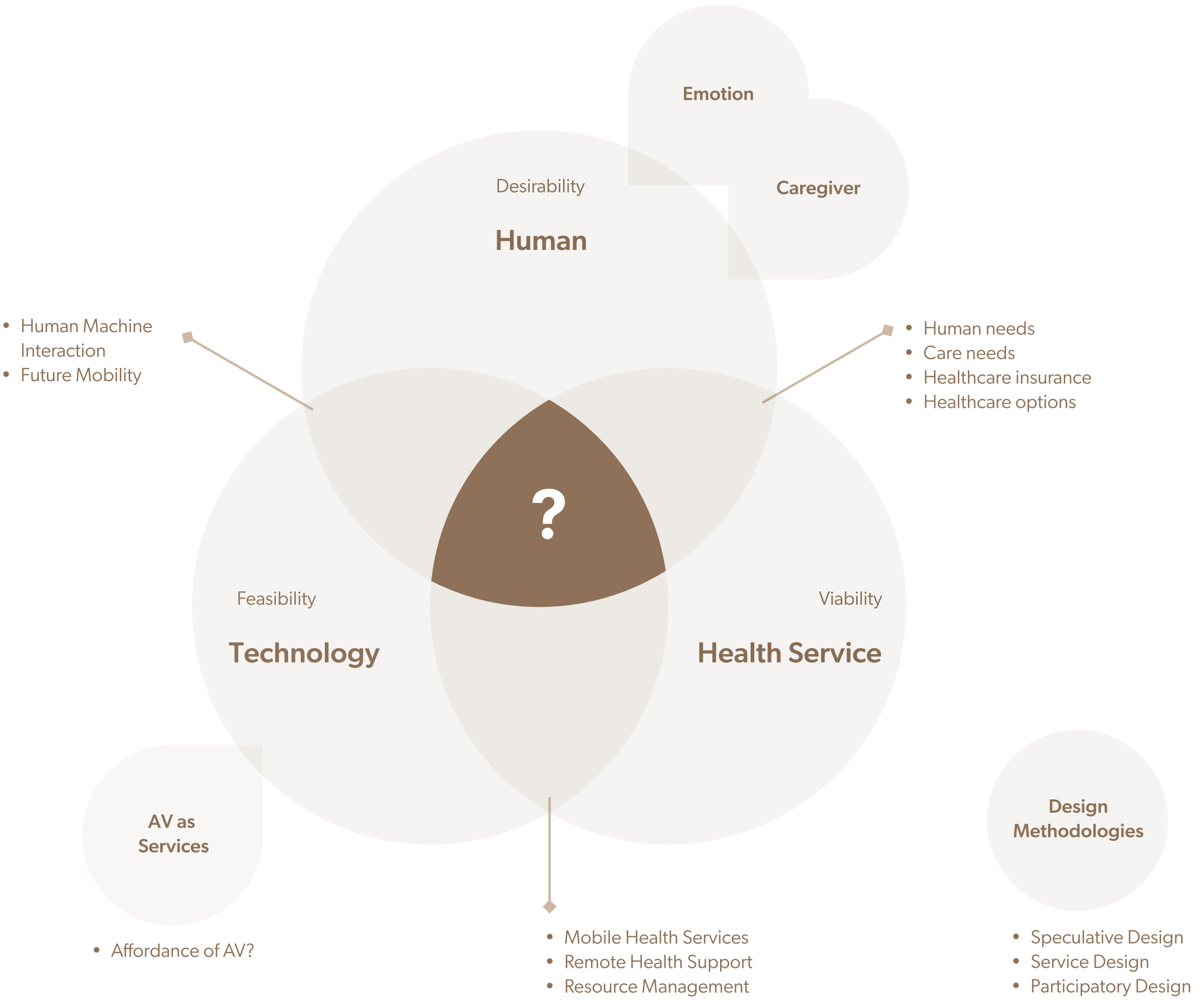
I will explore how design can facilitate communication between human and highly automated systems—such as self-driving vehicles and AI. How can design help fill the gap by providing transportation with medical support en route for urgent or emergency needs? Can design help ease concern and anxiety in urgent or emergent health situations?

Technology & Health Services

The intersection of technology and health services includes autonomous vehicles and remote health support. With further research, the focus could shift from “easy access to transport” to broader considerations of “easy access to services.”

Human & Health Services

What is the current standard user journey for visiting urgent care? Which stakeholders are involved in this process? What is the structure of the U.S. healthcare system and health insurance for urgent/emergent medical needs? Further research is needed to help me establish a comprehensive overview of how urgent/emergent care is currently delivered in the U.S., while also fostering empathy before moving into the design phase.



Manifesto

I believe the future of mobility is not just about getting from point A to point B — it’s about building a system that supports real human needs in everyday situations.

As AI and automation are redefining the way we live, design has the power to fill this gap — to bridge the distance between need for care, human emotion and logistics. The systems of tomorrow will not simply transport people — they will respond, support and reassure. I see autonomous vehicles not just as technologies, but as mobile spaces of care — equipped with empathy, designed for easy access, and capable of bringing calm in moments of crisis.

This project stands at the intersection of mobility, healthcare, and human experience. It’s not just about making urgent medical more convenient — it envisions a new type of care.



- Begin with ideas, embrace chance
- Celebrate coincidence
- Ad-lib and make things up
- Subvert expectation
- Make something difficult look easy
- Eliminate superfluous elements
- Believe complex ideas can produce simple things
- Allow concepts to determine form
- Reduce material and production to their essence
- Be first or last?
- Propose honesty as a solution
- Trust the process
- Sustain the integrity of an an idea

–Daniel Eatock

Pose ‘what if ’ questions that are intended to open debate and discussion about the kind of future people want, and do not want.

–Dune and Raby

Most Advanced Yet Acceptable

–Raymond Loewy



02 Research

- Literature Review
- Survey
- Observations
- Interviews
- Research Finding

Literature Review

1. **Social Determinants of Health Series: Transportation and the Role of Hospitals**, “<https://www.aha.org/ahahret-guides/2017-11-15-social-determinants-health-series-transportation-and-role-hospitals>”

The World Health Organization defines social determinants of health as “the conditions in which people are born, grow, work, live and age, and the wider set of forces and systems shaping the conditions of daily life.” This research shows only 20% of health attribute to medical care. Factors like access to healthy food, housing status, educational attainment and access to transportation account for 40%, which transportation barriers can affect a person’s access to health care services. Transportation issues related to healthcare are: lack of vehicle access, long distances and lengthy travel times to reach needed services, transportation costs, inadequate infrastructure and adverse policies. This research also provides four case examples of hospitals and health systems that are successfully addressing transportation issues in their community. I want to focus research on: Denver Health Medical Center, which partners with Lyft to develop a platform allowing the hospital to order rides for patients. And the hospital’s goal is to investigate the feasibility of a self-driving shuttle to use in designated spots around the community.

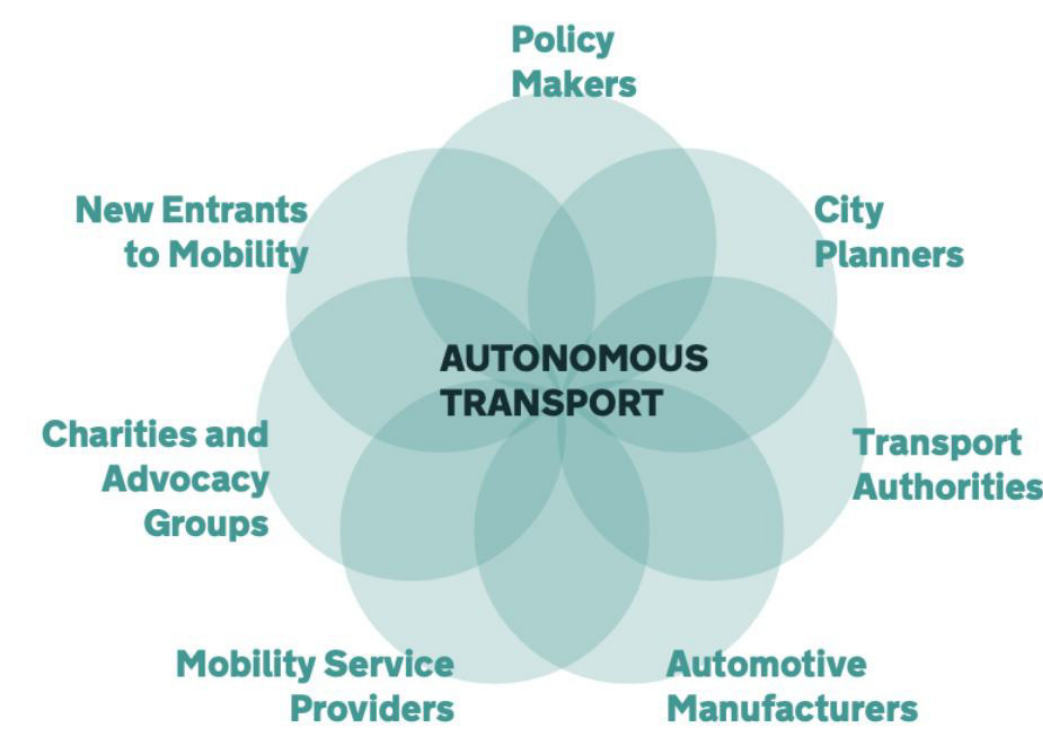
2. Mary K. Wolfe and Noreen C. McDonald, “**Innovative Health Care Mobility Services in the US**,” BMC Public Health 20, no. 1 (December 2020): 906, <https://doi.org/10.1186/s12889-020-08803-5>.

This research article, published on BMC Public Health journal, defined health care transportation as: any transportation to medical facility that is non-emergency in nature, including urgent care. This research identifies three types of innovative health care mobility services: health care provider leverages TNC (transportation network companies, e.g., Uber), insurer partners with TNC (e.g., Lyft), and paratransit provider partners with TNC.

3. Dale Harrow et al., **Driverless Futures: Design for Acceptance and Adoption in Urban Environments** (London: Royal College of Art, 2020), <http://gateway-project.org.uk>.

Founded by the Department for Transport and the Department for Business, Innovation & Skills (BIS) through Innovate UK and supported by the Centre for Connected and Autonomous Vehicles (CCAV), Professor Dale Harrow at Royal College of Art and his research team led this academic project taking a human-centered approach to the design of autonomous vehicles, systems and services. “It created a world-leading test-bed for driverless cars that enabled automotive and software industries, local authorities, planners, insurers, Government ministers, policy makers and others to evaluate new vehicles and new technologies applied to existing vehicles, and to understand the human behaviors and attitudes emerging around these new forms of transport.”

The GATEway project(reading in progress) provides insights on future mobility in a holistic view from ‘people’s needs and aspirations’, ‘vehicle experiences’, to ‘the experience of mobility’ and ‘design patterns for driverless vehicles’, and ‘environment and infrastructure.’ This research project also used a range of research methods including: literature review, stakeholder interviews, projects, and public engagement like workshops and exhibitions. These research methods and frameworks are inspiring and could help me tailor my own framework for my project.



Literature Review

4. De Lew, Nancy, George Greenberg, and Kraig Kinchen. **“A Layman’s Guide to the U.S. Health Care System.”** Health Care Financing Review 14, no. 1 (1992): 151–69.

There is no single nationwide system of health insurance. US primarily relies on employers to voluntarily provide health insurance to coverage to their employees and dependents.

US health organization

- Hospitals — open or close according to: community resources, preferences, and the dictates of an open market for hospital services
- Physicians — free to establish their practice
- Federal-and State-funded programs — provide primary care, served by the fee-for-service (FFS) system
- Municipal and county public health department — provide limited primary care through public health clinics and regulate sanitation, water supply, and environment hazards

US insurance types

- Private insurance — Self choose, or as package
- Government
 - Elderly insurance (Medicare) — A uniform national health insurance program for the aged and disabled. Administered by the Fed gov.
 - Low-income insurance (Medicaid) — A health insurance program for certain groups of the poor. It covers preventive, acute, and long-term care services. Financed by Fed and State gov.

Health services delivery system

- Hospitals
 - Community, acute care hospitals (expensive medical equipment)
 - Non-profit hospitals
 - Local gov hospitals
 - For-profit hospitals
 - Specialty hospitals (e.g., psychiatric, rehabilitation, long-term care)
 - Other (military, veteran, or native American)
- Physicians
 - Coordinated Care
 - Health maintenance organization (HMO)
 - Package available only from a defined network for a fixed payment
 - Preferred provider organization (PPO)
 - Selectively contracts with for a network of doctors, hospitals, and others to provide services ata discounted price

5. Severs, Robin, Jiayu Wu, Cyriel Diels, Dale Harrow, Joseph Singleton, and Richard Winsor. **“Imagining an Inclusive Future for Shared Autonomous Vehicle Interiors: A Participatory Design Workshop Study.”** In Adjunct Proceedings of the 14th International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 73–78. Seoul Republic of Korea: ACM, 2022. <https://doi.org/10.1145/3544999.3554787>.

The SAVs Workshop structure includes two parts. The first half invites participants to fill out an initial “about me” page with details about themselves and their general experiences with transport. Then, participants are encouraged to discuss these experiences with each other, following a critique phase focused on journey mapping of existing transport experiences.

The second half serves as a fantasy/implementation phase. Participants were asked to imagine their desired experience of an SAV and potential barriers to use. This experience includes the initial stage of booking, planning, preparing, and waiting, which were discussed around a table, and notes were recorded.

From the boarding stage onwards, participants were invited to a full-scale mock-up of an 8-12 seater SAV. The mock-up served as a blank canvas for participants to reconfigure and test during the workshop.



Literature Review

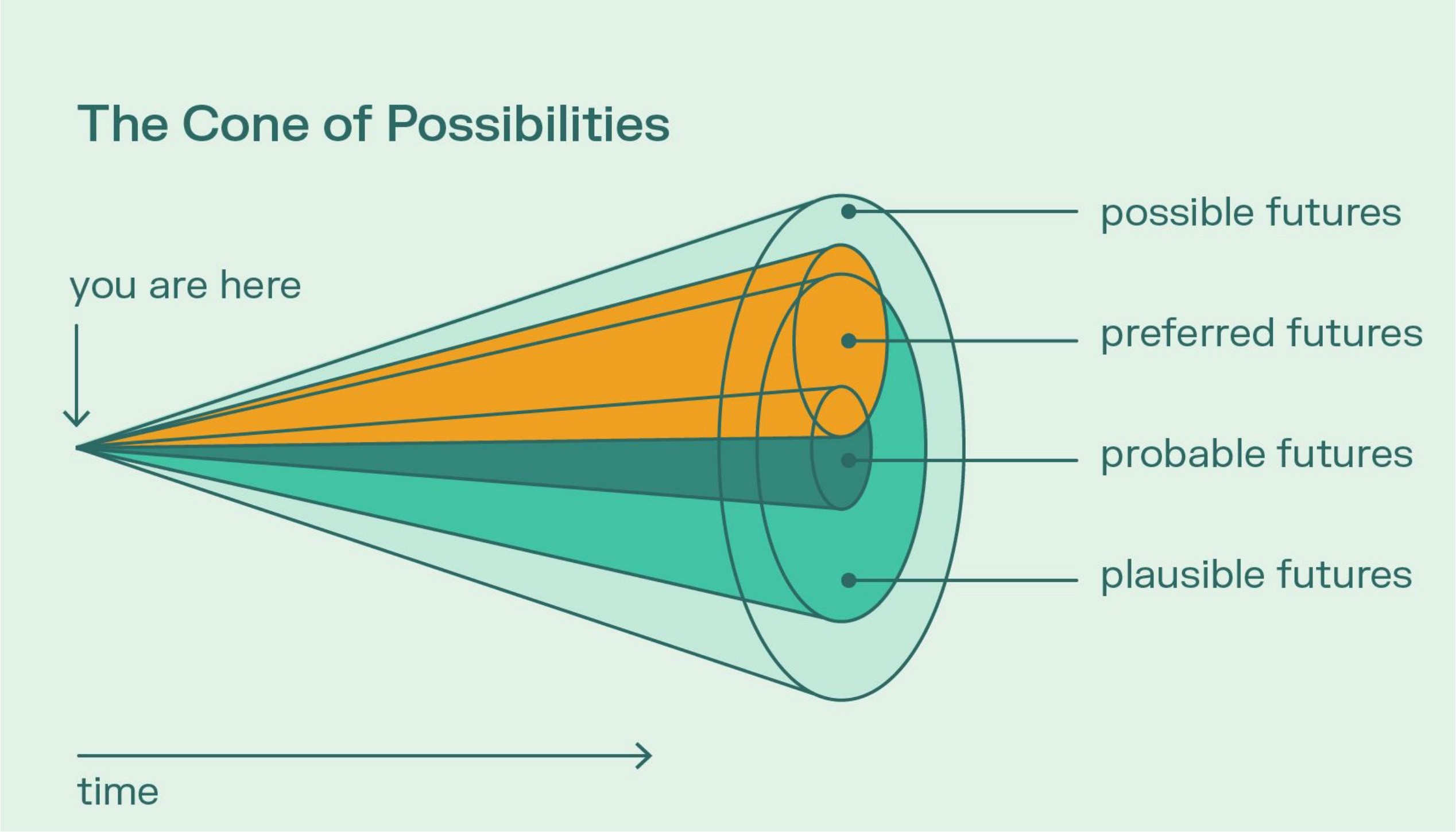
“Awful scene on the orange line. A woman’s leg got stuck in the gap between the train and the platform. It was twisted and bloody. Skin came off. She’s in agony and weeping. Just as upsetting she begged no one call an ambulance. ‘It’s \$3000,’ she wailed. ‘I can’t afford that.’”
– [Maria Cramer](#)

“Each year, 3.6 million people in the United States do not obtain medical care due to transportation issues. Transportation issues include lack of vehicle access, inadequate infrastructure, long distances and lengthy times to reach needed services, transportation costs and adverse policies that affect travel.”
– [Social Determinants of Health Series](#)

“Transportation barriers can affect a person’s access to health care services. These barriers may result in missed or delayed health care appointments, increased health expenditures and overall poorer health outcomes.”
– [Transportation and the role of hospitals](#)

“Ridesourcing options are becoming a part of the mode choice set for patients through formal partnerships between ridesourcing companies, health care providers, insurers, and transit agencies. The on-demand nature of rides, booking flexibility, and integration of ride requests and payment options via electronic medical records appear to be the strongest drivers of this innovation.”
– [Innovative Health Care Mobility Services in the US](#)

“When engaged, system drives, you ride.”
– [NHTSA.GOV](#)



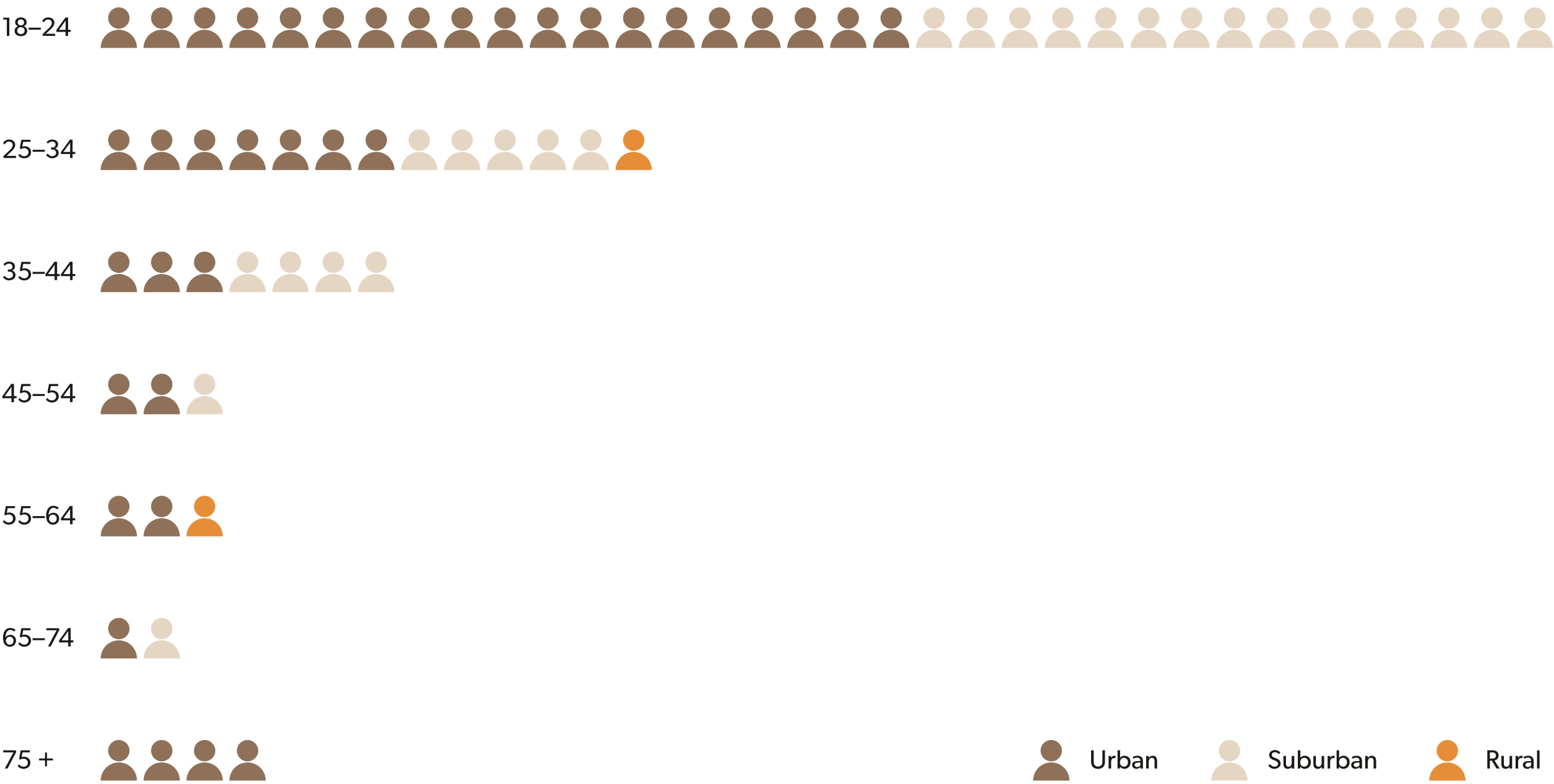
“People’s hopes and fears about autonomous vehicles are just as important as their practical needs.”
–[Driverless Future](#)

“Probable | Plausible | Possible | Preferable”
–Speculative Design

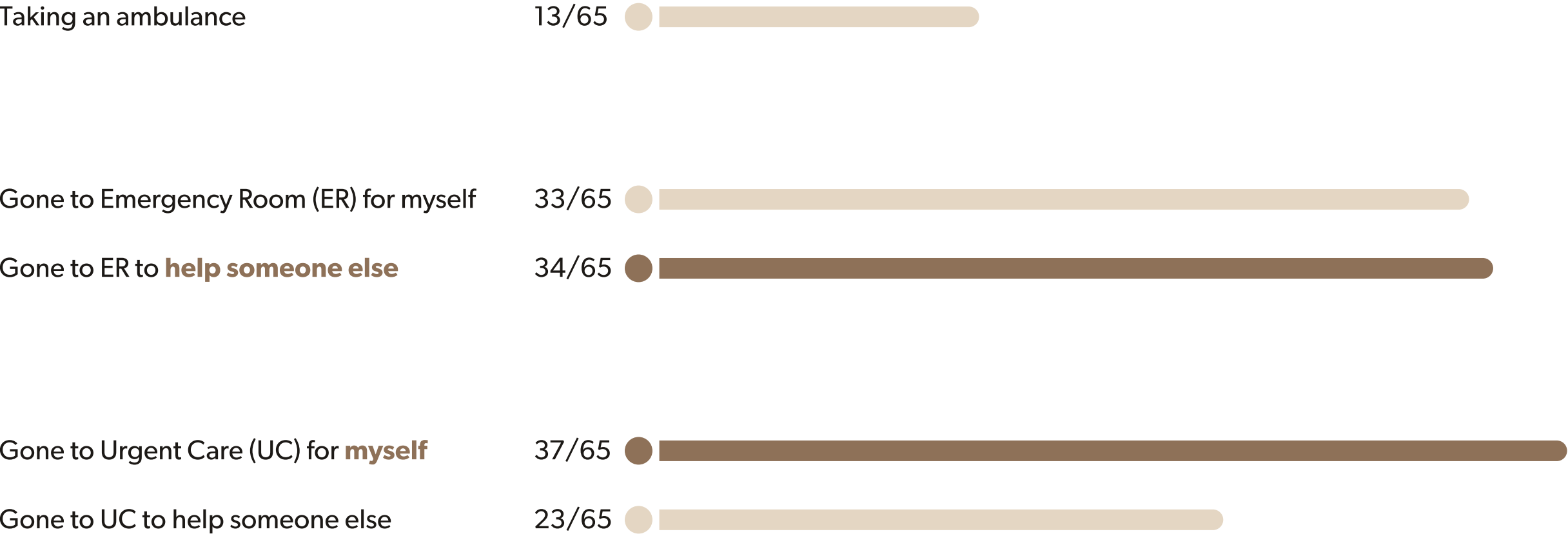
Survey

I used a survey to gather initial insights into how people currently access urgent and emergent care, with a focus on transportation challenges. As of July 28, 2024, I received 65 responses. The survey data provided a foundational understanding of users’ pain points and helped shape the questions for my interviews. I also followed up with survey respondents and invited 18 of them to participate in interviews.

Demographics

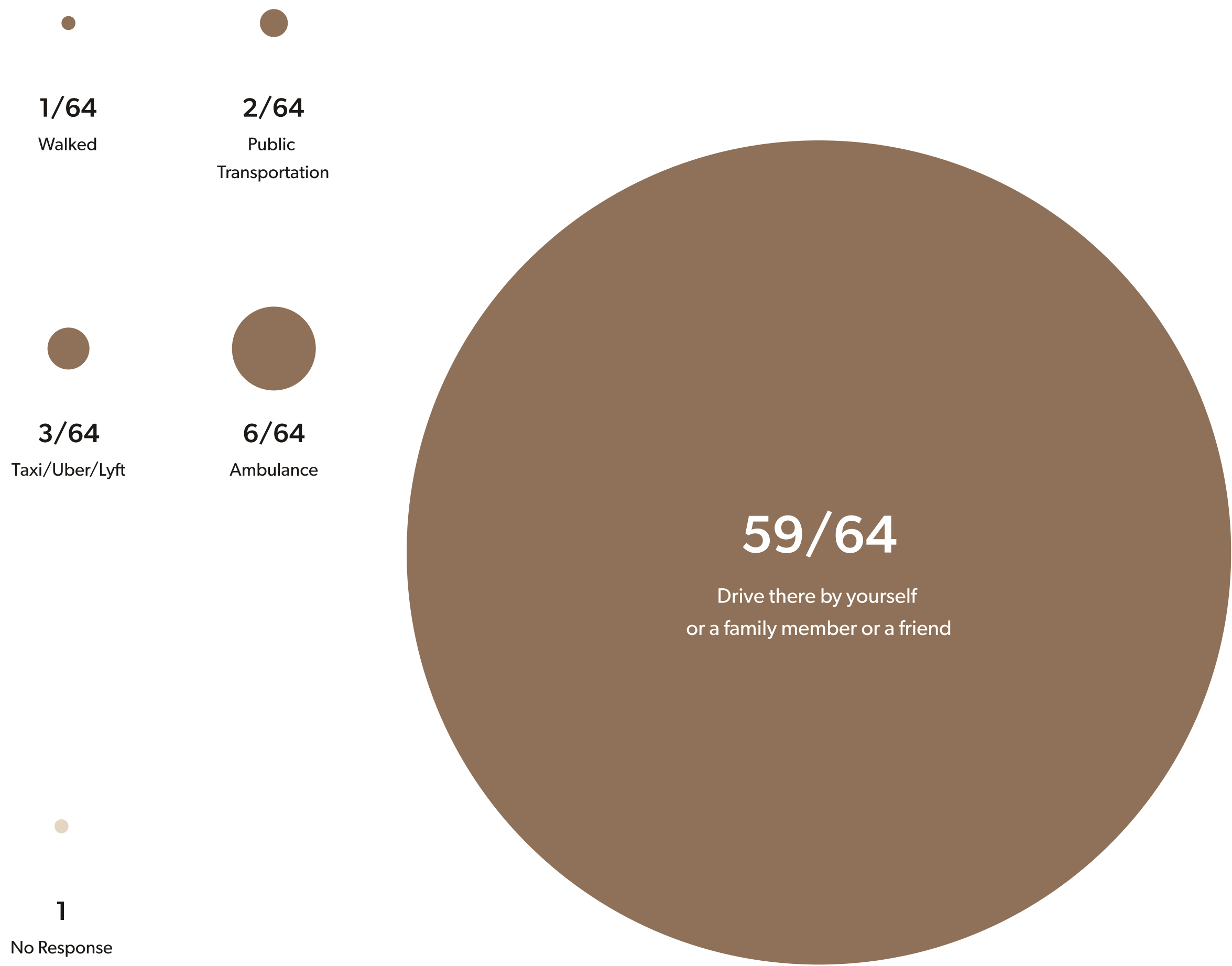


Participants’ Experiences

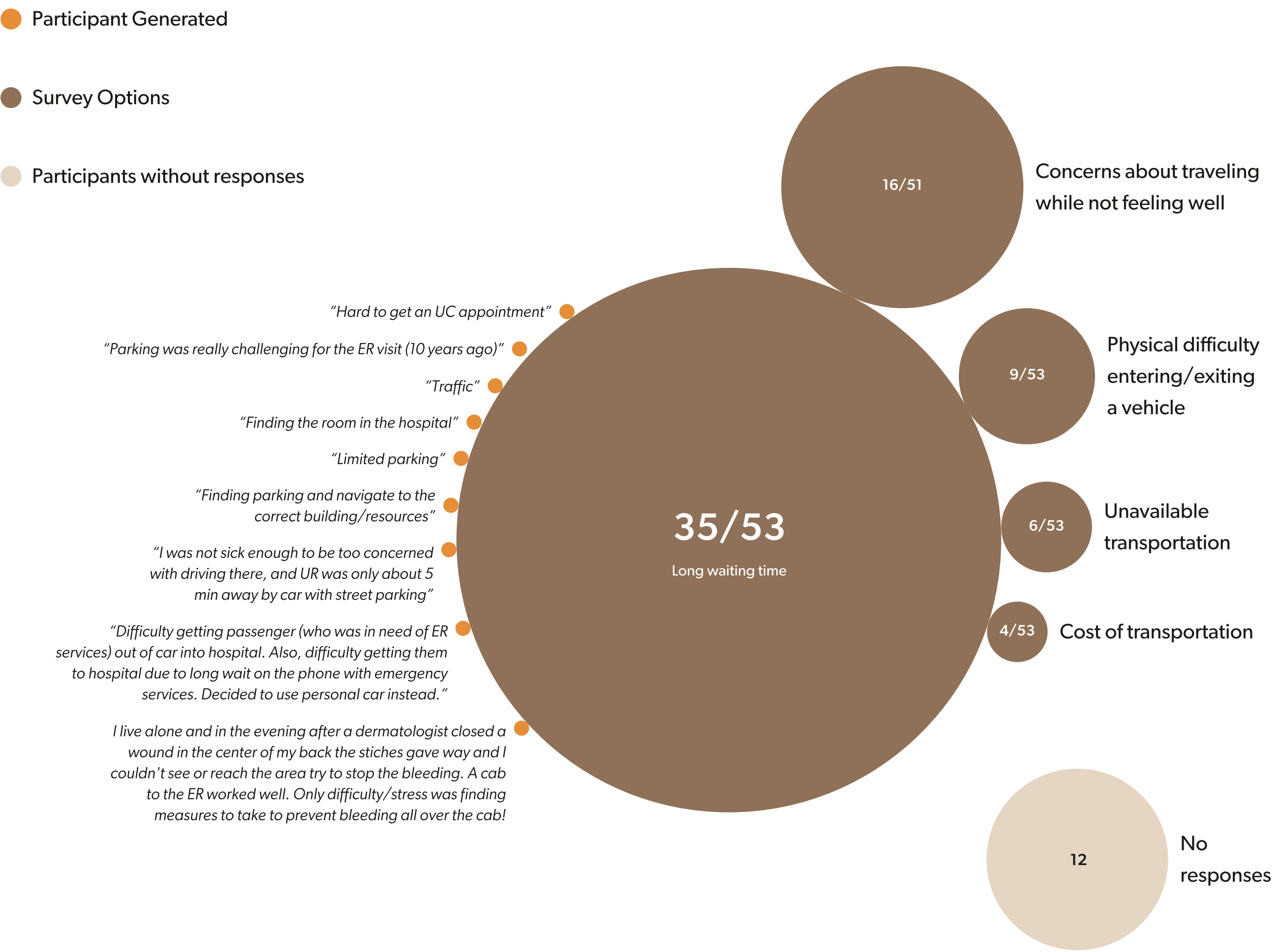


Survey

How they get to the UC or ER?



Difficulties



Interviews

Interview with patients and caregivers

I conducted semi-structured interviews with participants who had experience with urgent care and/or hospital emergency departments. They shared personal stories related to accessing urgent or emergent care, as well as their mobility options.

I transcribed all interviews and transferred key notes onto post-it for analysis. I went through three major rounds of theme sorting and grouped my notes into different categories to identify recurring patterns and key insights.



Insight 1

Patients and caregivers have various ways to search for timely medical care options, such as calling primary doctors, consulting family or friends, calling insurance nurse line, or searching online. However, they often have to rely on themselves to determine the appropriate type of care to look for.

Insight 2

Patients and caregivers have varying expectations about wait times and what will happen in the process of getting timely care. When wait times exceed their thresholds or unexpected situations arise, it heightens their anxiety, especially during an already stressful health crisis.

Insight 3

In the current process of accessing timely care, the majority of patients and caregivers check in (without an appointment) after arriving at the facility. This can lead to delays, depending on how busy the facility is.

Interview with medical experts

I also reached out to nurse practitioners to learn about their process of providing care to patients in the ER and urgent care. I focused particularly on the triage process that medical teams follow when admitting a patient. Key quotes from experts:

- *At urgent care, service is typically walk-in, without appointment and first come, first serve. A registration clerk will collect chief complaint, ID, insurance.*
- *But, that said, the front desk person is typically eyeballing the patient and will call for licensed personnel to take a look if there is concern. "*

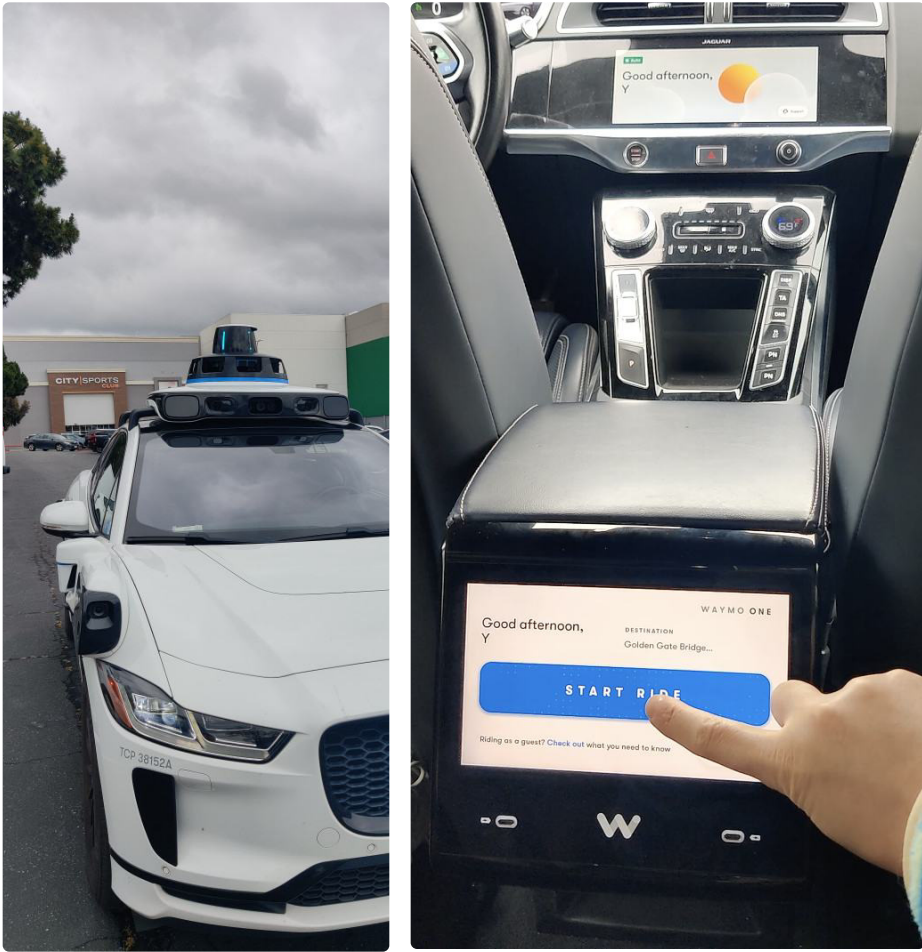
Interview with robotaxi experts

Speaking with experts in the robotaxi industry also helped me understand the limitations and possibilities of fully autonomous vehicles, particularly their potential role in providing care. For example, an autonomous vehicle won't turn down a rider and can operate reliably, even late at night. However, questions remain—such as who will assist a patient who may need help boarding the vehicle. Key quotes from experts:

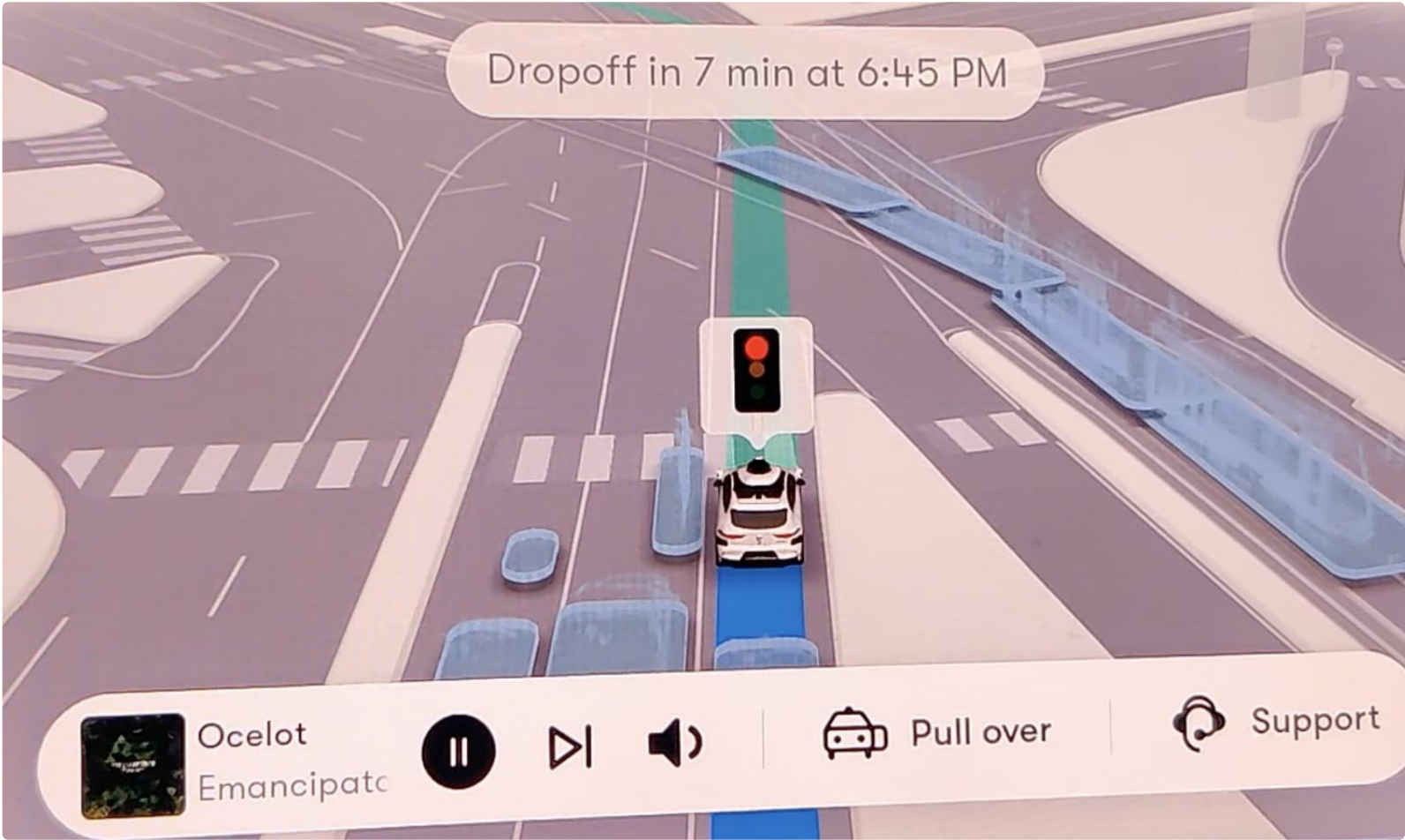
- *What are the advantages and benefits of being no driver in the seat?*
- *Why talking to a nurse in an AV on a phone is better?*
- *What is the autonomy get you and not get you?*

Observations

To better understand how people interact with fully autonomous vehicles, I took a test ride with Waymo and documented the experience, focusing on actions and interactions.



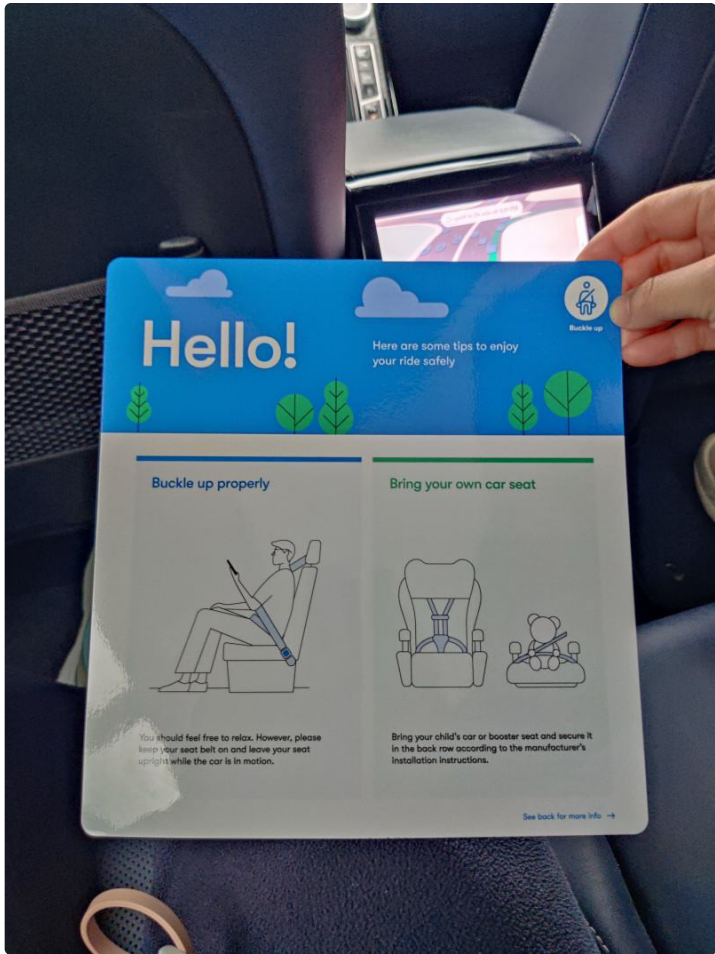
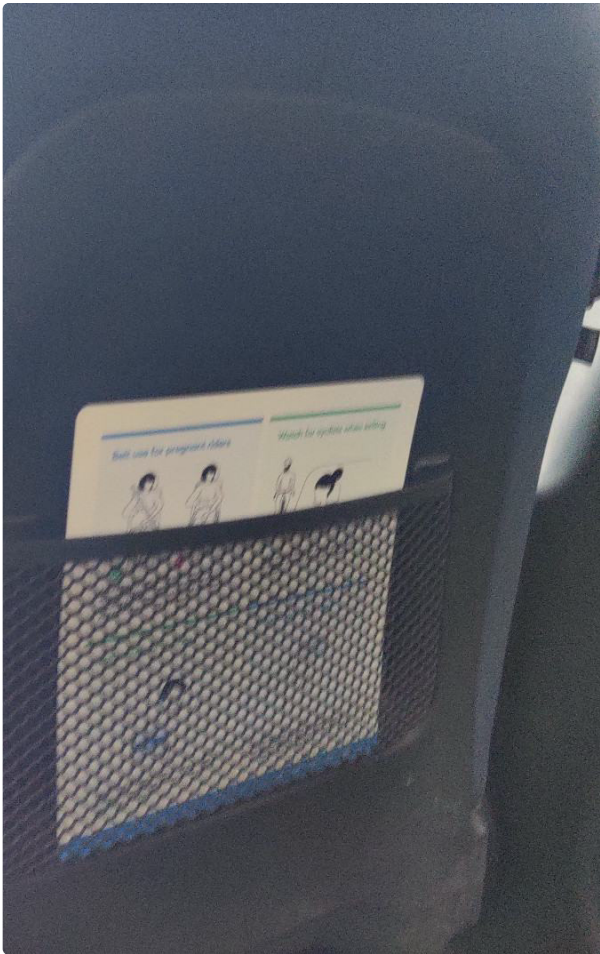
Start Ride



Ride Information. Pull-Over Assistance. Support



Pull-Over Assistance. Help. Lock. Start Ride



Ride Instruction



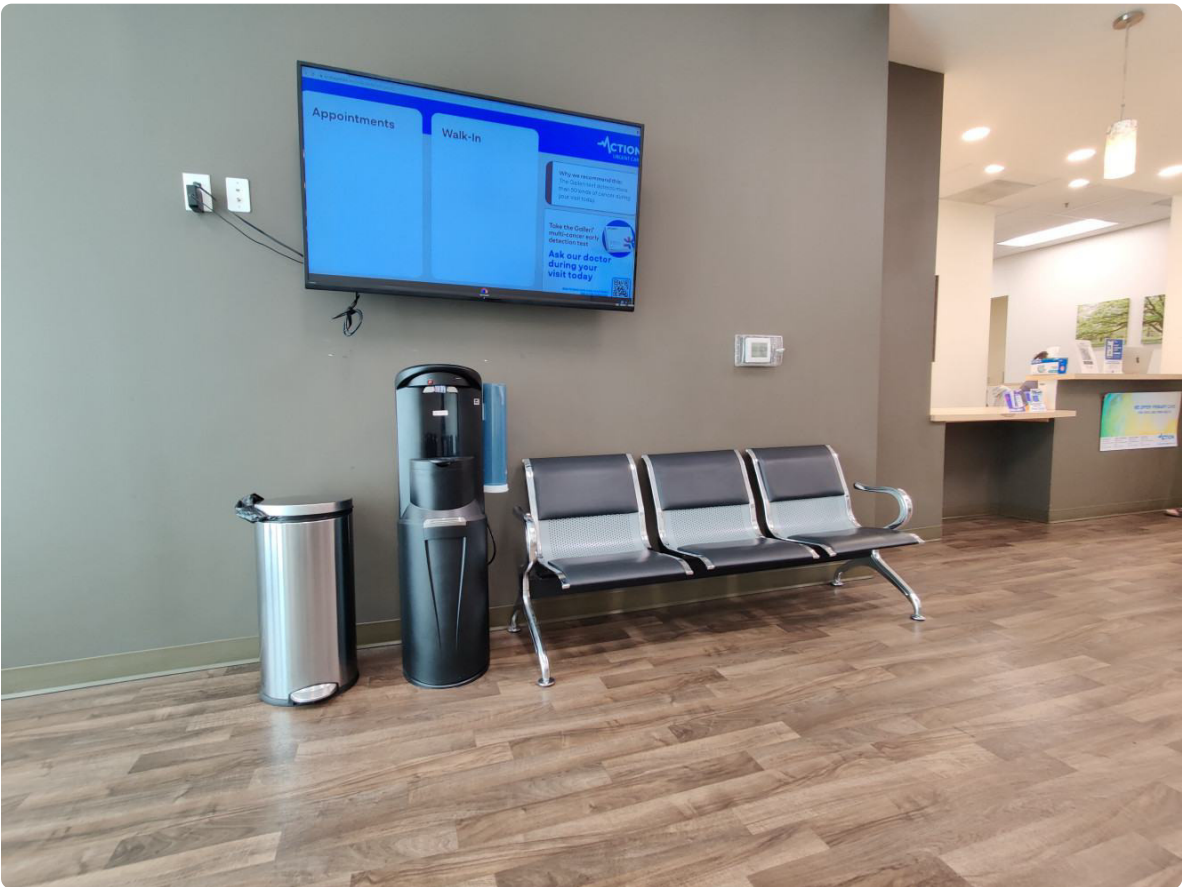
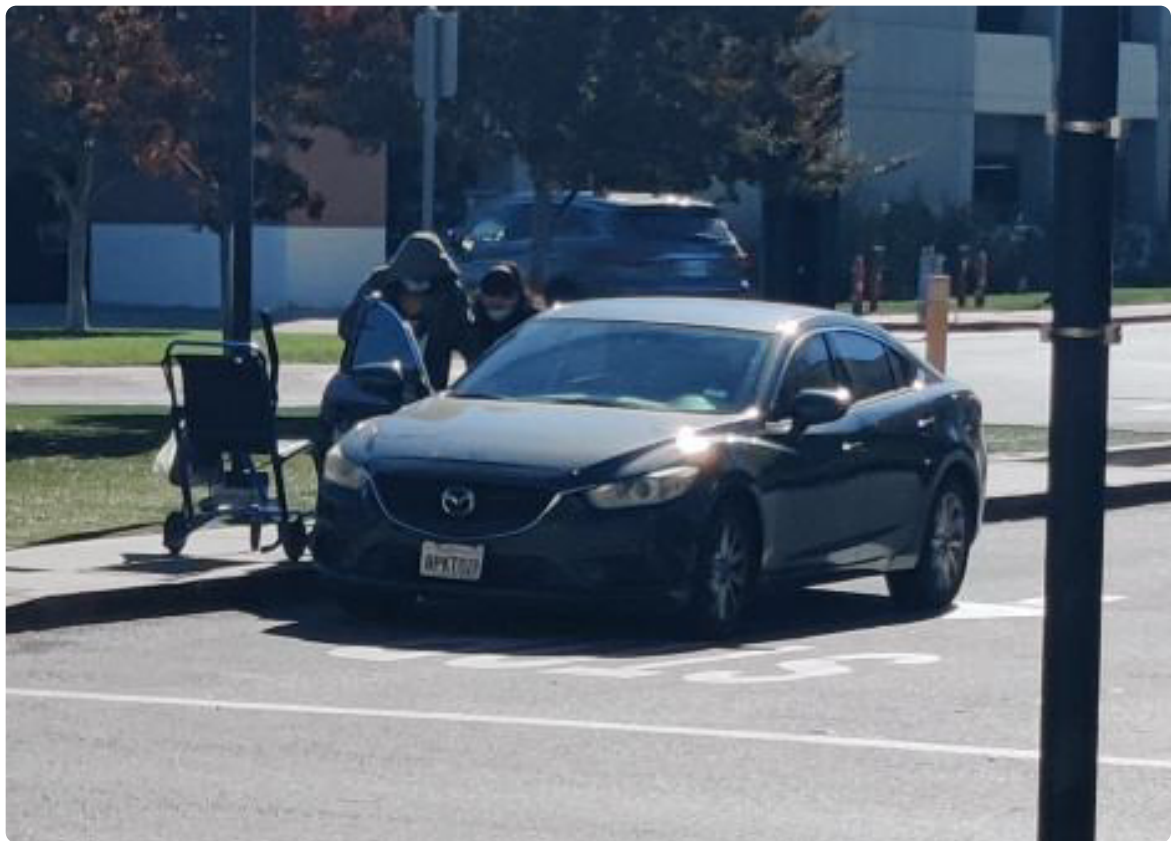
Windshield Wiping in Rain



Child Seat

Observations

To gain insight into people’s experiences when accessing urgent or emergent care, I conducted observations at urgent care clinics and hospital emergency rooms, focusing on the environment, objects, people, and interactions.



First Responder Interview

I also interviewed paramedics and EMTs about their protocols when assisting people with life-threatening health conditions. These conversations helped me better understand the urgency levels involved in their responsibilities, which may not apply to the scope of the service I’m designing, and the devices they use to monitor patients’ conditions en route.

Fire Fighter Paramedics

“We have more resources than ambulances, we make first patient contact, treat them accordingly, wait for the ambulance.”

“It will show more advanced image of heart rhythm, we can take a picture of it and see if there is any heart block, and we use this to shock them, get their heart rhythm to go back to normal. We plug everything to this device.”

Ambulance Crew

“Emergency medical dispatcher (EMD) intake the call, triage the call, they prioritize the call based upon the complaint of the patient, that will dictate the kind of resources that are sent to the scene, it could be just an ambulance, it could be a fire truck and an ambulance, a rescue squad and an ambulance...it’s really depend on what’s going on.”



Research Finding

Stakeholders

Patient

What factors affect people’s decisions on how to access timely medical care?

Caregiver

Who do caregivers contact and how do they reach out while helping a dependent search timely medical care?

Urgent/Emergent Care Staff

How do urgent/emergent care staff communicate with patients and their caregivers prior to clinical intake?

Medical Providers

Medical Assistant, Nurses, Doctors, NP/PAs

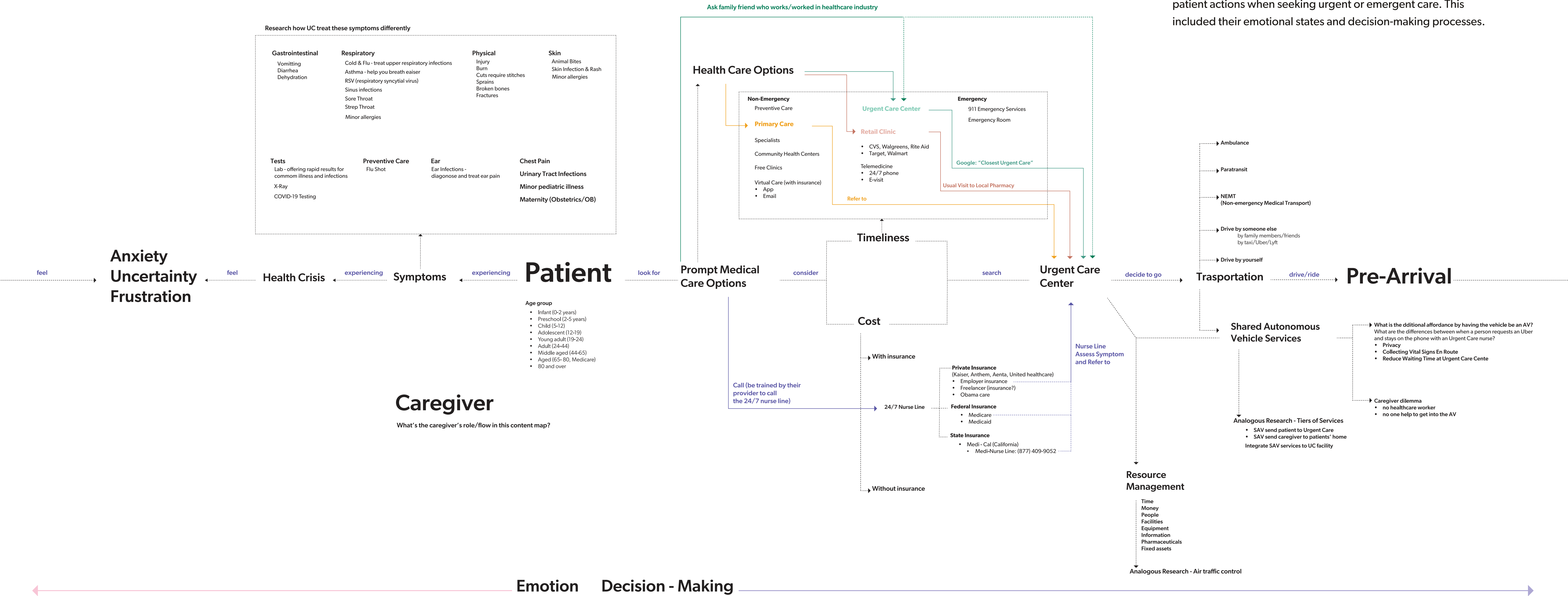
What information do providers have to collect before admitting a patient?

Insurer

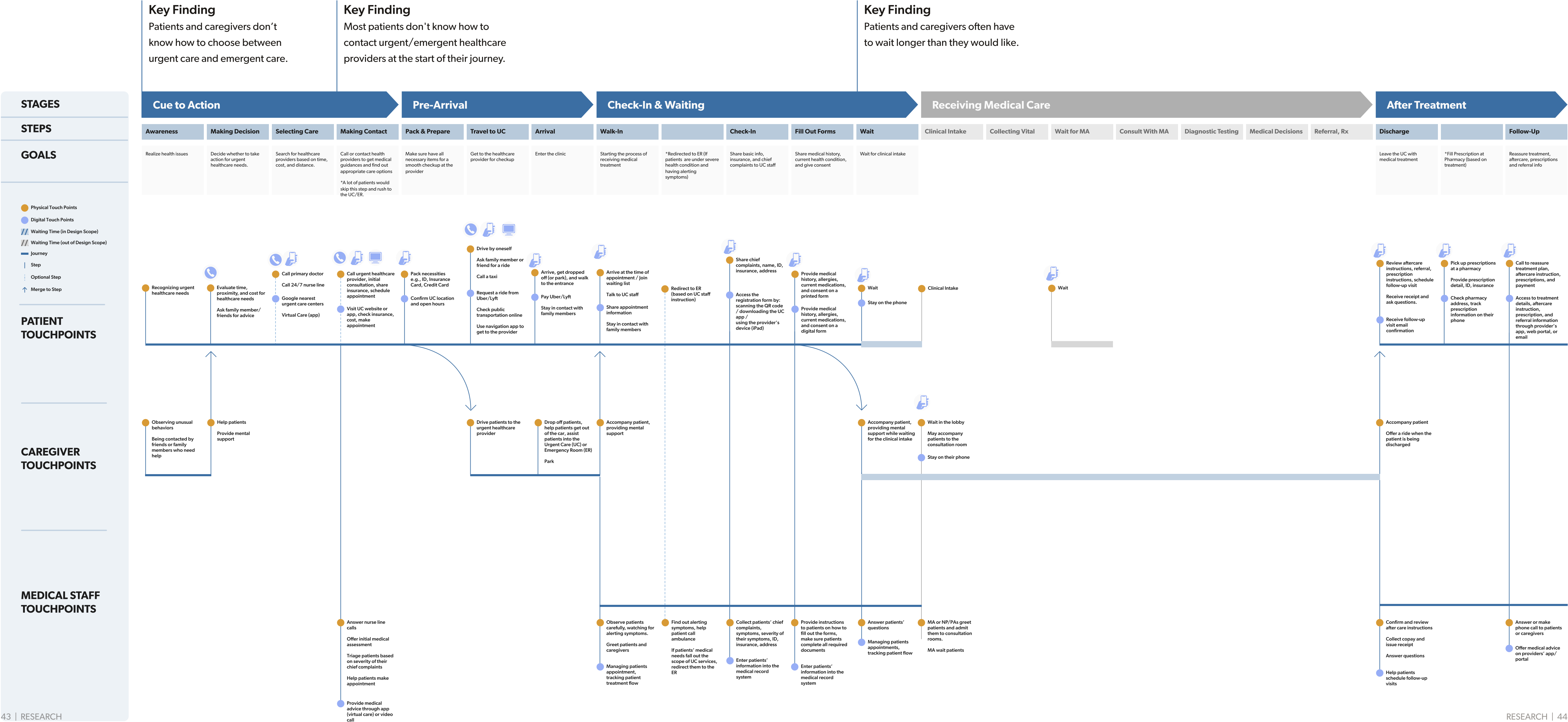
What information do insurance providers need when their customers seek urgent/emergent care?

Content Map

I used a content map to visualize all my raw data as a sequence of patient actions when seeking urgent or emergent care. This included their emotional states and decision-making processes.



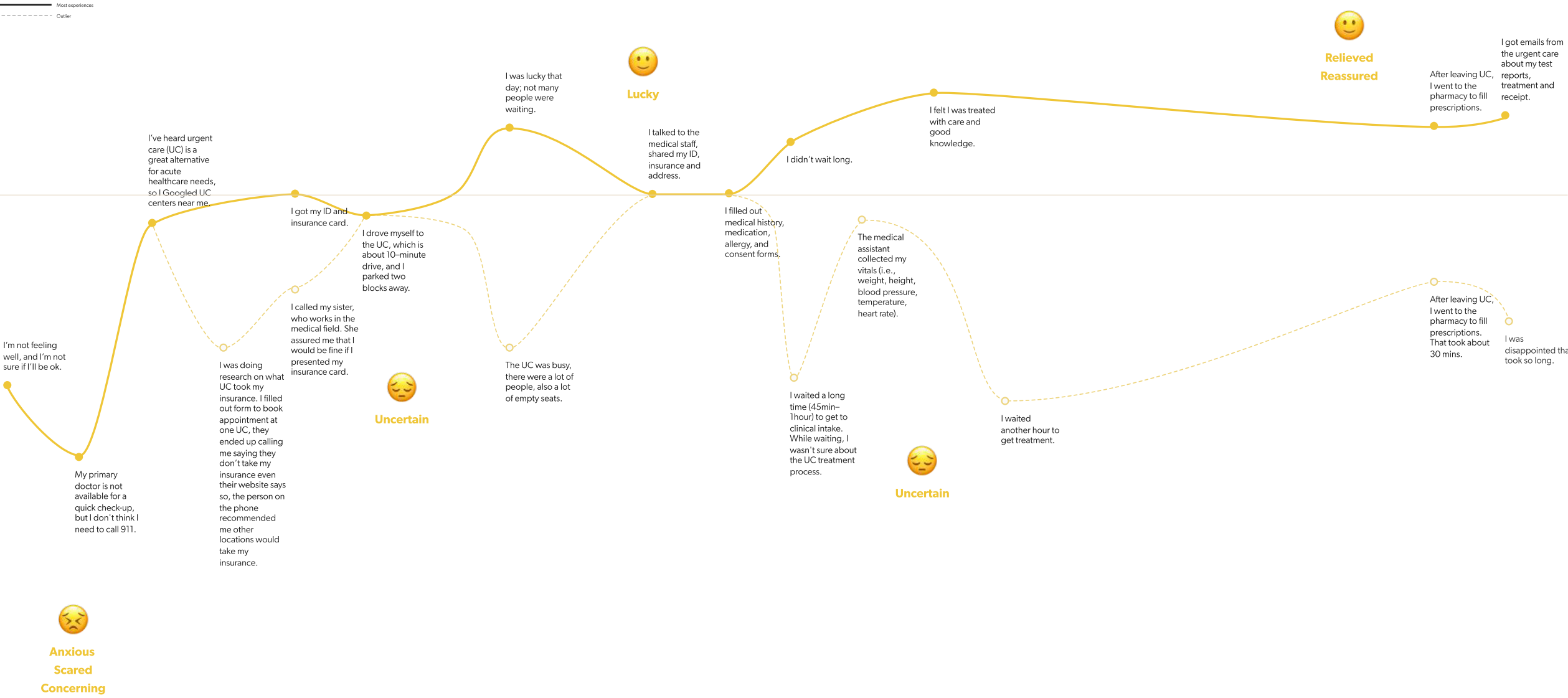
Journey Map



Emotions and Key Quotes

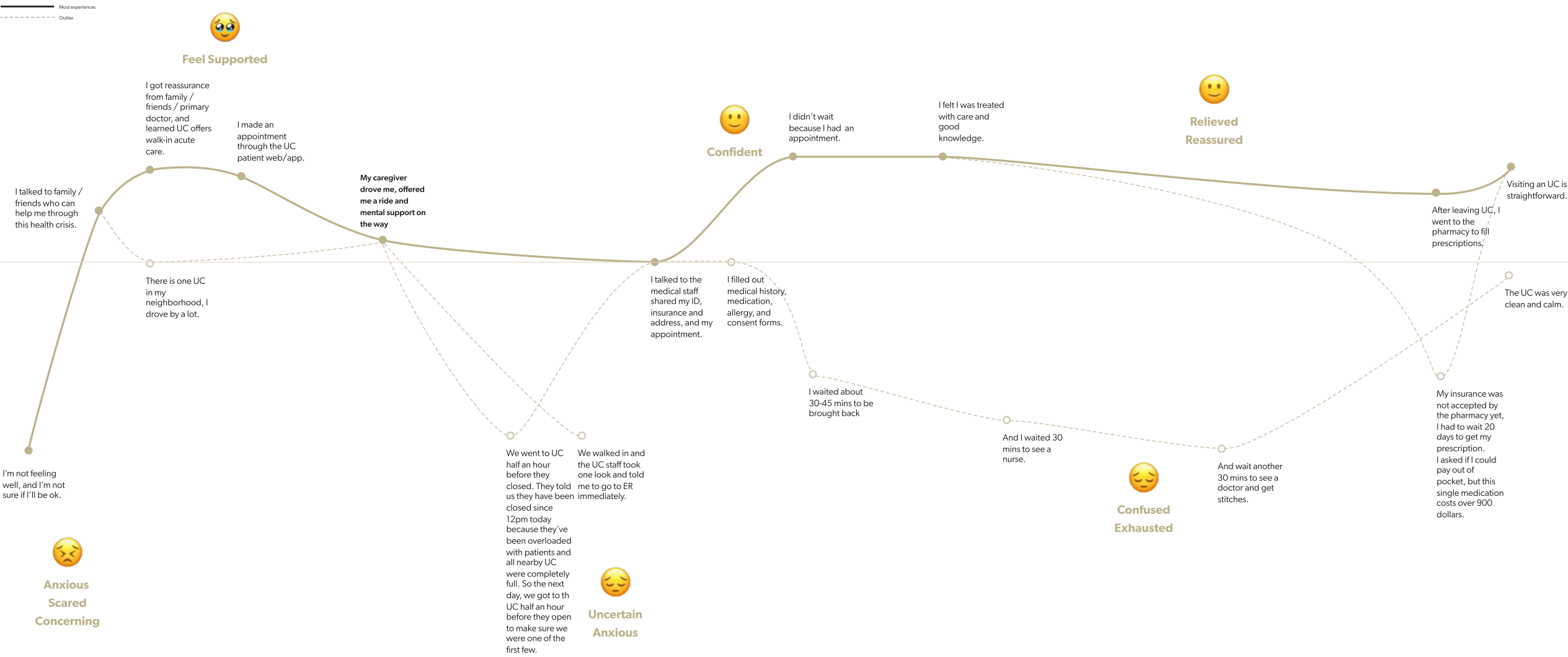
Self-Reliant Urgent Care (UC) Patients

Patients experiencing urgent but non-life-threatening health issues. They may have heard of urgent care. They search online for nearby UC centers. They drive themselves to the UC, receive treatment, fill prescriptions at a pharmacy.



Advised Accompanied UC Patients

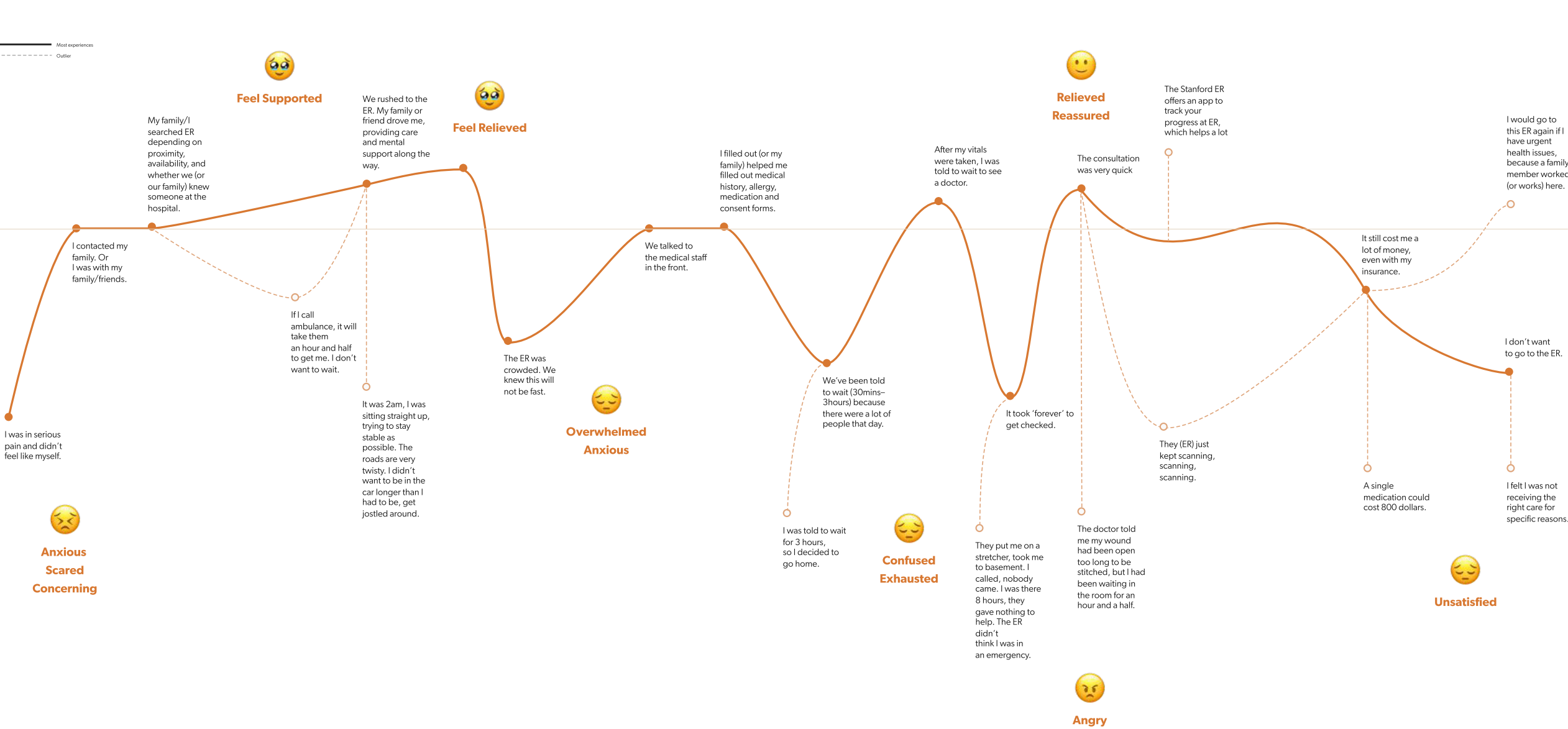
Patients experiencing urgent but non-life-threatening health issues often ask for advice from family member or family friends before making any decisions. After learning about UC, they will be accompanied by family member or they will ask friends to accompany them to the UC. Their caregivers provide transportation, offer mental support and help them receive treatment. This social support helps patients navigate the medical services and receiving care.



Emotions and Key Quotes

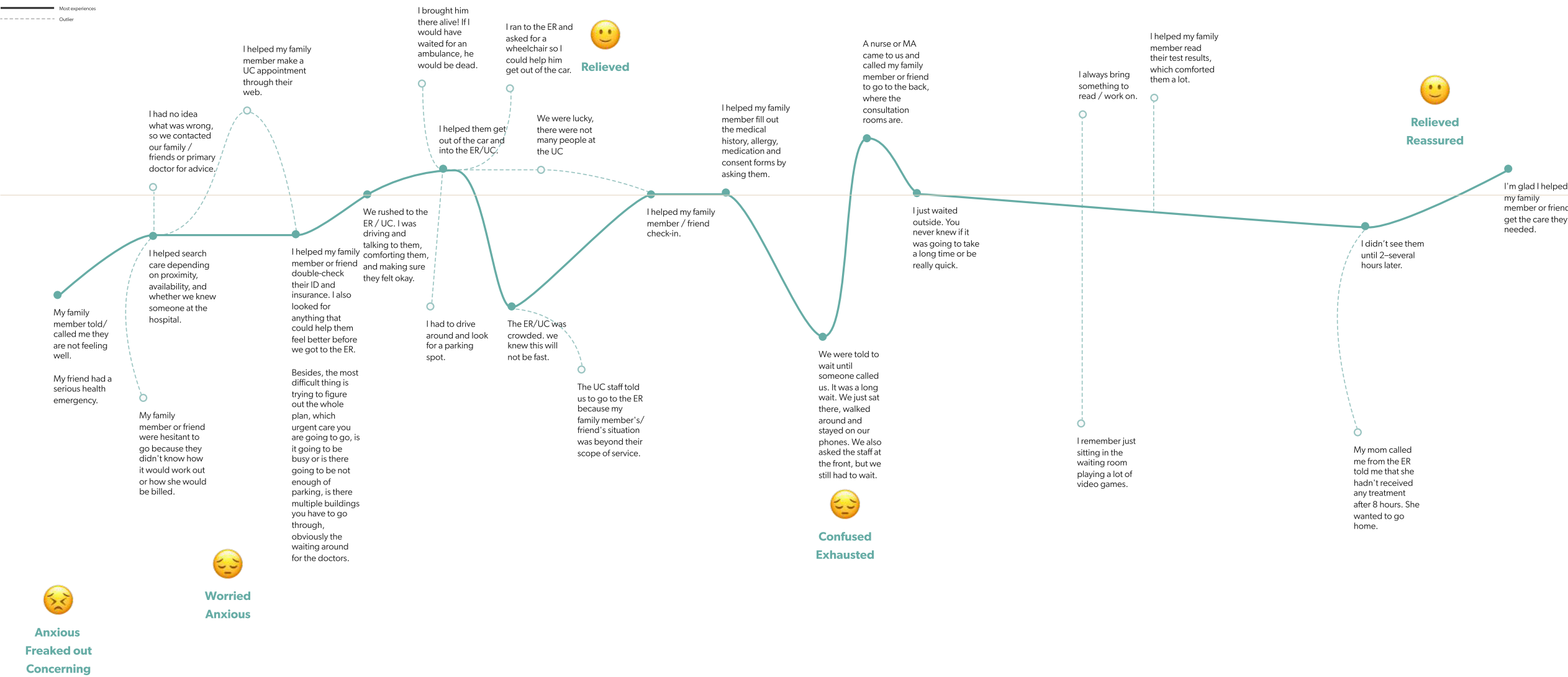
Supported Direct ER Goers

Patients experiencing emergency health issues typically inform their family members to get help and then rush to the hospital emergency room (ER). Family members often accompany them, assist with decision-making, and sometimes check them in or fill out forms on their behalf.



Companion Caregiver

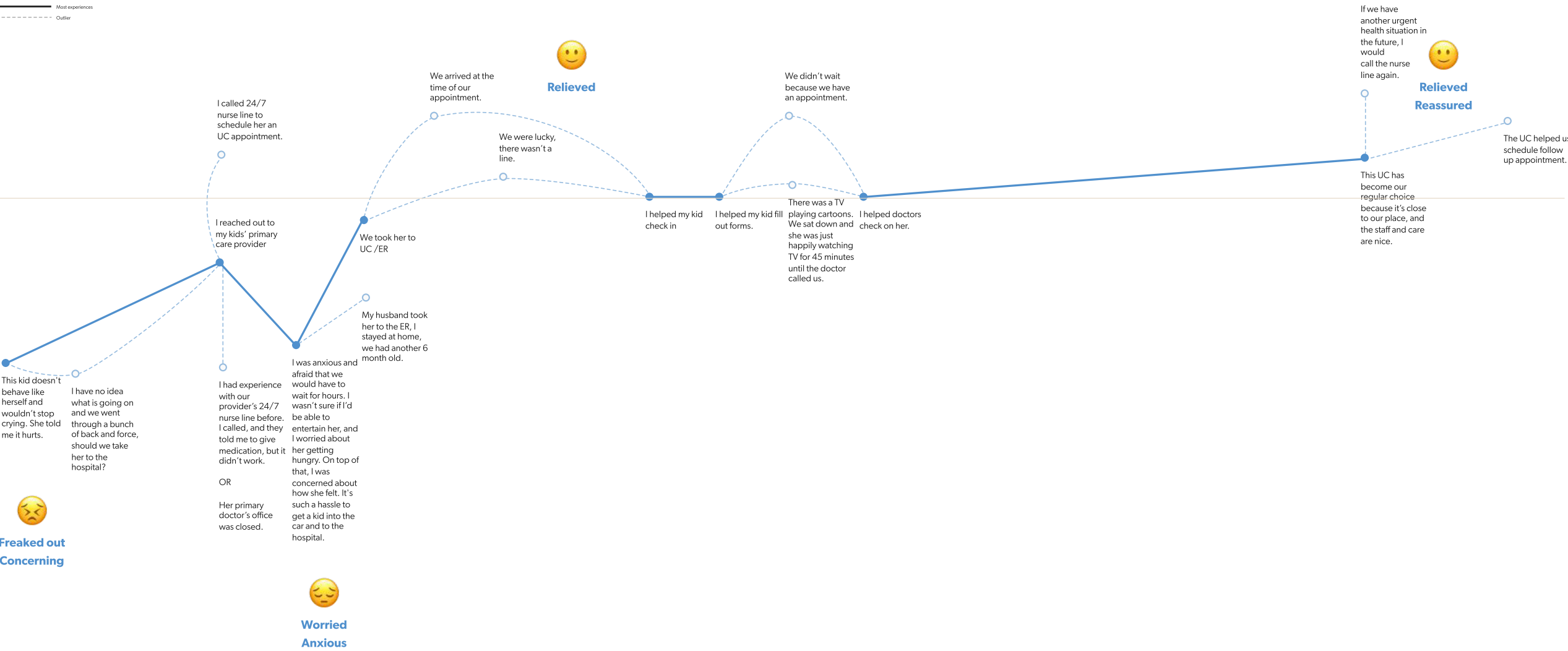
Companions typically offer help by contacting family friends for medical advice (if they have contacts), helping patients search for healthcare, providing rides, offering mental support, and accompanying patients through a health crisis.



Emotions and Key Quotes

Guardian Caregiver

Guardian, parents of children aged 3–7. Guardians usually start by assessing their child’s health condition and then help them make decision and select care on their behalf. They also need to prepare for the visit and accompany their children throughout the entire process, and provide care at home. In addition, guardians must manage their child’s emotional needs and be prepared to handle situations where the child becomes upset during the visit.



Based on emotion and experience curve, I narrowed my focus to three users groups who experience more frustration in the current journey and created persona to further guide the design phase.

Self-Reliant UC Patients

Supported Direct ER Goers

Guardian Caregiver

Persona

Self-Reliant UC Patients



Kim

“My issue a year ago was outside of my primary doctor’s business hours, so I had to find care on my own. I had heard about urgent care from my neighbors, so I Googled for proximity.”

Pain Points:

- Patients often rely solely on their own resources—such as the internet, social circles, and past experiences—to search for urgent medical care.
- When their usual care providers are unavailable, they may find themselves without a reliable source of immediate medical assistance.
- Patients experiencing health issues may need to drive themselves for care, navigating routes and traffic.

Supported Direct ER Goers



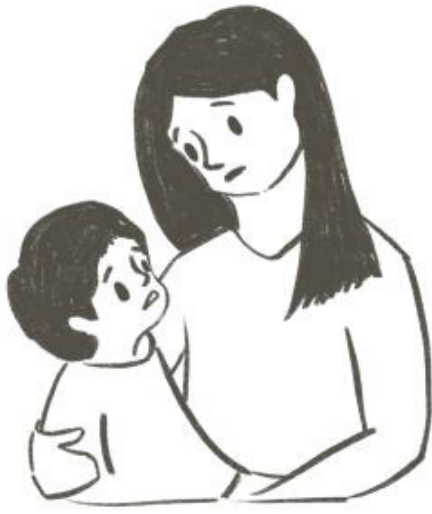
Ali

“I know that they will assess me, but I didn’t know they would take my labs. I didn’t know assessment was in a separate room, I thought I would go straight to a hospital bed. The wait was terrible the first time. They told me what to do, but they didn’t give me a timer of when the things going to happen, like when they are going to assess me, when they are going to put me to bed.”

Pain Points:

- Patients may face extended wait times if their health concerns are not assessed as high priority by providers.
- Patients may experience a loss of control due to uncertainty about what to expect during their visit.

Guardian Caregiver



Alex

“Getting a sick kid to see a doctor is such a pain. I was afraid we would have to wait for hours, and I wasn’t sure if I could keep her entertained, and I was worried about her being in pain. On top of that, we have a 6-month-old at home.”

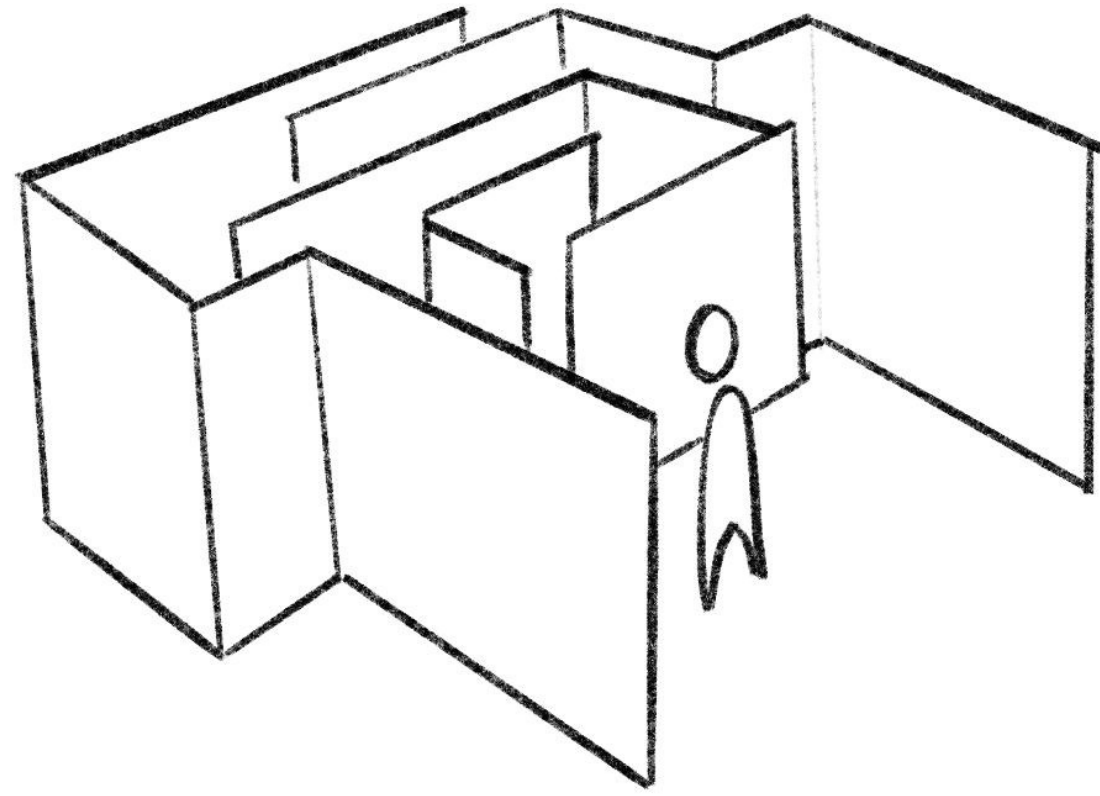
Pain Points:

- Caregivers may have difficulty understanding patient's health issues.
- Guardian caregivers may experience anxiety about bringing a young child to ER or urgent care due to potentially lengthy and unpredictable process.

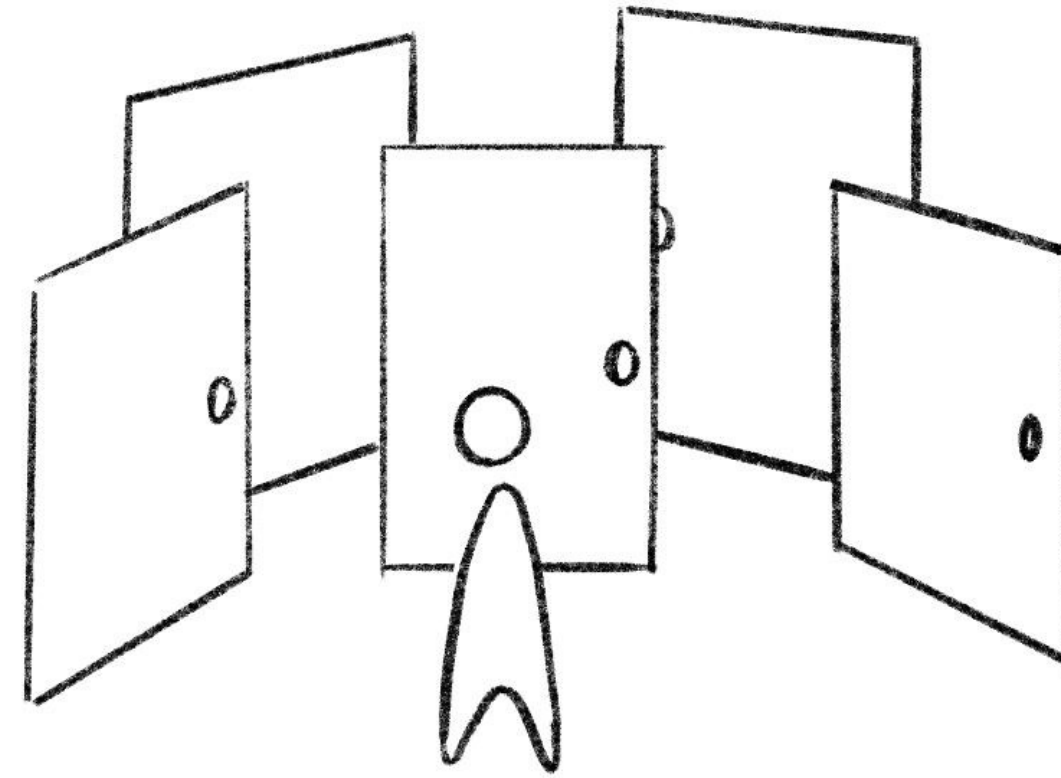
03 Concept Development

- 3 Problems
- 3 Opportunities
- Brainstorming
- Storyboarding
- Design Concept

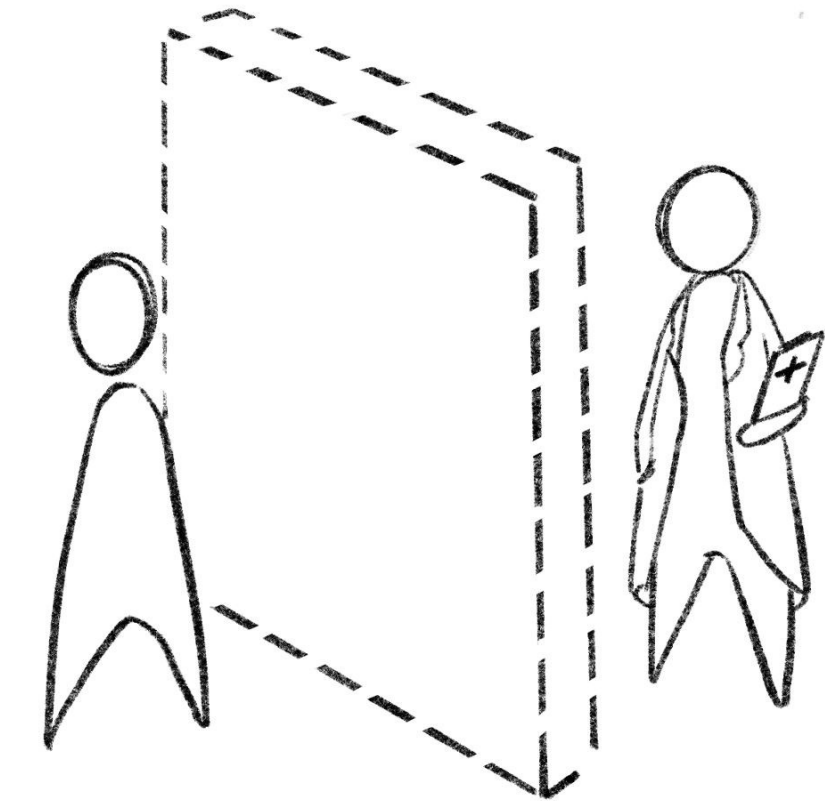
3 Problems



A multi-step, unclear process for finding timely care creates uncertainty and exacerbates an already stressful experience for patients and caregivers.

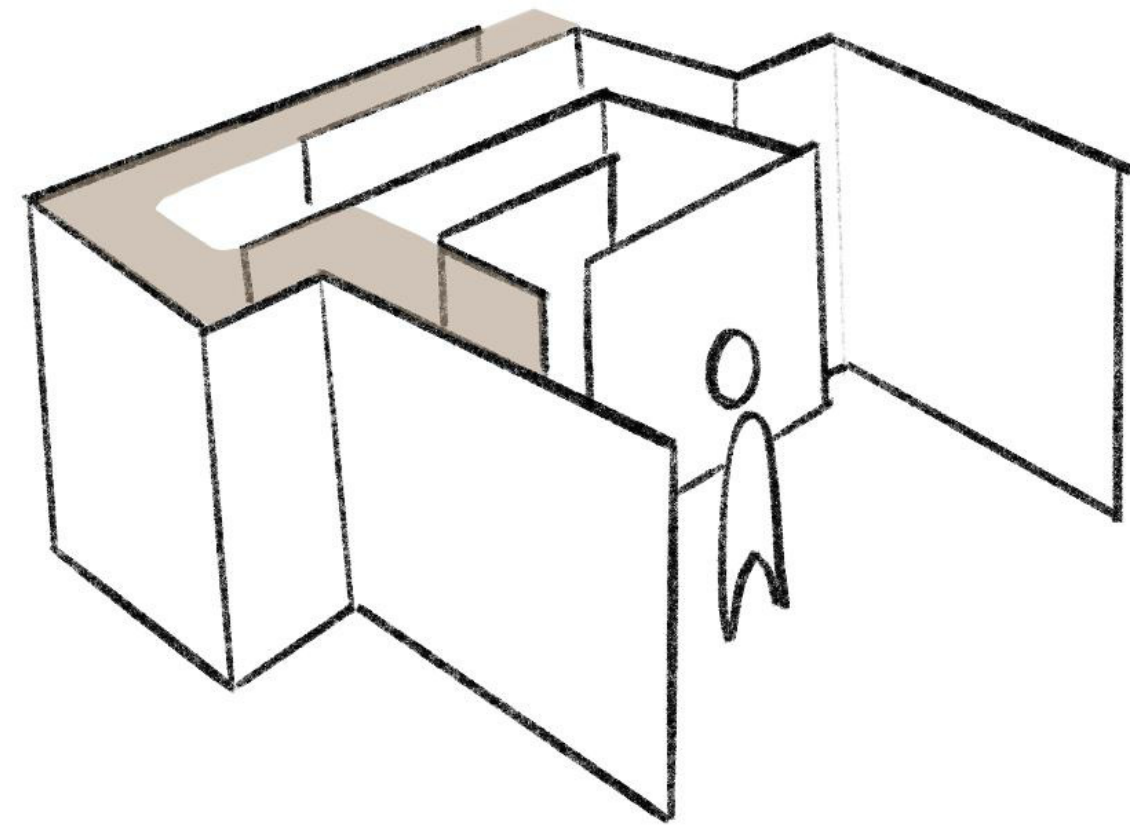


Opacity in the waiting process for urgent medical care takes away patients' and caregivers' sense of agency.

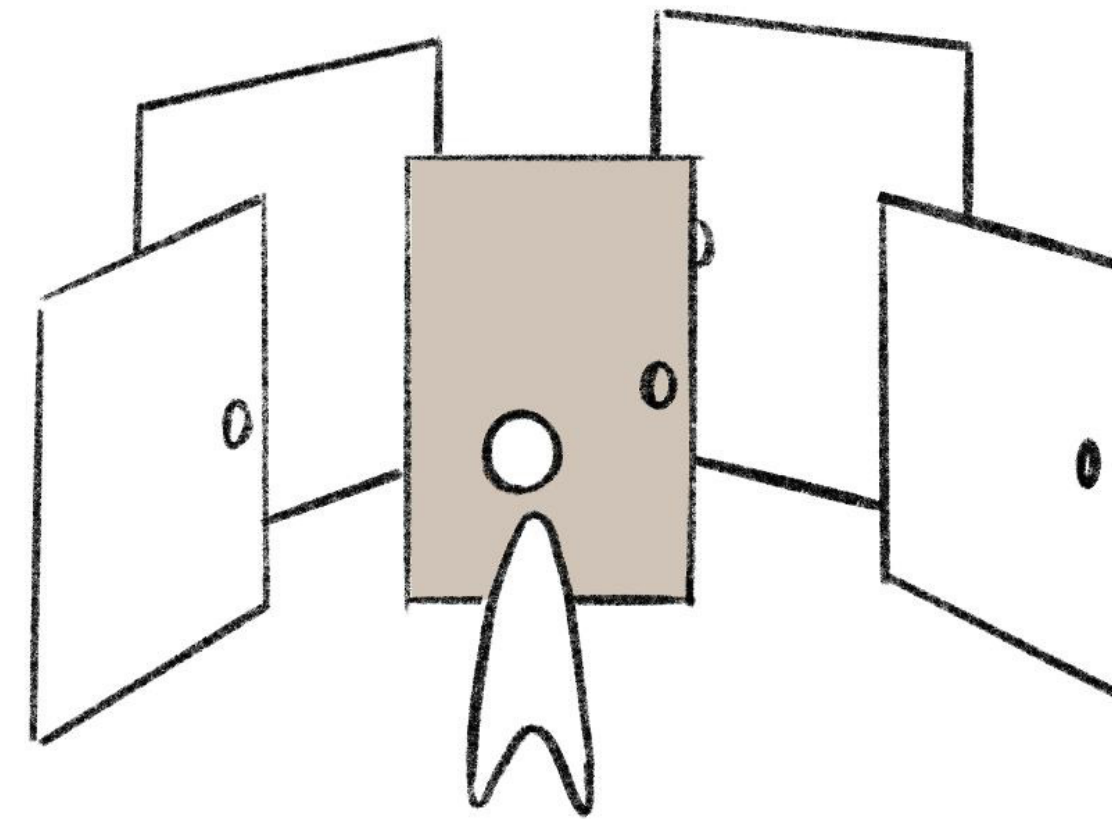


The check in process for urgent/emergent care **feels like a burdensome roadblock** to patients and caregivers, interrupting their access to care and increasing frustration.

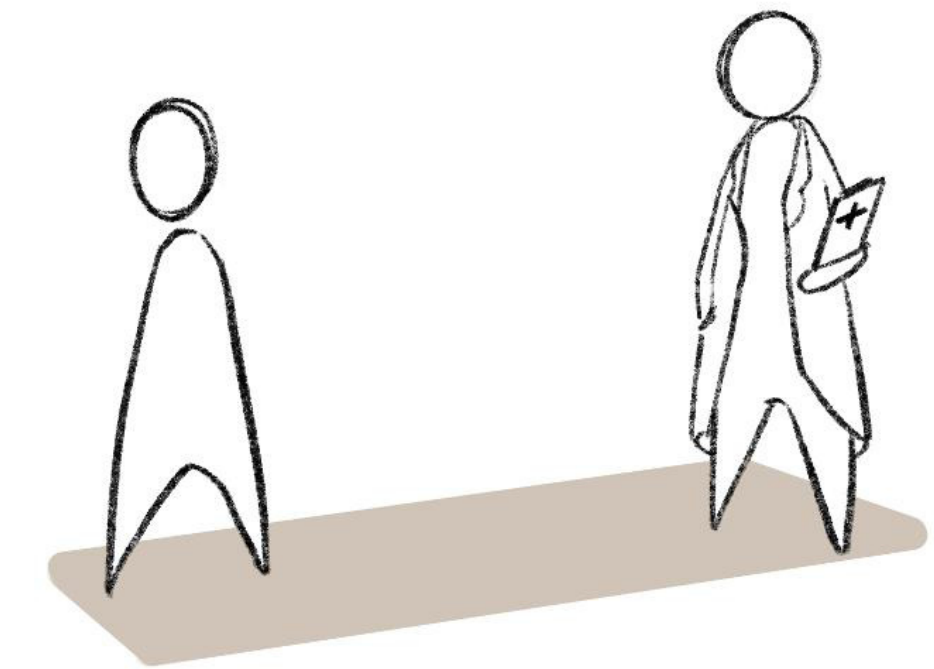
3 Opportunities



How might we **ensure patients and caregivers have simple and clear information about timely care** that empowers them to make well-informed decisions about their urgent medical needs?



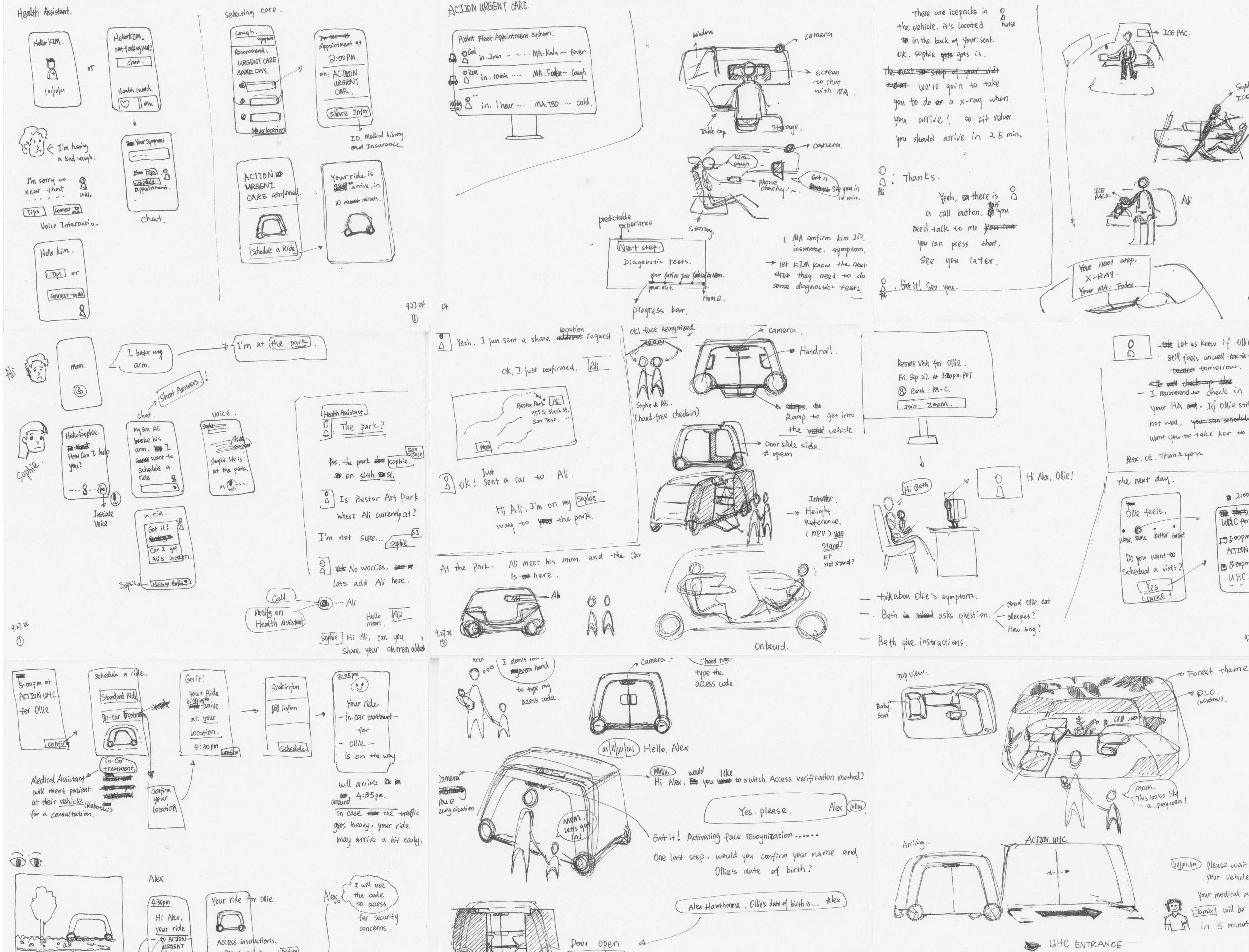
How might we **ensure patients feel they have agency** when they are waiting to receive timely medical care?



How might we ensure care teams have all the necessary information about a patient **without creating perceived barriers** and increased frustration and anxiety for patients and caregivers?

Brainstorming

My early concepts explore both the digital and physical touch points when people looking for timely care. These ideas were developed around scenarios that the three personas—Kim, Ali, and Alex—might experience when accessing care using robotaxi services and remote health support.



Storyboarding

I used the thin-slice method to break down the journey of accessing timely care. Storyboarding helped me to visualize the future experience of each persona and connect the thread of my ideas into a cohesive story.

Self-Reliant UC Patients

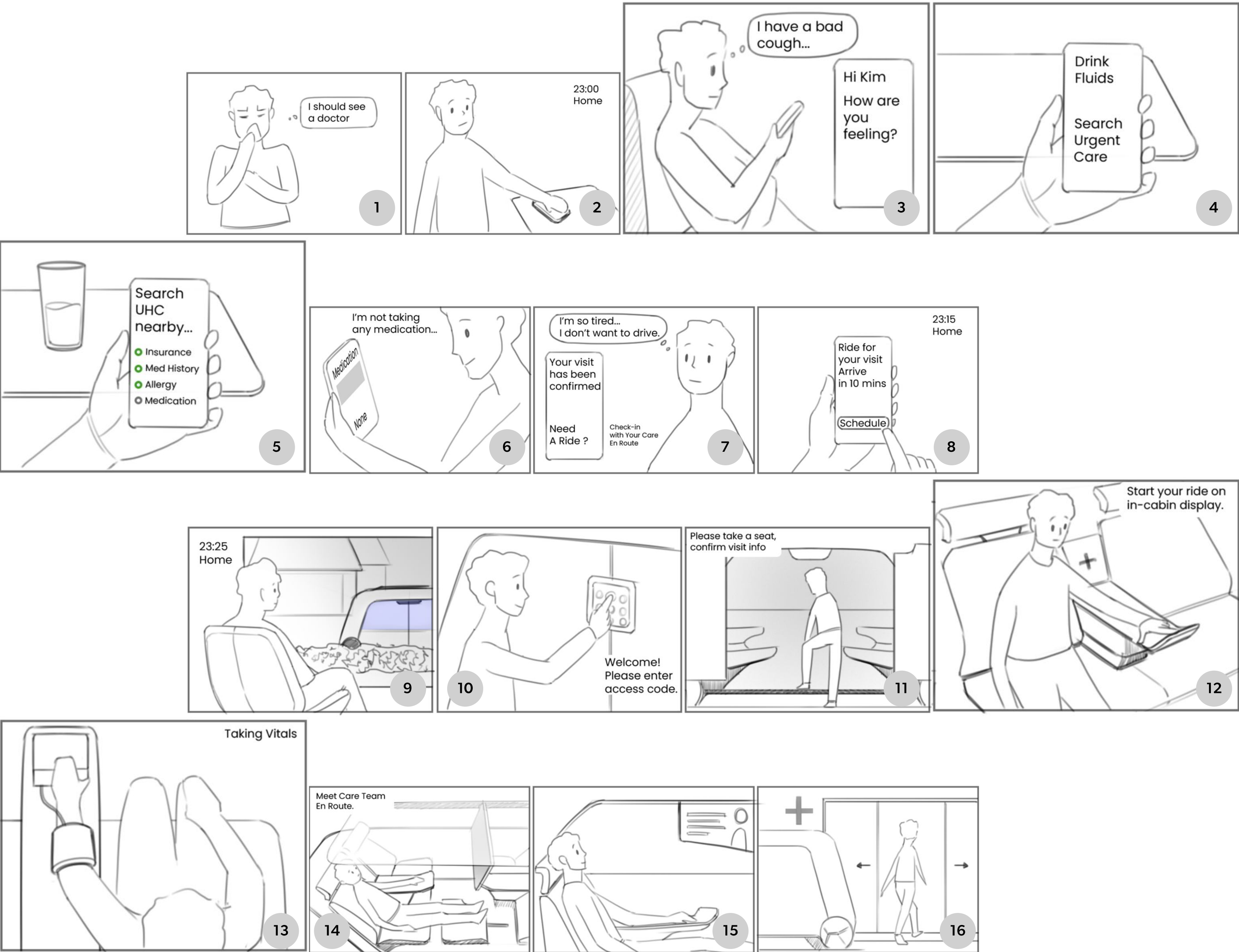


Kim

“My issue a year ago was outside of my primary doctor’s business hours, so I had to find care on my own. I had heard about UC from my neighbors, so I Googled for proximity.”

Pain Points:

- Patients often rely solely on their own resources—such as the internet, social circles, and past experiences—to search for urgent medical care.
- When their usual care providers are unavailable, they may find themselves without a reliable source of immediate medical assistance.
- Patients experiencing health issues may need to drive themselves for care, navigating routes and traffic.



Storyboarding

Supported Direct ER Goers



Ali

“I know that they will assess me, but I didn’t know they would take my labs. I didn’t know assessment was in a separate room, I thought I would go straight to a hospital bed. The wait was terrible the first time. They told me what to do, but they didn’t give me a timer of when the things going to happen, like when they are going to assess me, when they are going to put me to bed.”

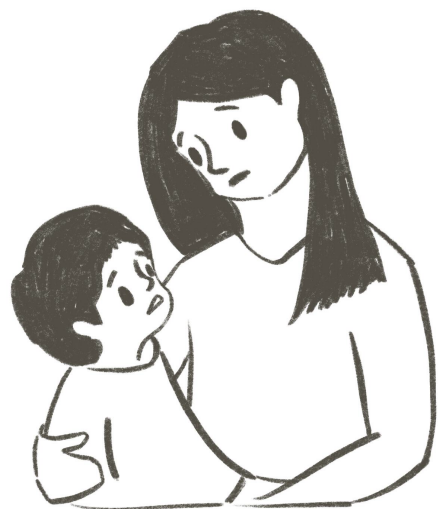
Pain Points:

- Patients may face extended wait times if their health concerns are not assessed as high priority by providers.
- Patients may experience a loss of control due to uncertainty about what to expect during their visit.



Storyboarding

Guardian Caregiver



Alex

“Getting a sick kid to see a doctor is such a pain. I was afraid we would have to wait for hours, and I wasn’t sure if I could keep her entertained, and I was worried about her being in pain. On top of that, we have a 6–month–old at home.”

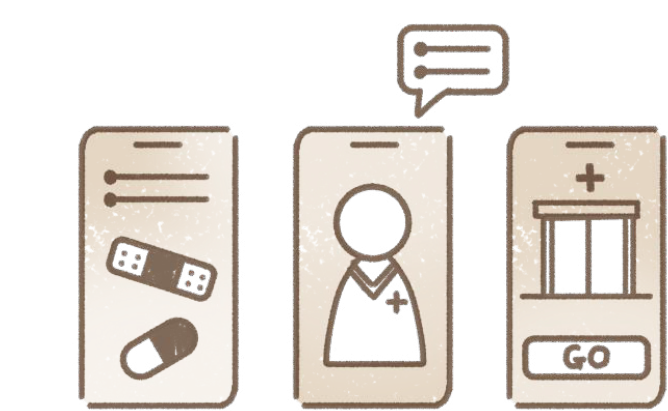
Pain Points:

- Caregivers may have difficulty understanding patient's health issues.
- Guardian caregivers may experience anxiety about bringing a young child to ER or urgent care due to potentially lengthy and unpredictable process.



Design Concept

My design concept integrates a health mobile app and a robotaxi service. This new model of care & transport service aims to support patients and caregivers in their decision-making process, streamline access to care, and provide medical and emotional reassurance before clinical intake.



Health Mobile App

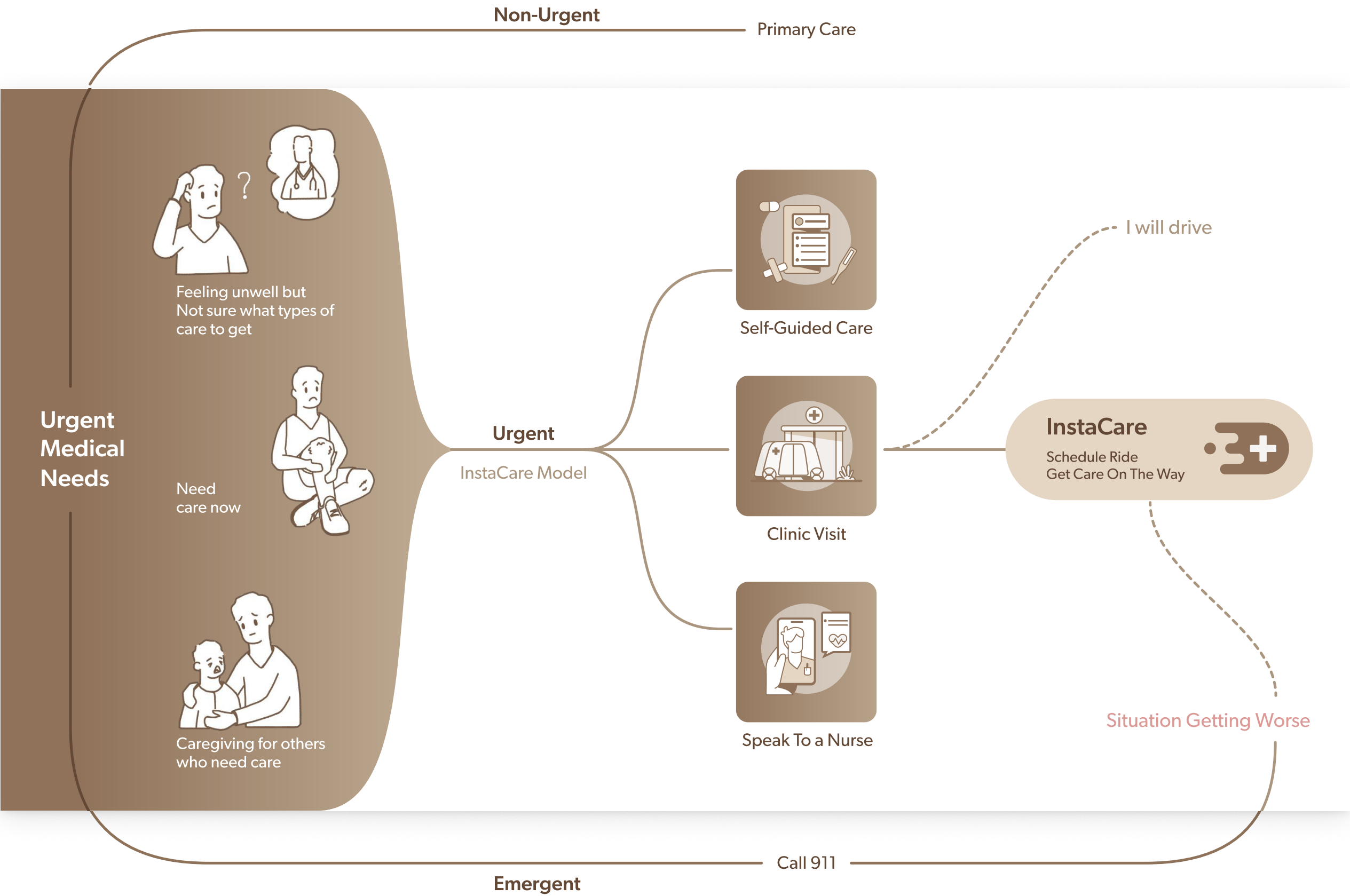
- Search personalized care options for urgent health needs.
- Schedule medical visits and request care ride.
- Offer reassurance to patients and caregivers.



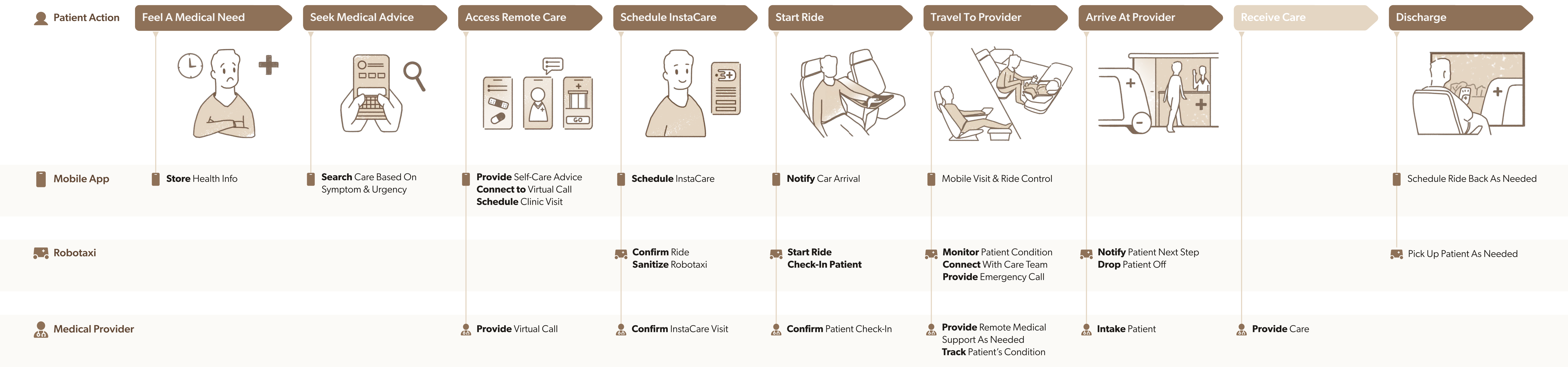
Robotaxi Service

- Enables remote check-in as a mobile extension of a care facility.
- Monitor & share patients health condition en route.
- Prepare for potential health emergency during transit.
- Provide a calm, private and supportive care space and ride.

InstaCare Model



Journey with InstaCare



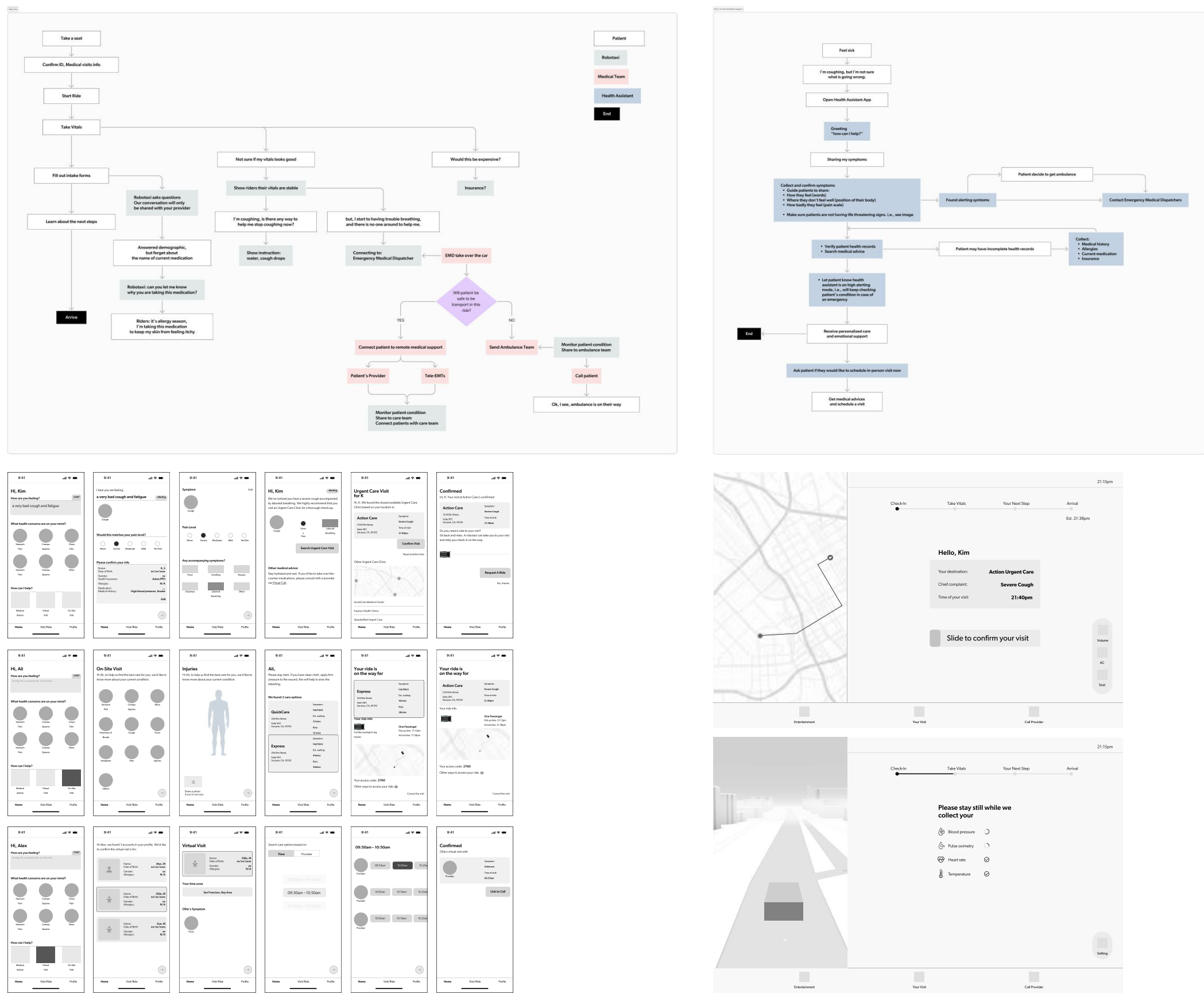
04 Design Validation

- Early-Stage Prototype
- Usability Test
- Testing Feedback Analysis
- Design Prototype

Early-Stage Prototype

Flowchart & Wireframes

I used flowcharts to highlight key decision points, interactions, and navigation paths for both mobile and ride interfaces. Based on these user flows, I created wireframes to visualize early-stage key screens.



Moodboard

Striking a Balance Between Strength and Softness

The soft, neutral-toned material and rounded corners create a sense of comfort and approachability, offering emotional support to patients and caregivers during anxious times. This calming and protective environment, along with thoughtful product interactions, provides visual cues that aim to alleviate anxiety and offer emotional support.

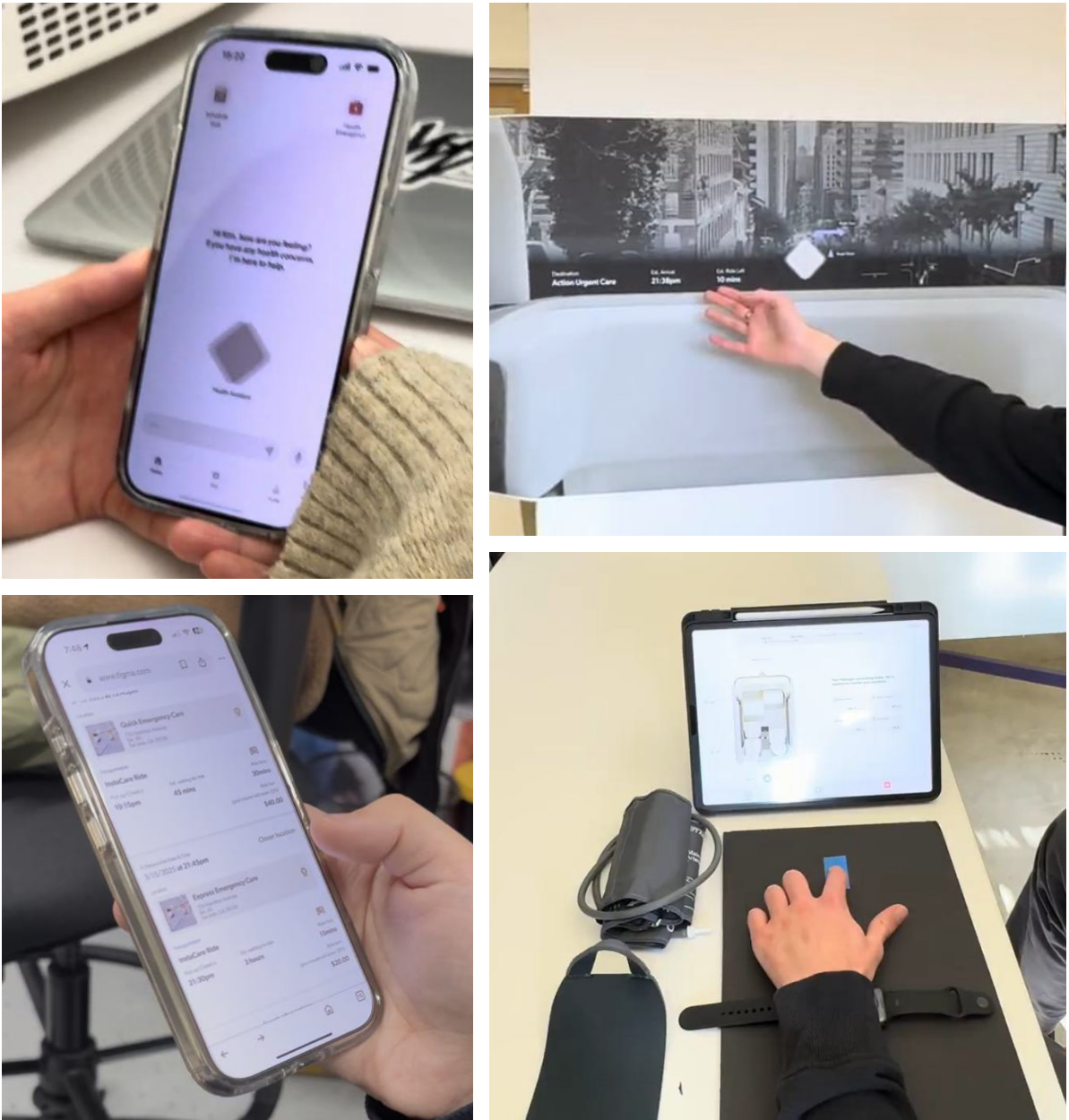


The hard surfaces, precisely aligned lines, and repetitive geometric shapes provide a sense of stability and structure, visually communicating to users that this product is reliable and effective. For an urgent/emergent healthcare product, establishing trust is crucial, especially as users will likely interact with it during vulnerable moments.

Usability Test

1st Round

In the first round of usability testing, I tested the scenario of “Kim,” a user experiencing a severe cough who initially looked for self-care options, then decided to schedule an in-person visit at night. I conducted tests with eight participants and evaluated the entire service — from the mobile app to the ride flows. I also tested three different vital sign devices to gather feedback on how users can use them one hand or assist others in taking vitals.



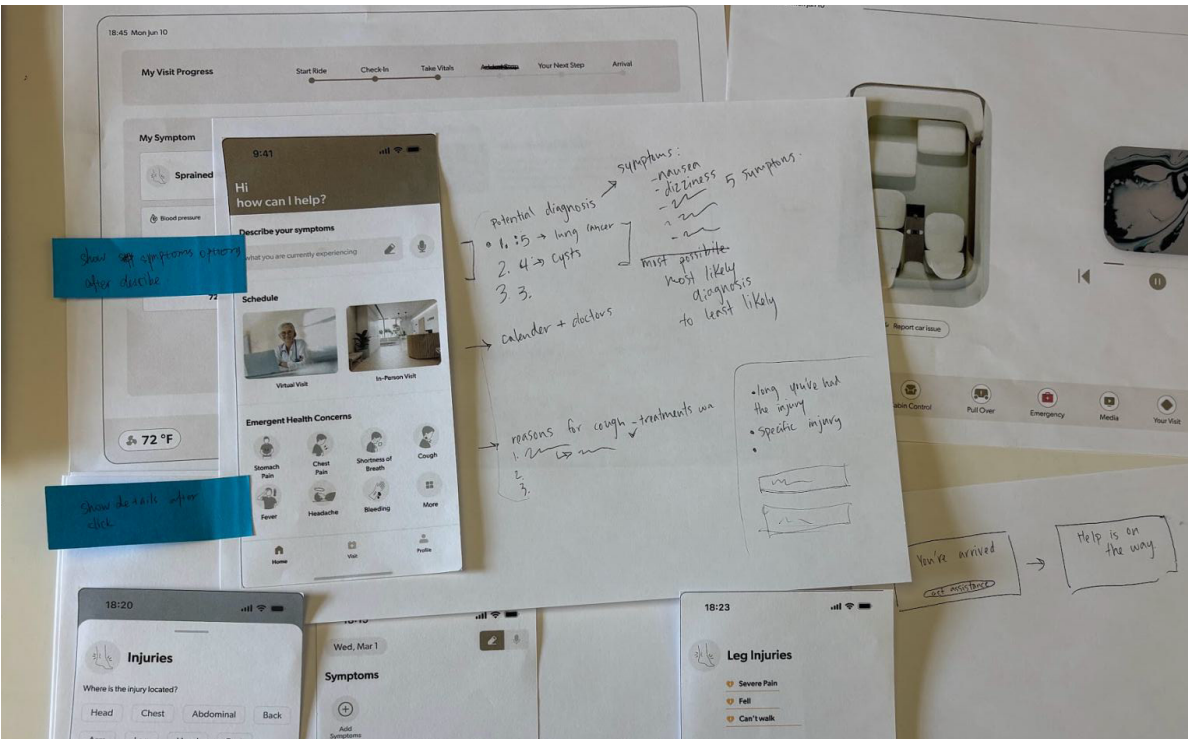
Key Findings

- Using chat as the entry flow for people to search for care didn’t work, as participants associated it with a lengthy process and felt intimidated to start with.
- Even when participants followed the flow to schedule a ride for their in-person visit, they still assumed it was a regular ride hailing service picking them up.
- After scheduling the ride, participants were unsure about what to do next.
- Participants didn’t realize it was a self-driving car until they were led to the riding space, saw an interior image without a driver’s seat, or were explicitly told.
- The navigation icons in the ride flow—especially “Ride Emergency” and “Health Emergency”—confused participants.

2nd Round

To validate the design updates from the 1st round testing, I tested an updated digital prototype (Ali scenario) with my first participant in 2nd round. I found that participants tend to move through the prototype too quickly to share in-depth feedback on key screens.

To address this, I printed out the key screens and conducted tests with four more participants using paper prototype. This approach allowed me to better capture their thought processes and reasoning behind how they use or expect to use the key flows.



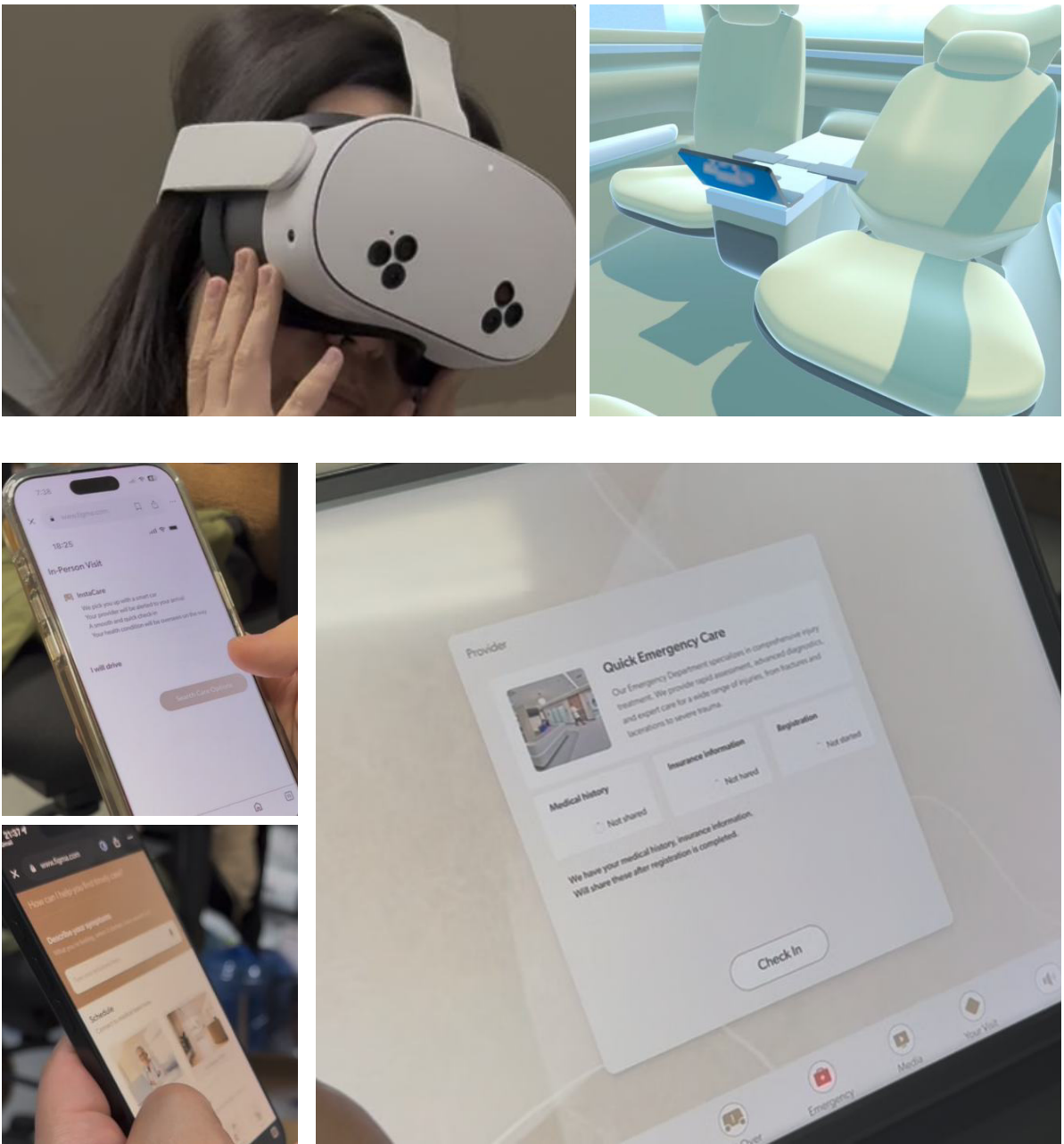
Key Findings

- Instead of chatting/texting with a medical system to get initial medical advice, participants saw the “Describe Your Symptoms” as a search tool.
- The schedule sections on landing screen takes up a large portion of screen real estate, which naturally draws the most attention from participants.
- The self-guided care screen currently only summarizes patient’s symptoms. However, participants wanted to know what immediate actions they could take.
- The emergency section in the ride flow doesn’t provide enough information to help participants understand how to identify a health emergency.

Usability Test

3rd Round

In the third round of usability testing, I tested the scenario of “Alex,” a mother caring for her six-year-old daughter, Ollie, who has a fever. When Alex decides to take Ollie for an in-person visit, she also has a baby at home. I conducted tests with four participants, who are parents with young children. I tested the updated design using digital prototypes for mobile and ride flow and used VR to demonstrate the vehicle interior, gathering feedback on seating, onboarding/dropping off, and riding experience.



Key Findings

- Participants had a difficult time understanding this new care & transport service. They were unsure of what the service offered or how it differed from their current options, such as driving themselves or using ride-hailing apps.
- InstaCare was introduced later in the mobile flow, making it easy for participants to overlook.
- The ride flow overall felt intuitive. However, the check-in screen confused participants because its call-to-action didn’t match with the information displayed.

Quantitative Feedback

In both the second and third rounds of testing, I included a System Usability Scale (SUS) survey alongside qualitative feedback to gather quantitative insights (received 8 responses).

Key Findings

I found the design unnecessarily complex.



I found the various features in this design were well integrated.



I would image that most people would learn to use this new service to get urgent/emergent care very quickly.

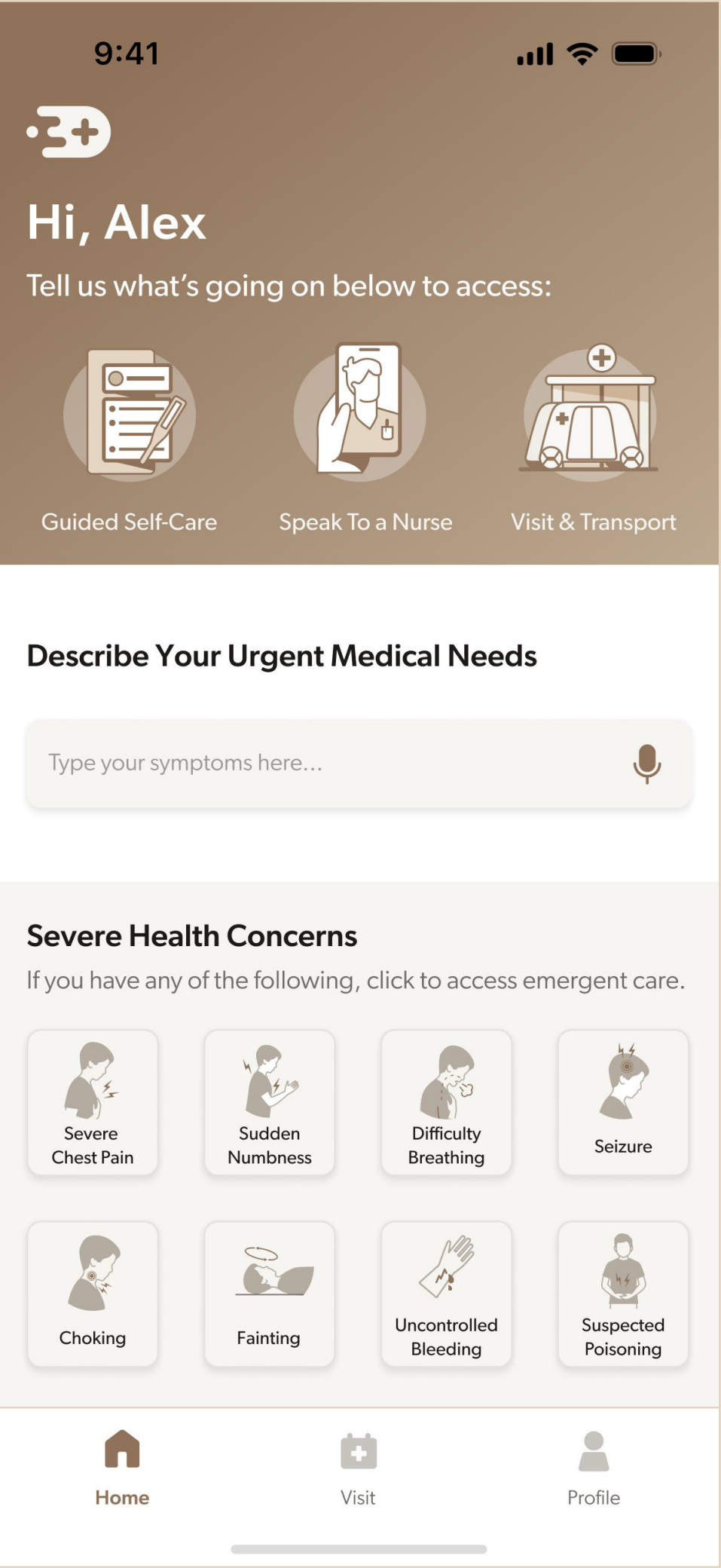


I needed to learn a lot of things before I could get going with this new service.

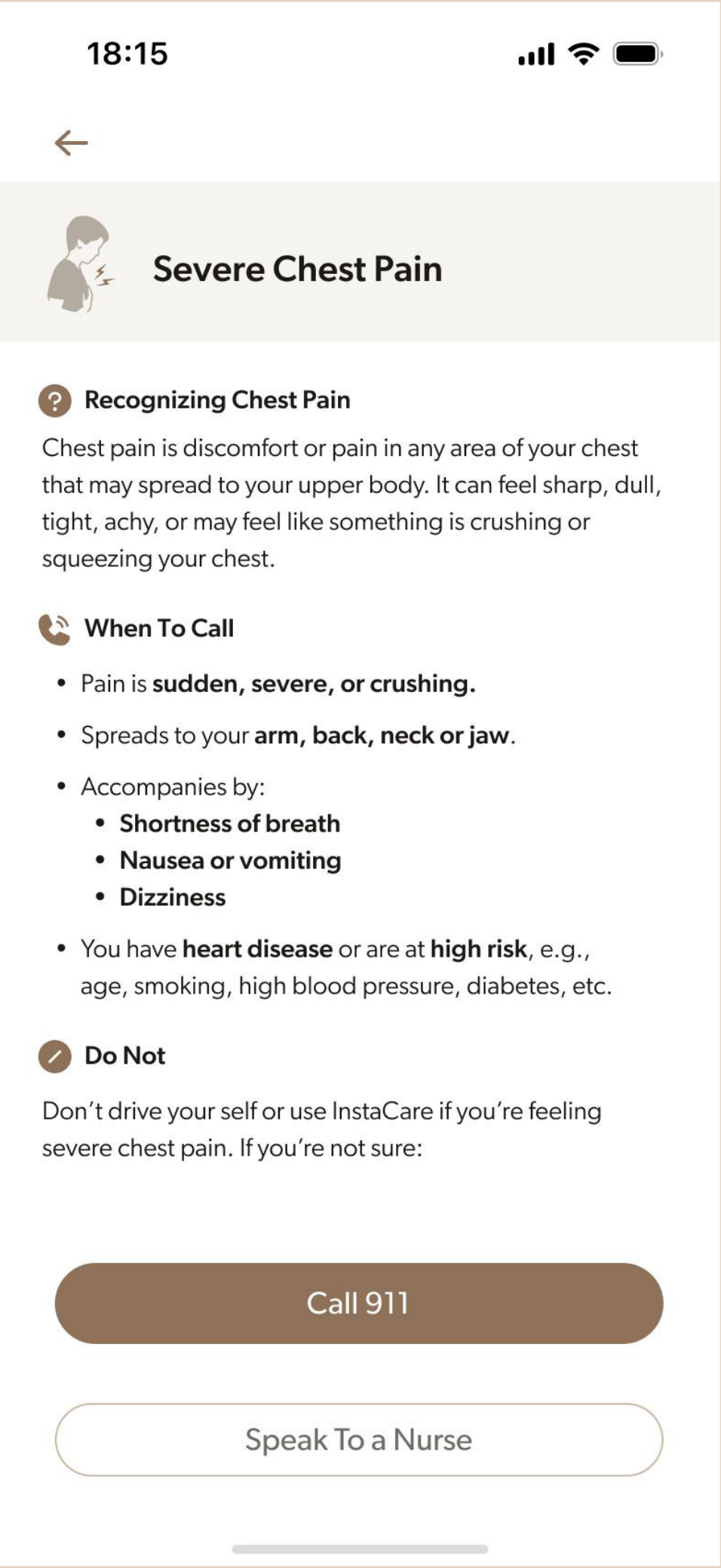


Design Prototype

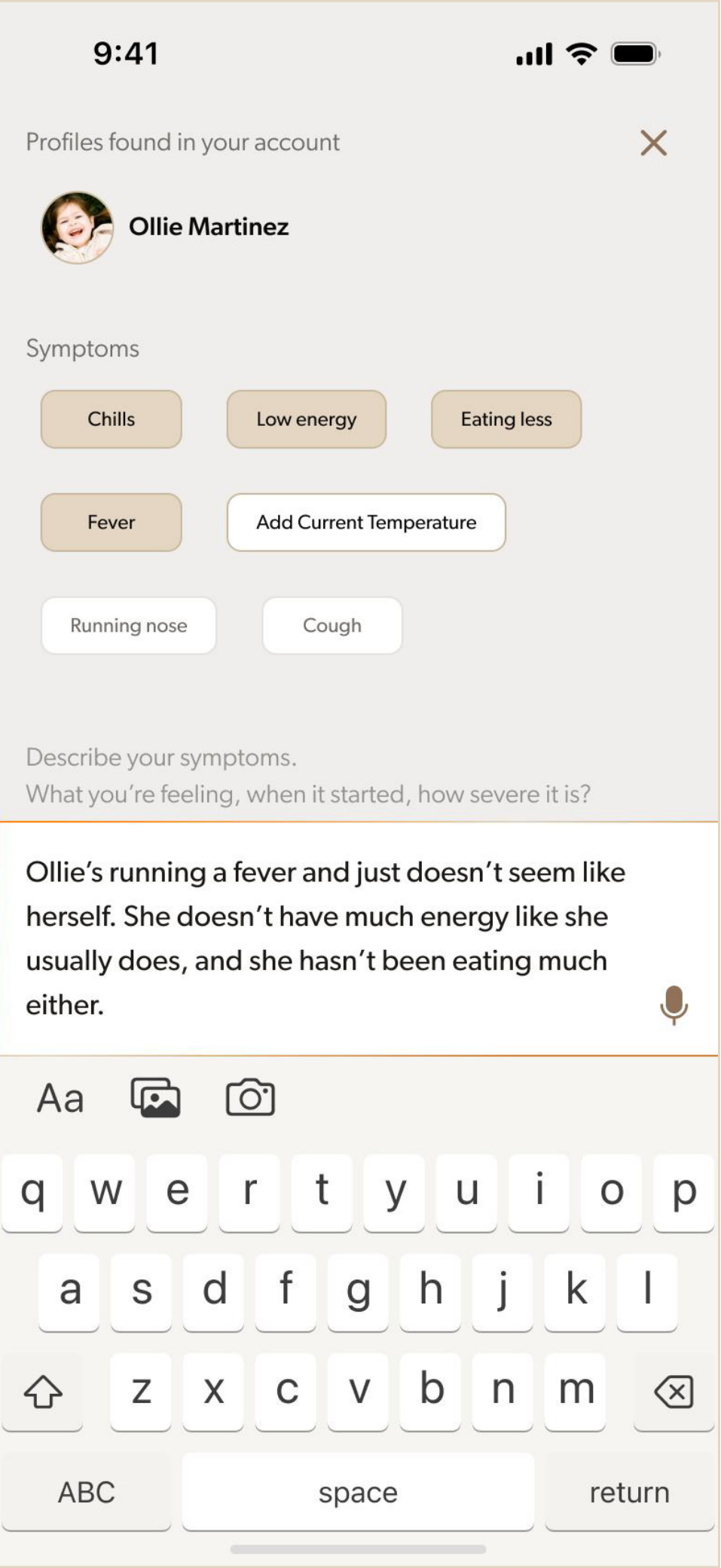
Mobile Flow – Landing Screen



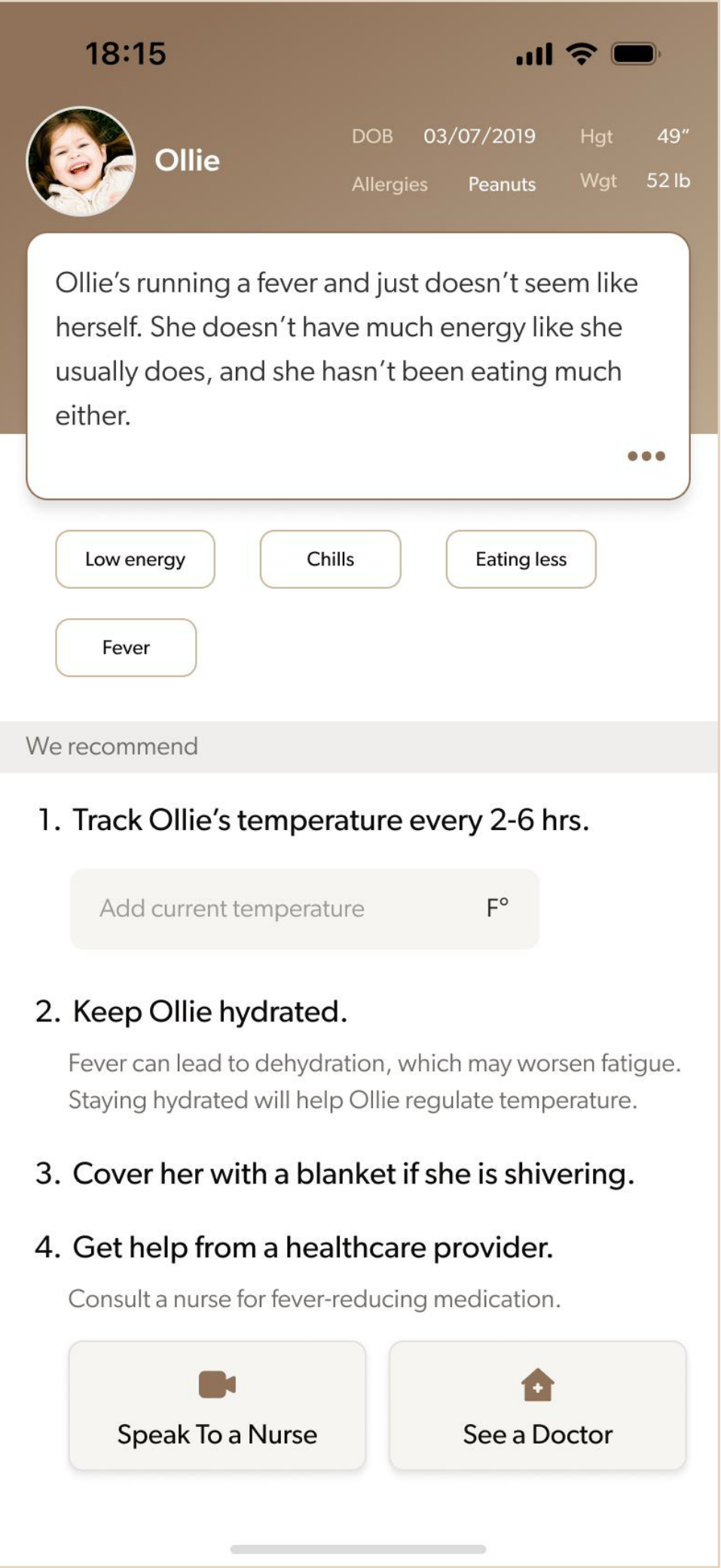
Mobile Flow – Severe Health Concerns



Mobile Flow – Describe Urgent Medical Needs

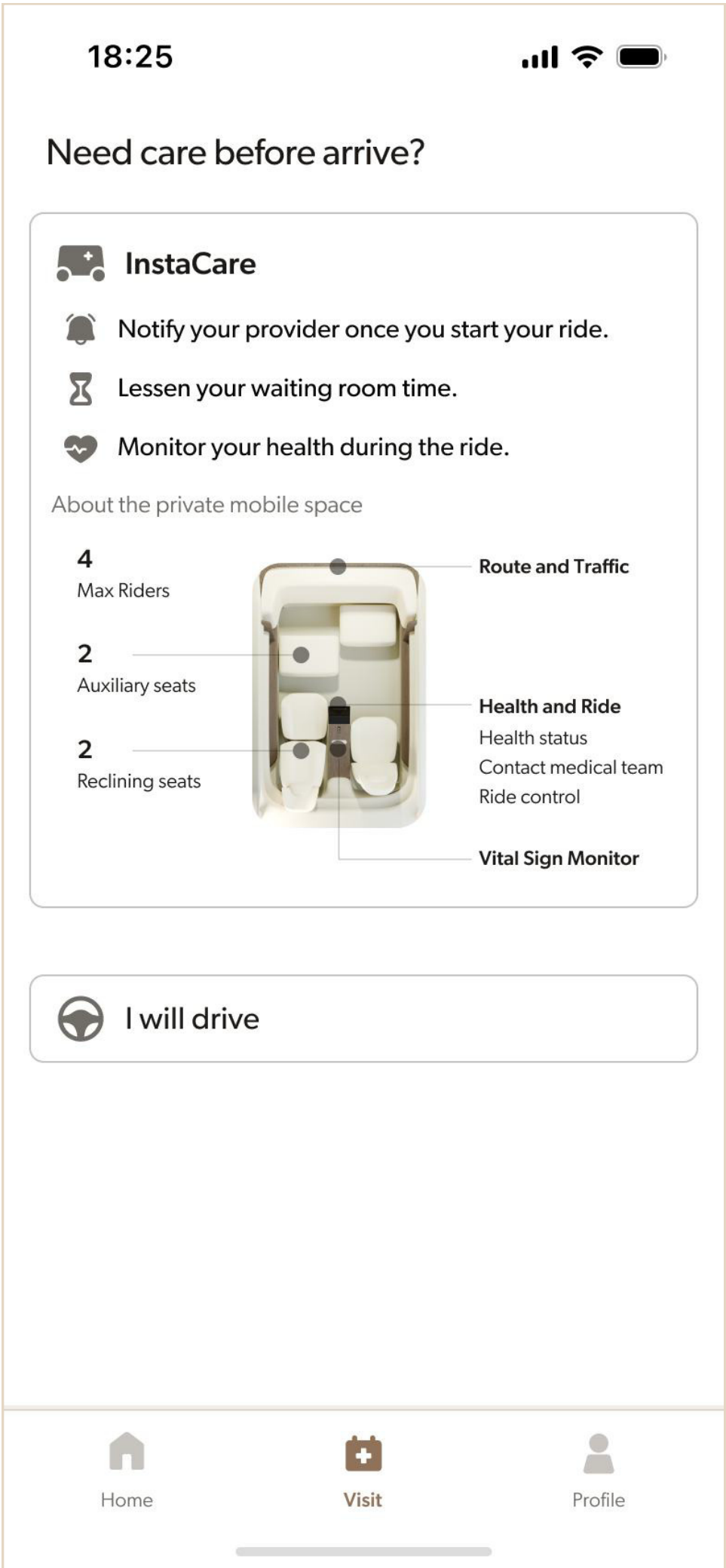


Mobile Flow – Guided Self-Care

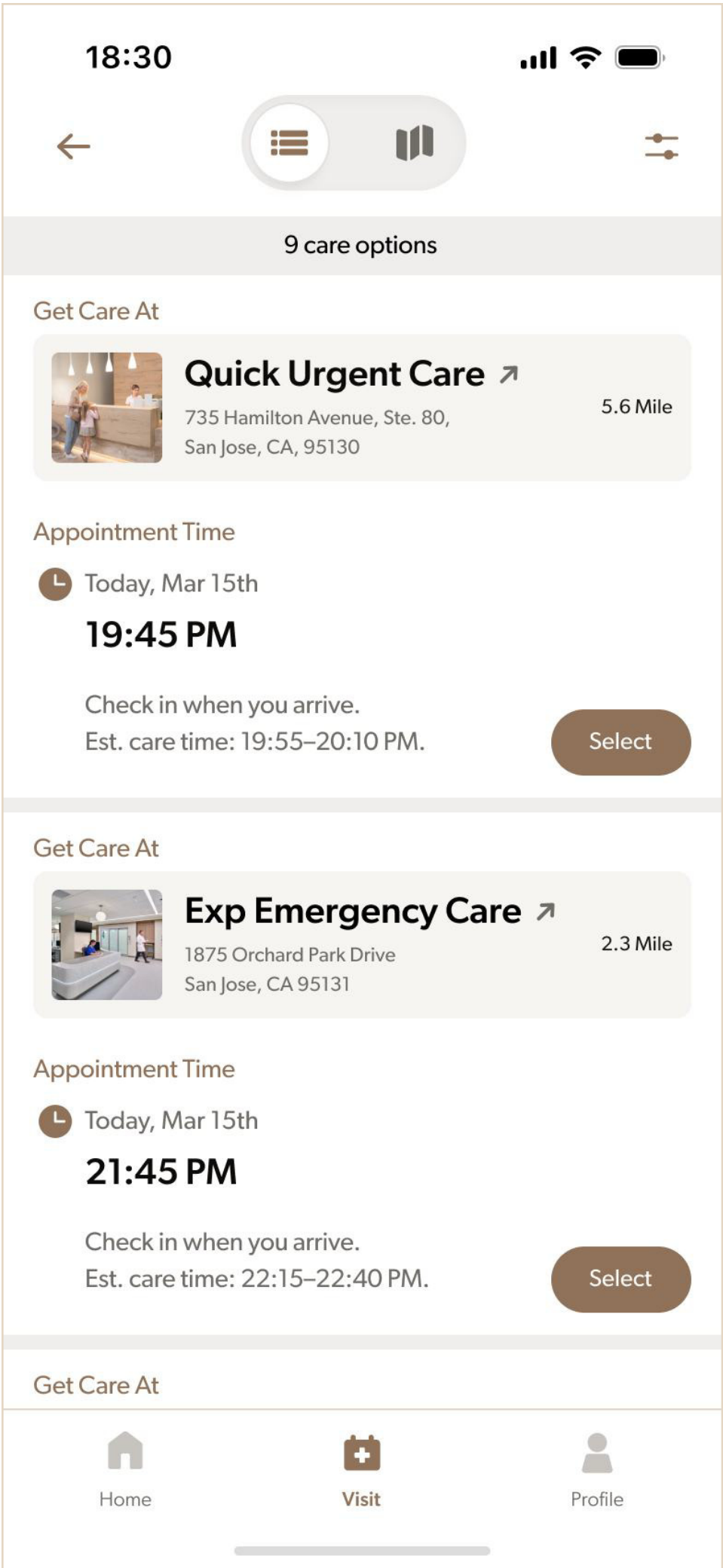


Design Prototype

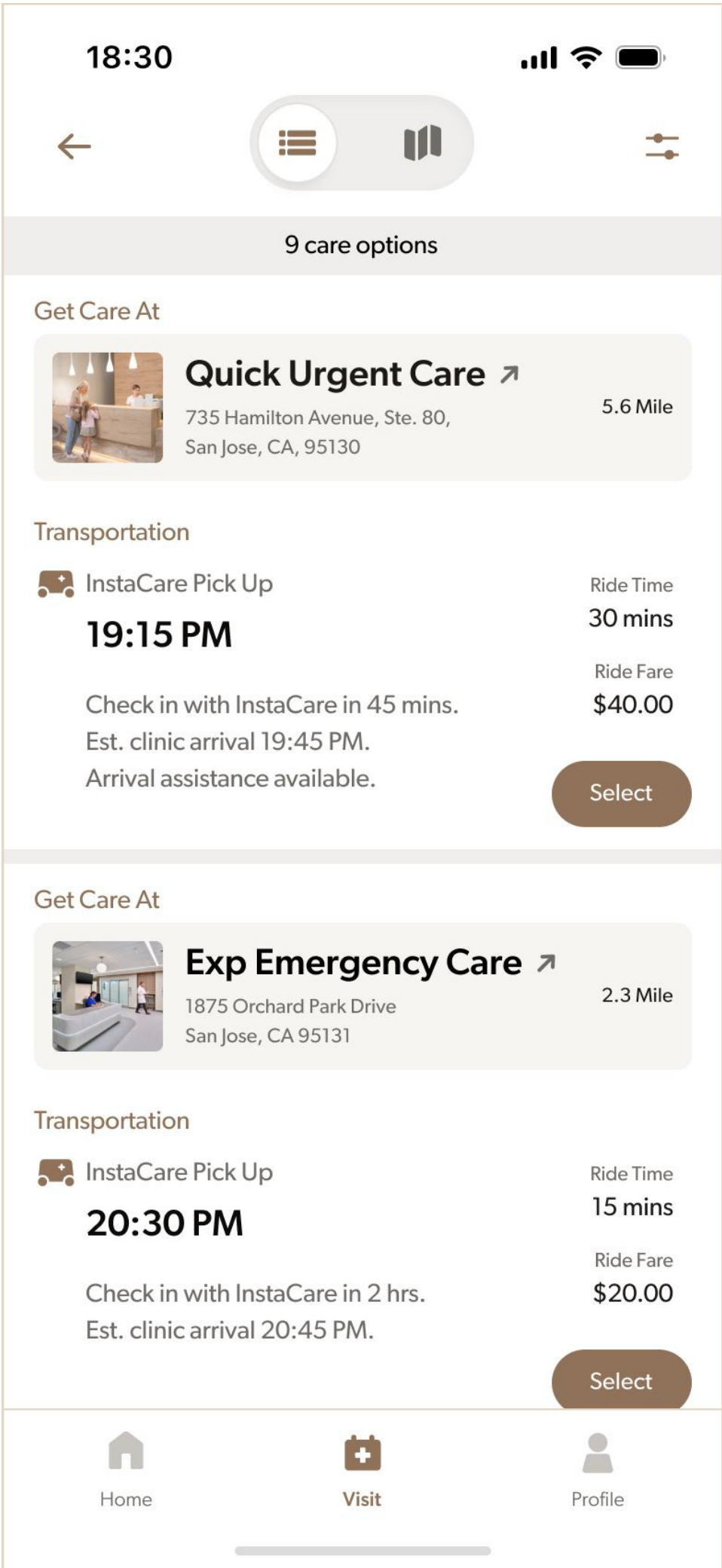
Mobile Flow – Select Care Option



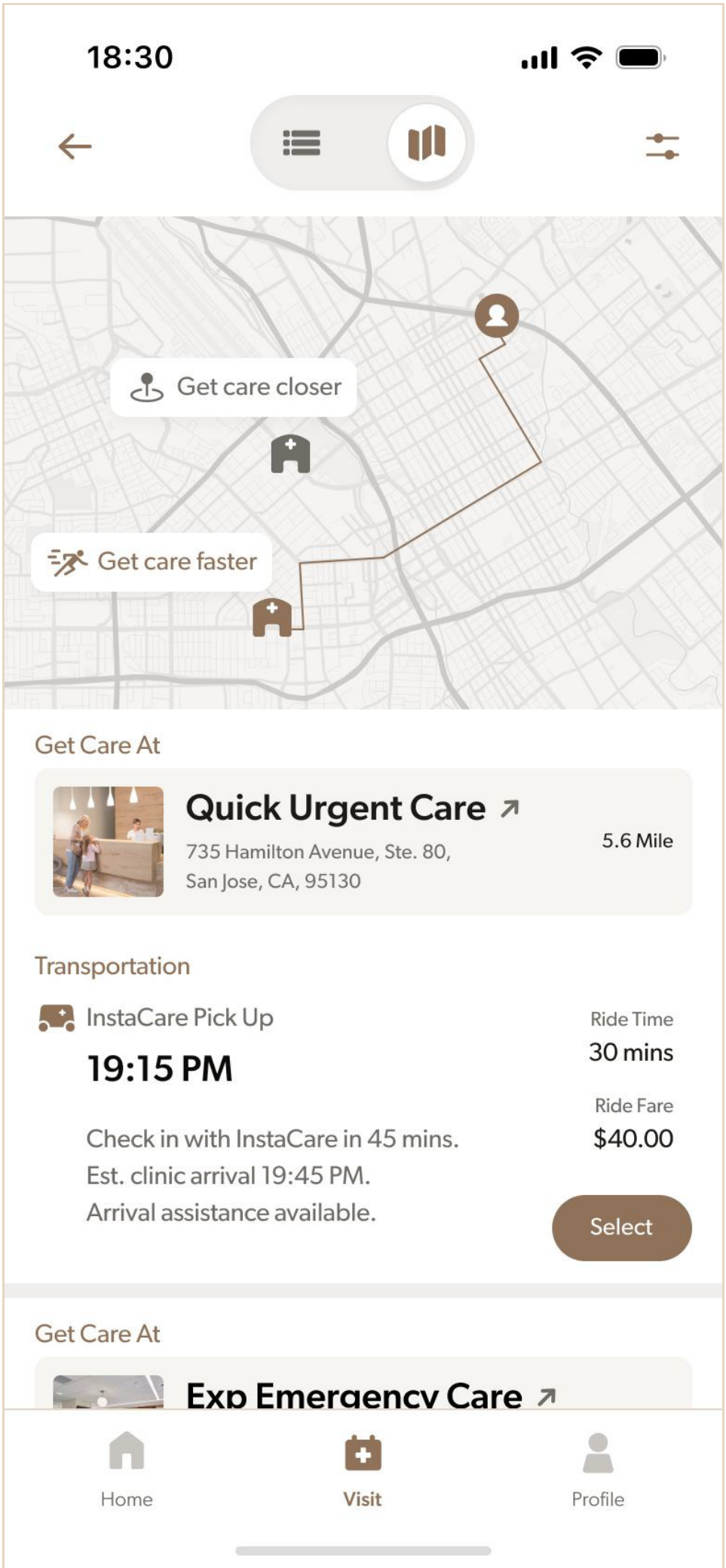
Care Option – I will Drive



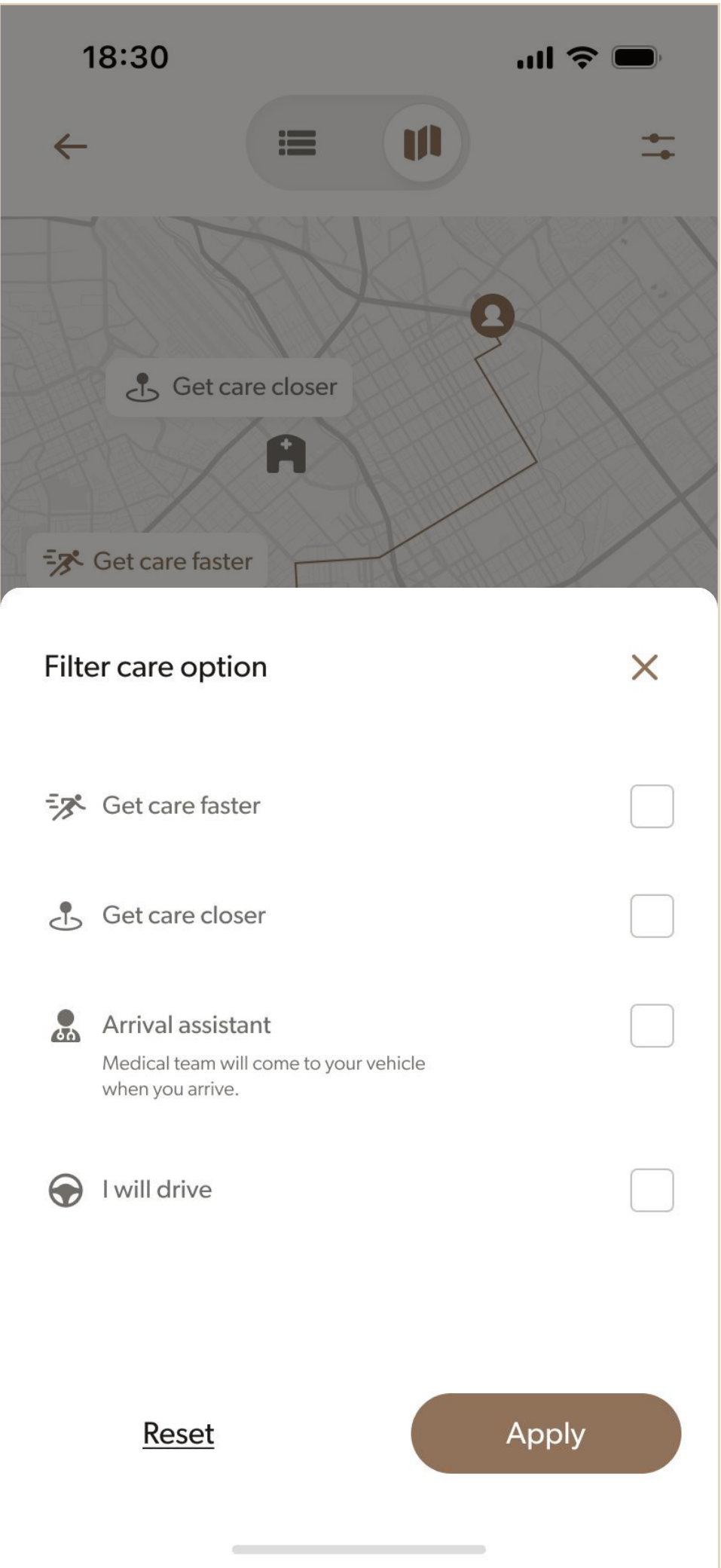
Care Option – InstaCare



Mobile Flow – Care Option Map View

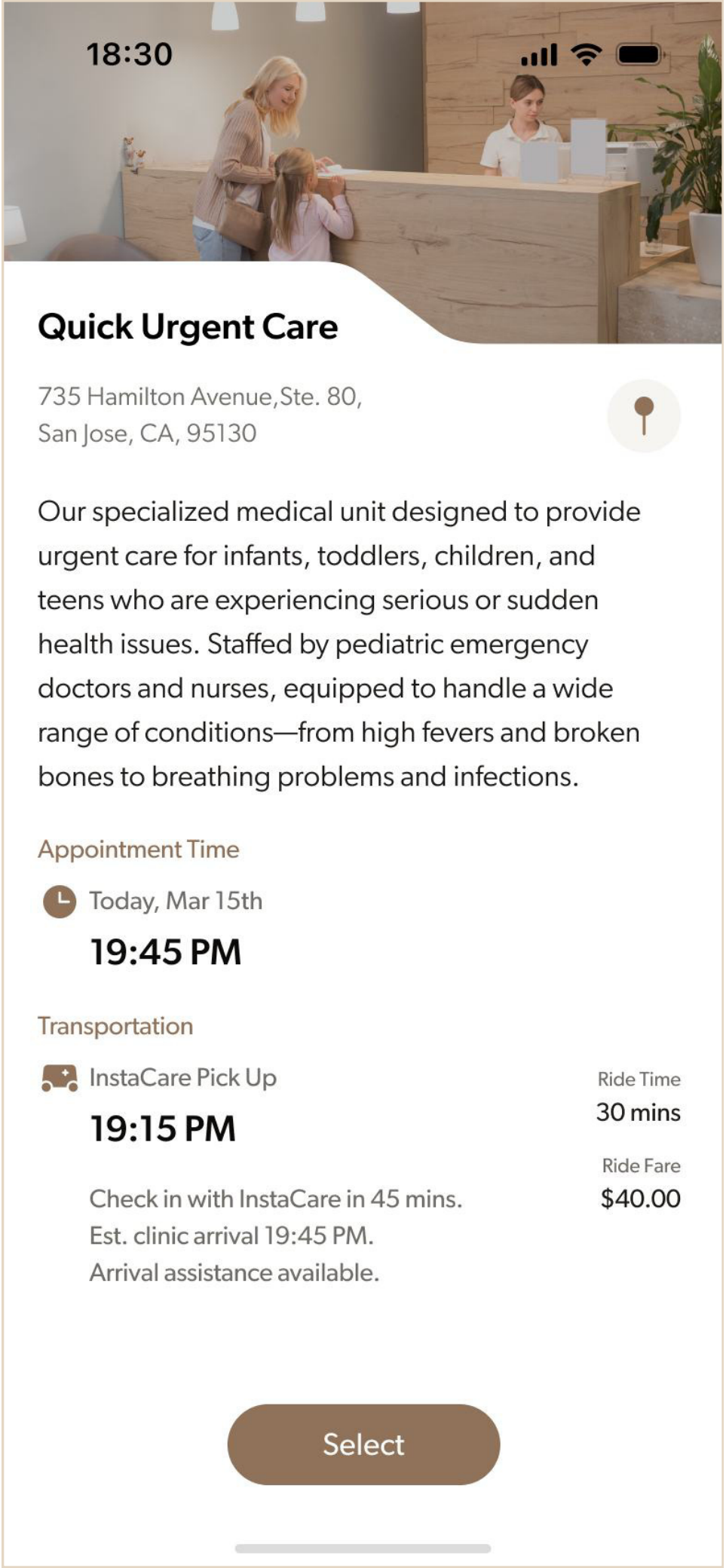


Mobile Flow – Care Option Filter

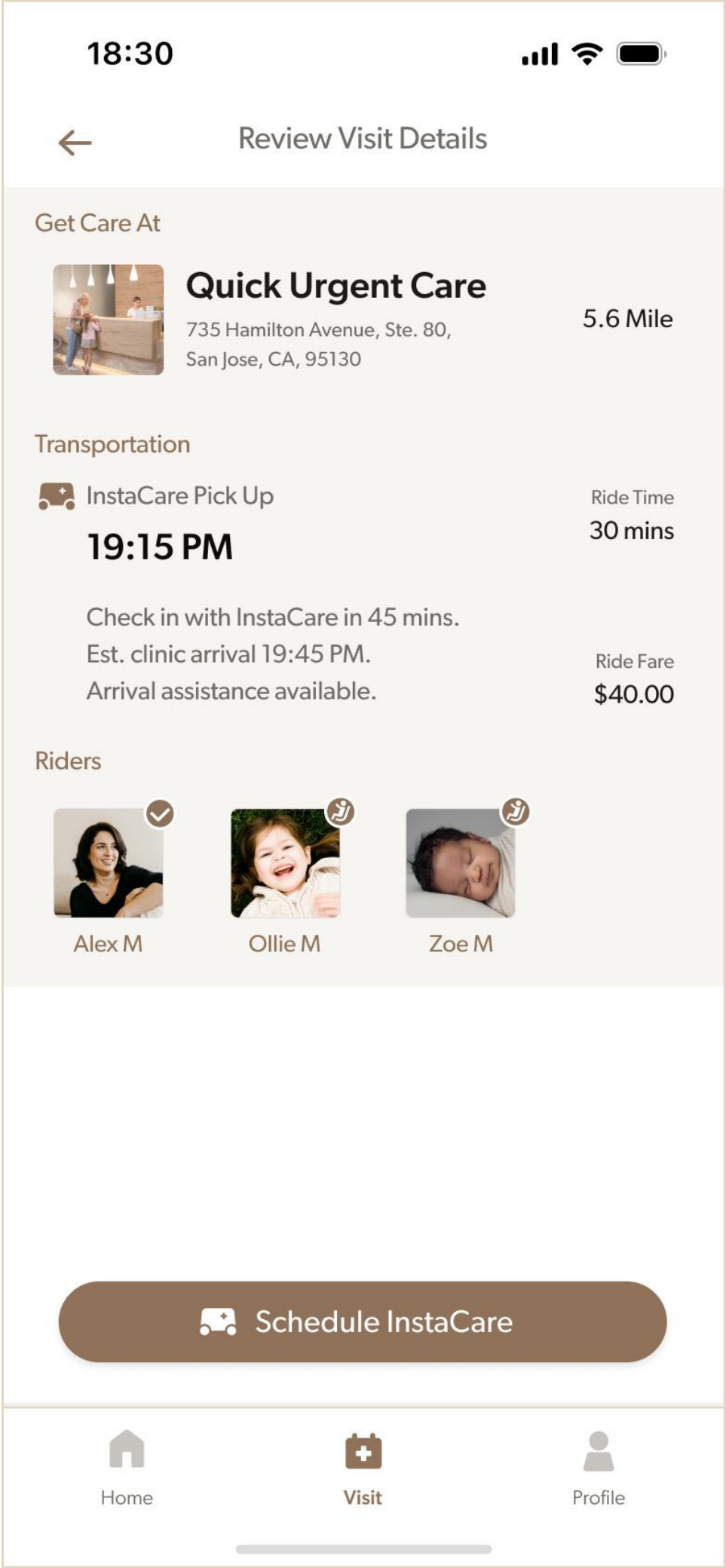


Design Prototype

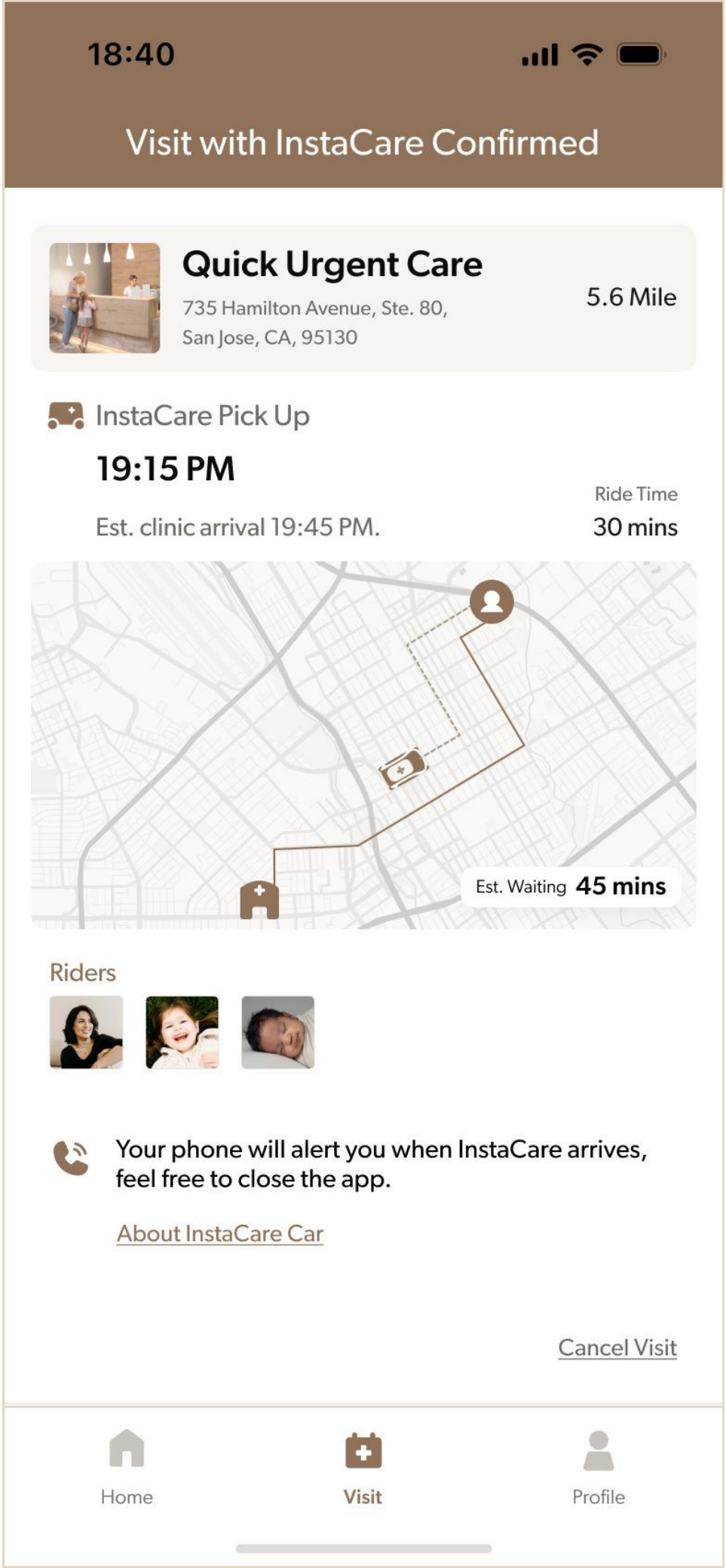
InstaCare – Provider Details



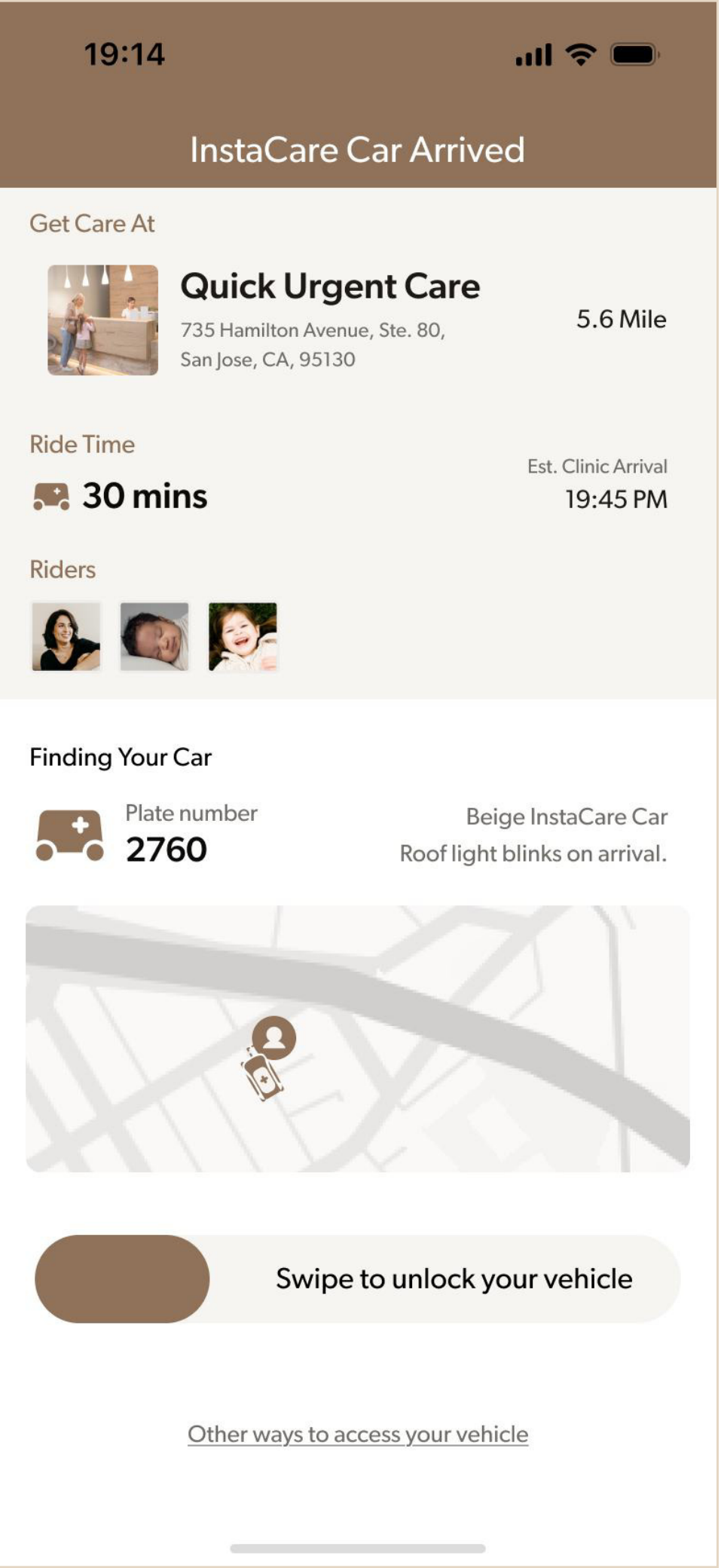
InstaCare – Schedule InstaCare



InstaCare – InstaCare Confirmed

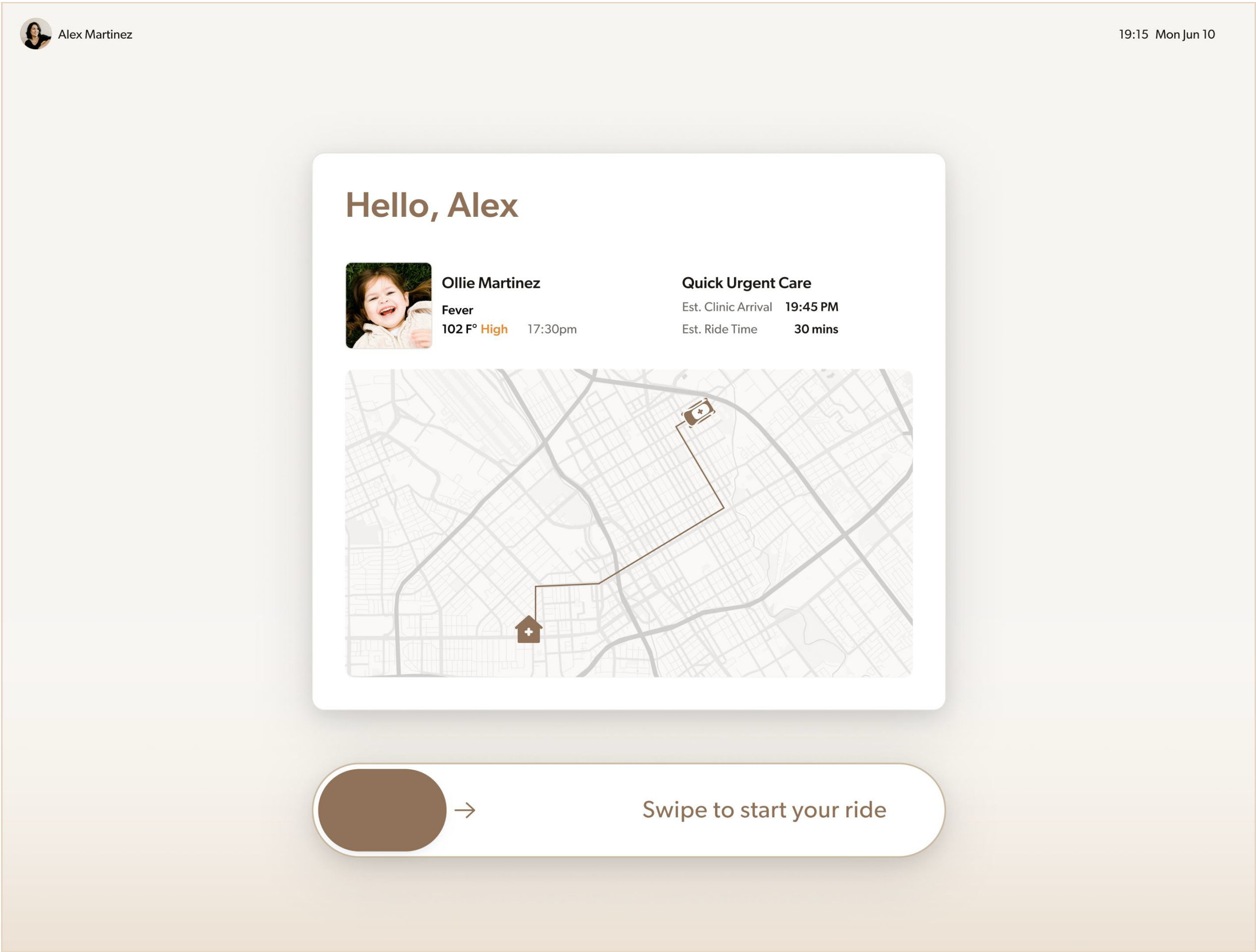


InstaCare – InstaCare Pick Up

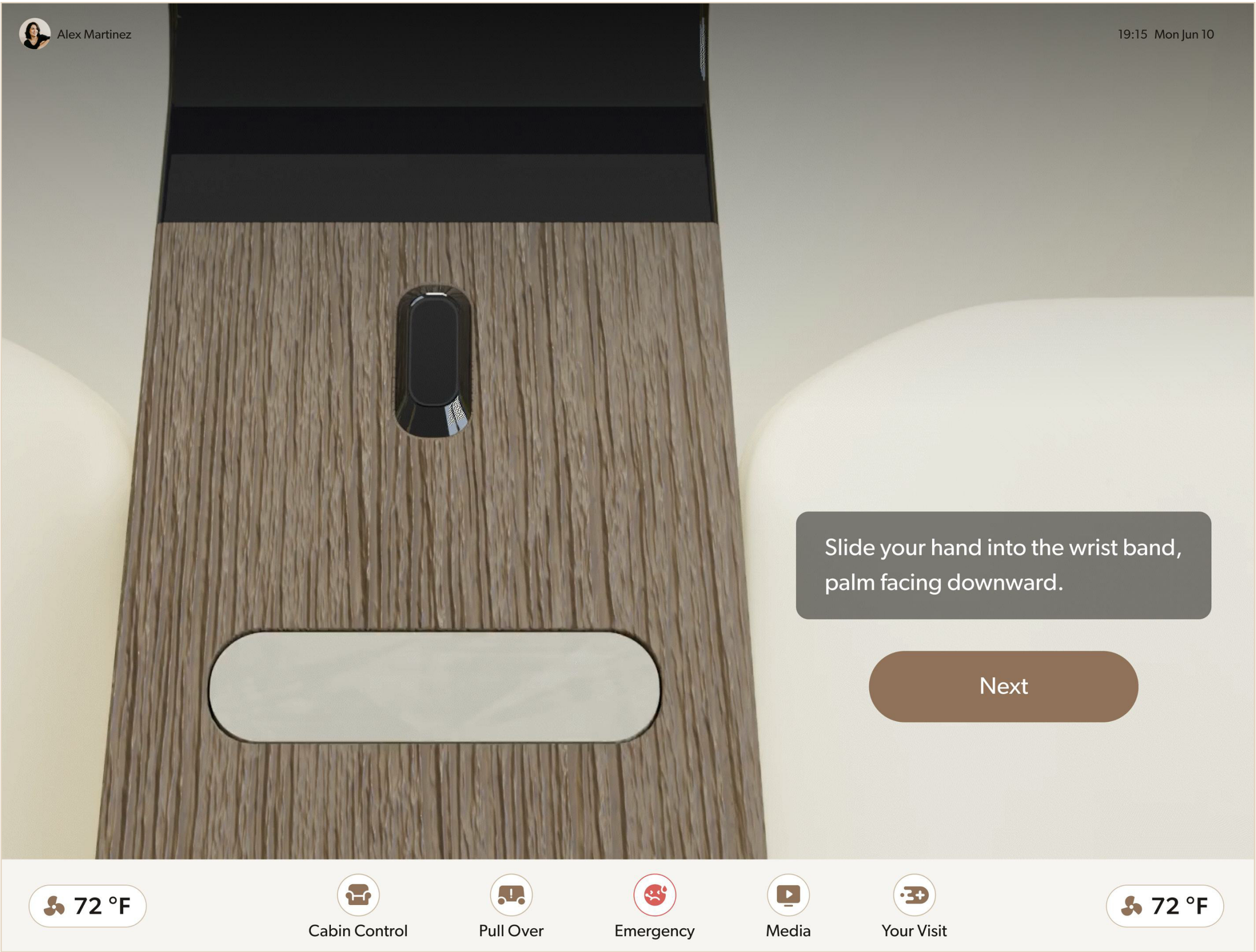


Design Prototype

Ride Flow – Start Ride & Remote Check-In

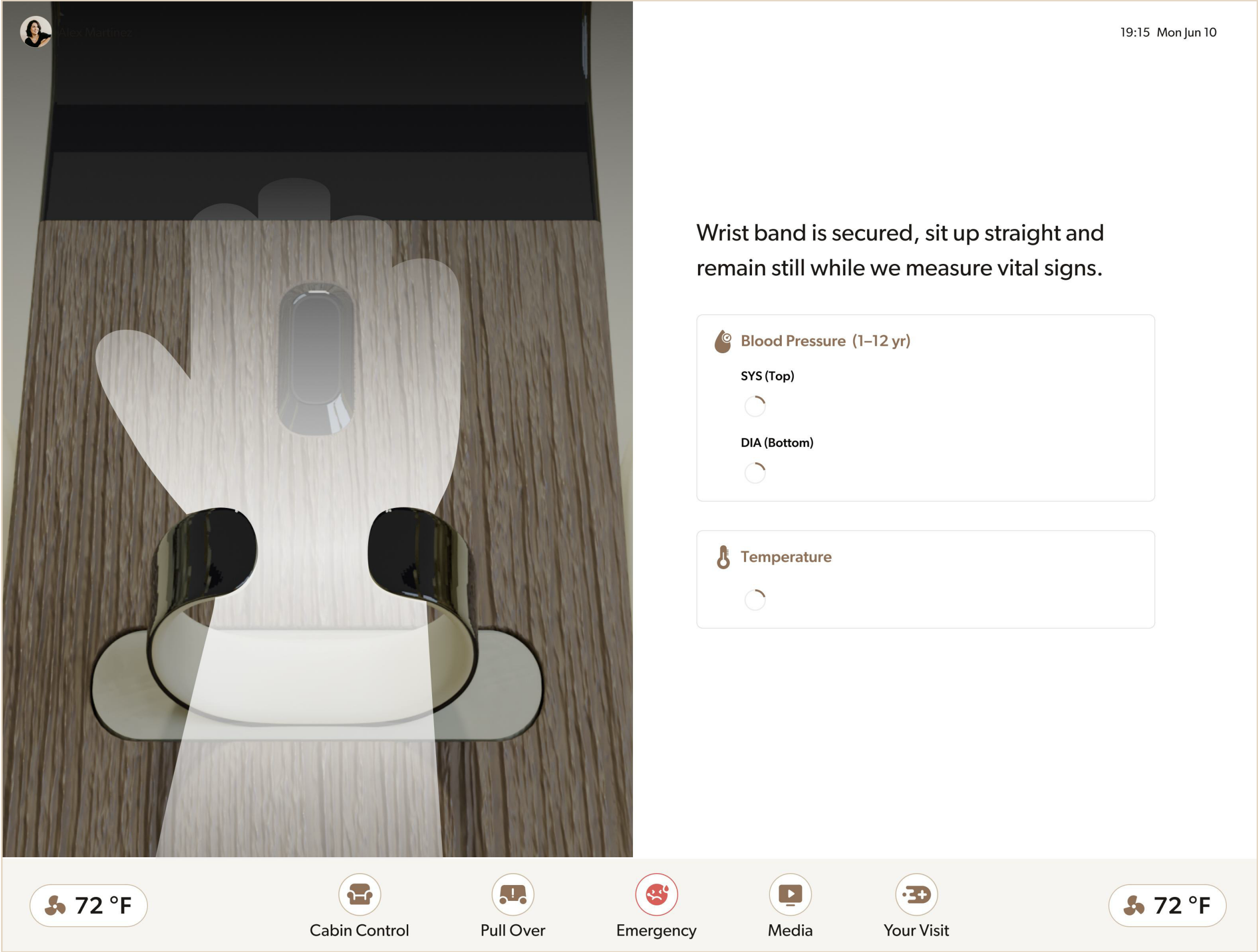


Ride Flow – Vital Sign Taking Instruction

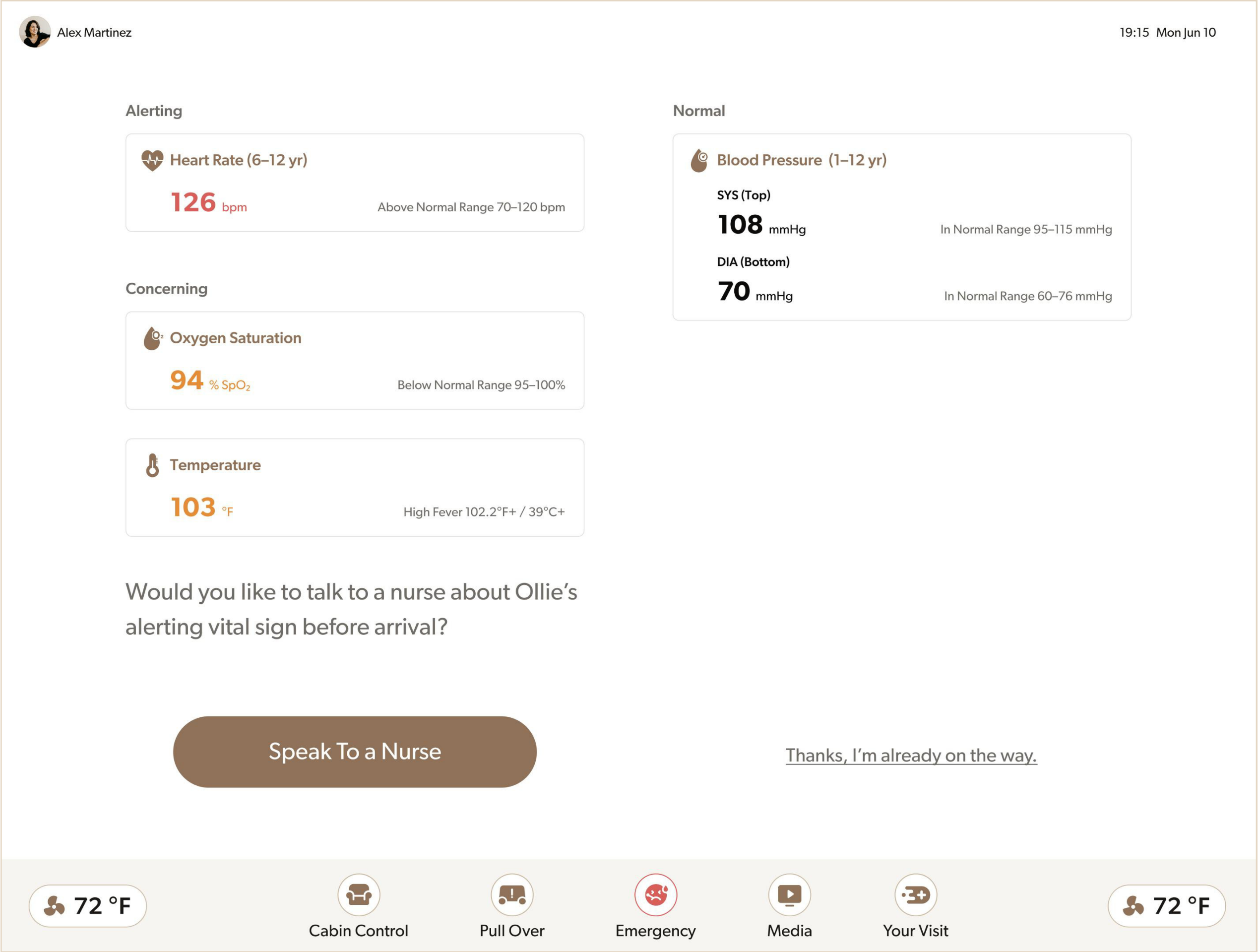


Design Prototype

Ride Flow – Take Vitals

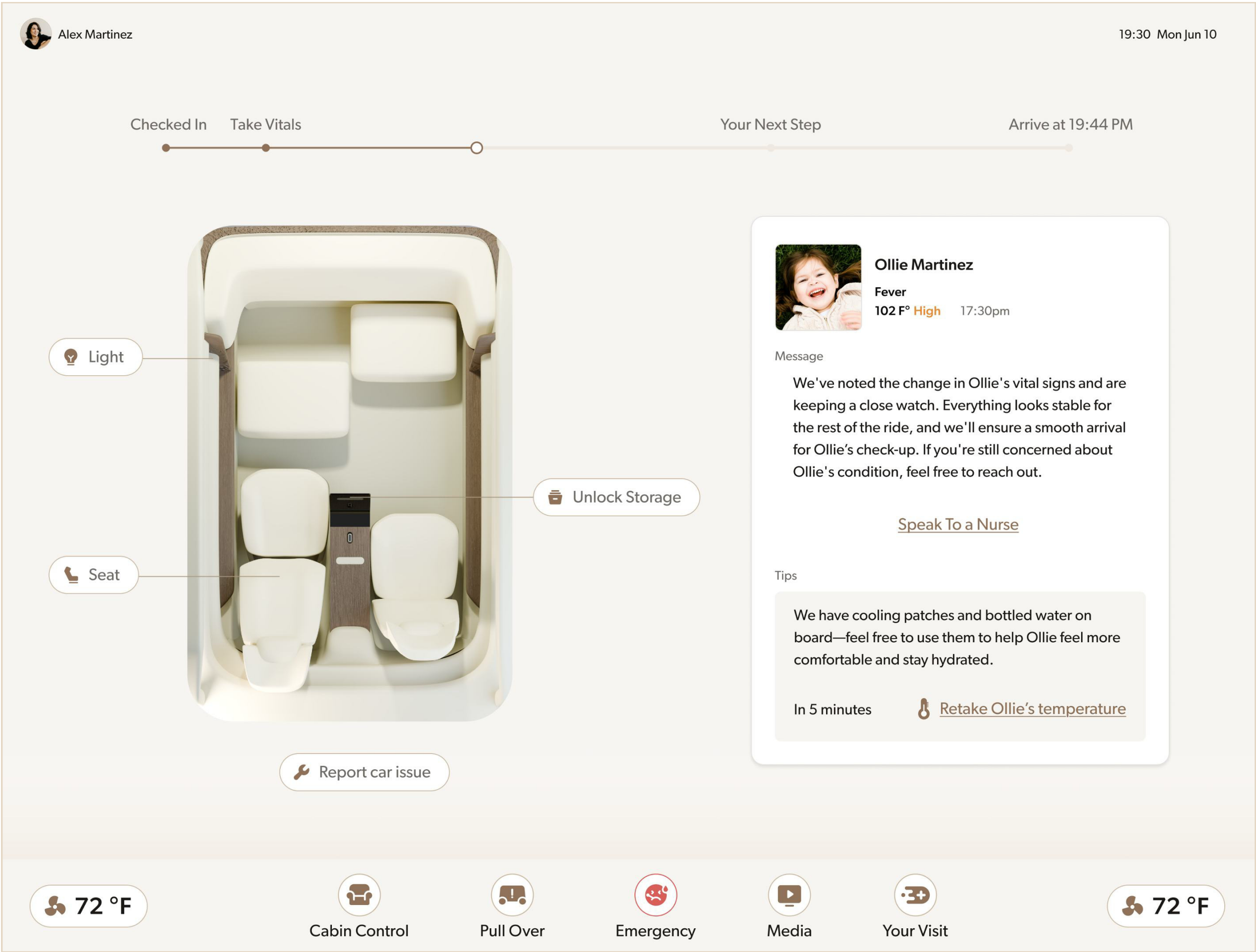


Ride Flow – Take Vital Summary

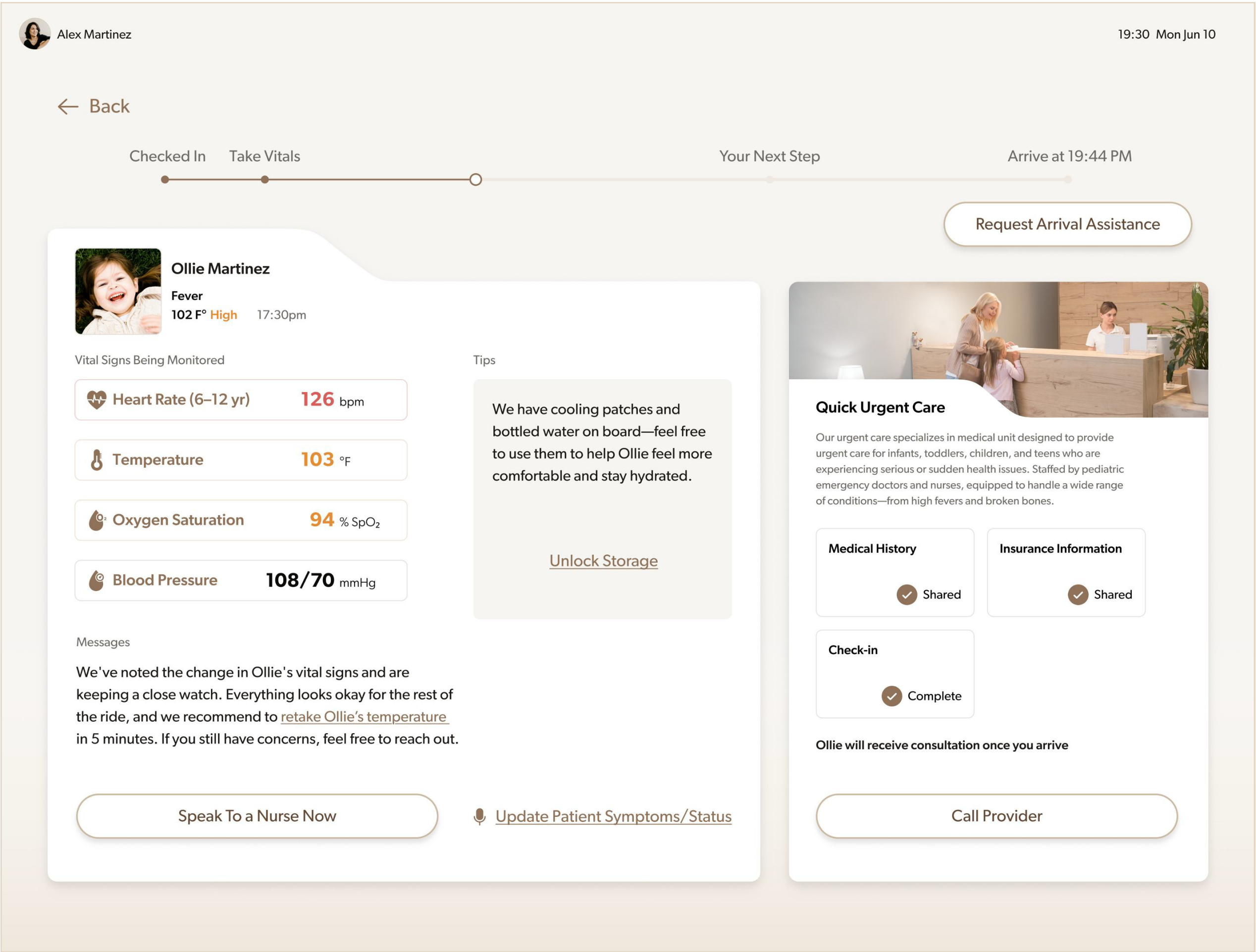


Design Prototype

Ride Flow – Idle/Riding Screen

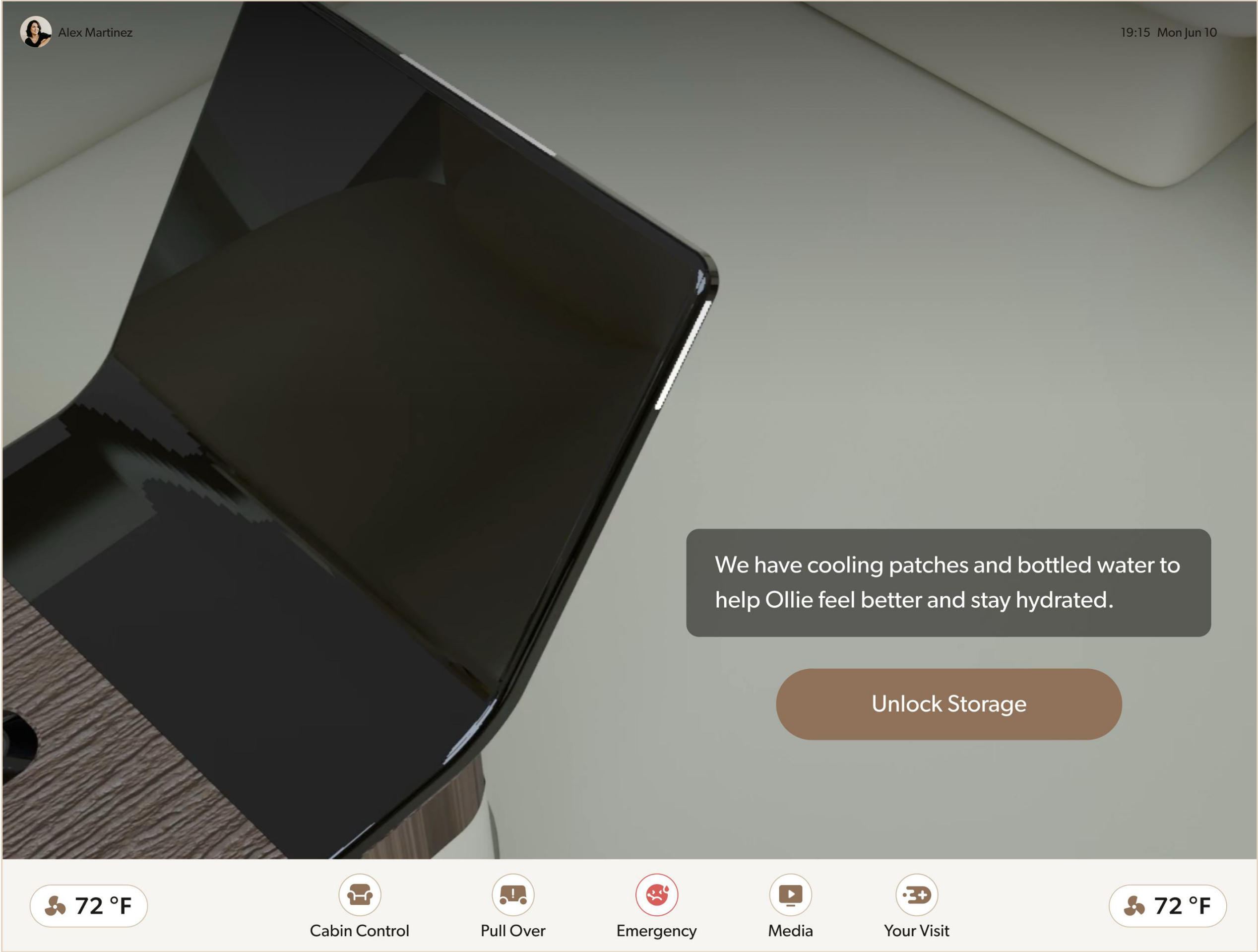


Ride Flow – Your Visit

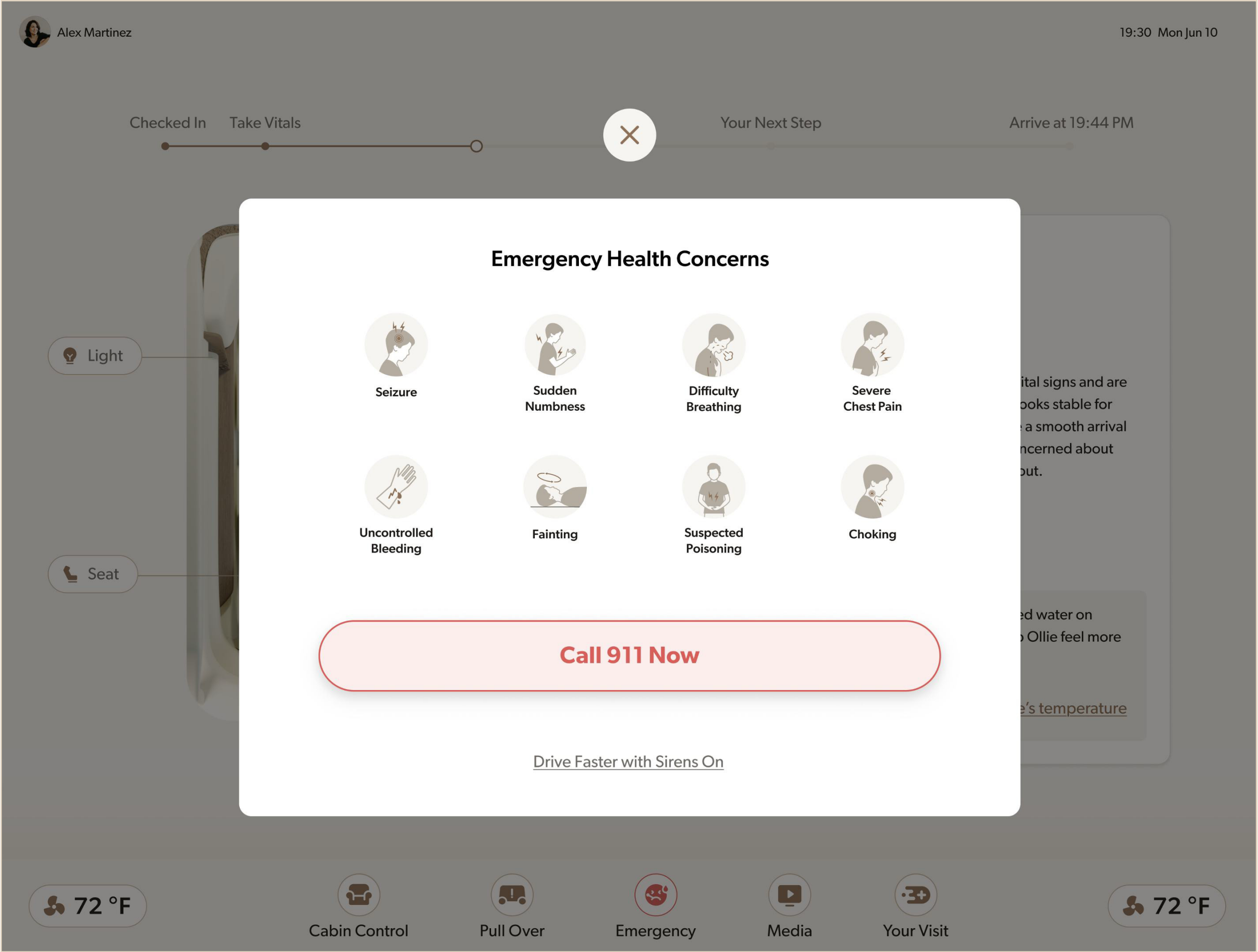


Design Prototype

Ride Flow – Unlock Storage




Ride Flow – Emergency



Design Prototype

Ride Flow – Next Step

 Alex Martinez

19:40 Mon Jun 10

Checked In


Take Vitals

Temp Updated

Your Next Step

Arrive at 19:44 PM

Request Arrival Assistance



Ollie Martinez

Fever

102 F° **High** 17:30pm

103 F° **High** 19:20pm

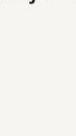
103 F° **High** 19:38pm

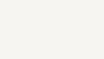
Next Steps

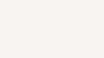
1. All of Ollie's pre-visit information has been synced to your app and your provider.

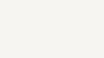
2. Request arrival assistance, and one of our team members will be there to help you.

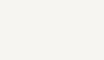
3. When you arrive, we will check Ollie's vitals again. Because of her fever, we'll also do a COVID test. If there are signs of infection, a blood test may be needed as well.

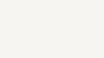
72 °F


Cabin Control

Pull Over

Emergency

Media

Your Visit



72 °F

Ride Flow – Arrival

Alex Martinez

19:44 Mon Jun 10

You have arrived at the entrance.

-  Now you can use your app to access your visit information.
-  Nurse Mark will meet you at the registration desk at the 1st floor.

Style Guide

Color Palette

Brand Color Warm Mocha

100

200

300

400

500

600

Neutrals

950

900

800

700

600

500

400

300

200

100

50

W

Success

200

400

Warning

200

400

Error

200

400

Typography

Aa

Gibson Medium

Gibson Regular

Gibson Book

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
123456789!&

Mobile

H1

P1

Button 1

Label 1

H2

P2

Button 2

Label 2

H3

P3

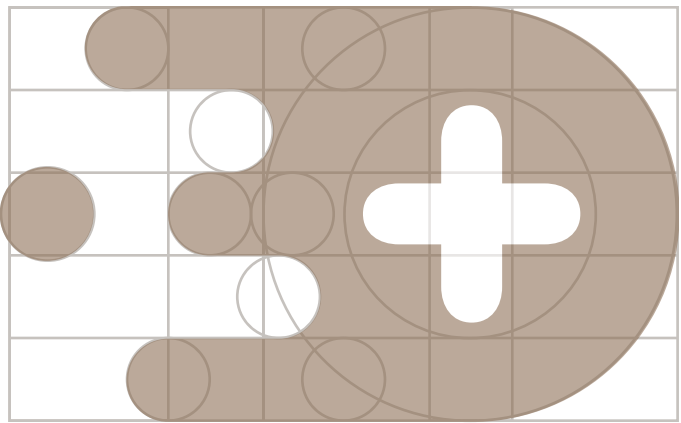
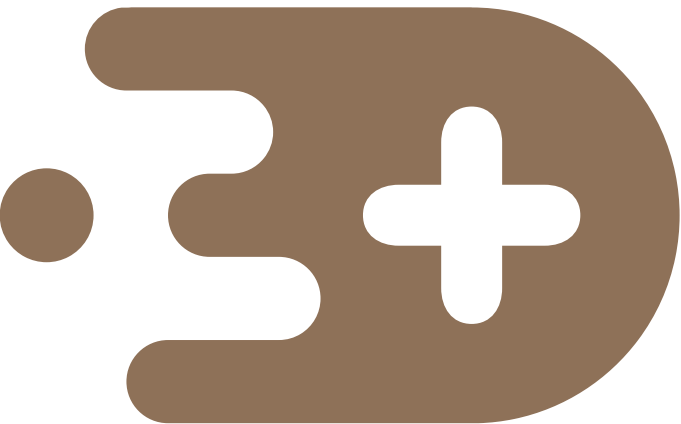
Button 3

H4

P4

H5

Logo & Icon



Components

Button

Button

Button

Button

Button

Button

Button

Button

Button

Home

Visit

Profile

Home

Visit

Profile

Home

Visit

Profile

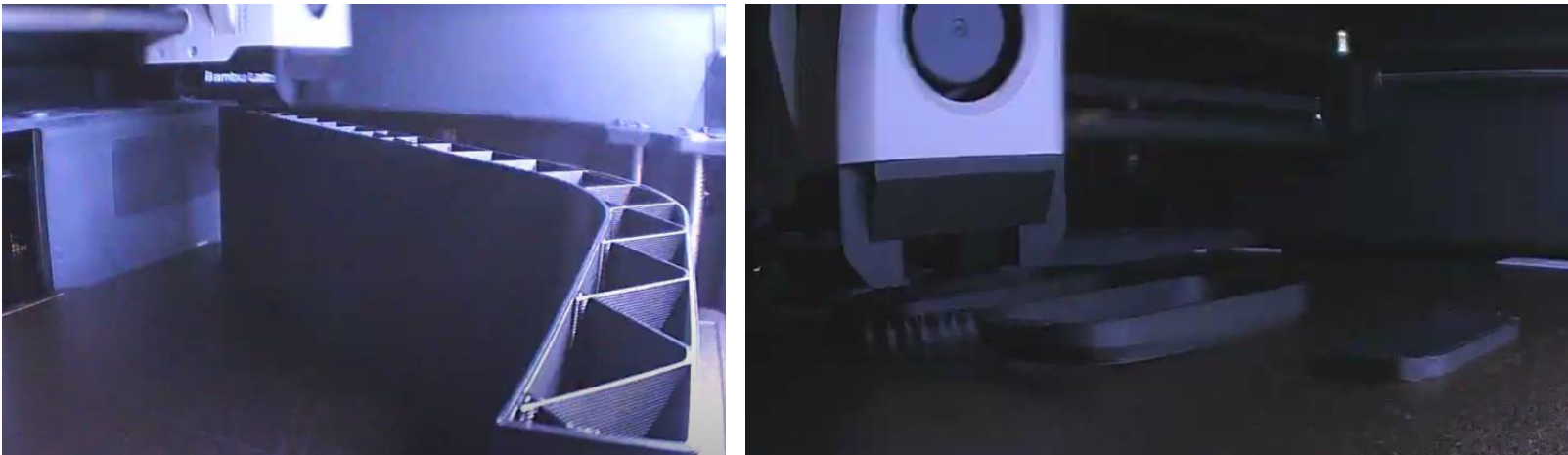
Design Prototype

CAD Model



Design Prototype

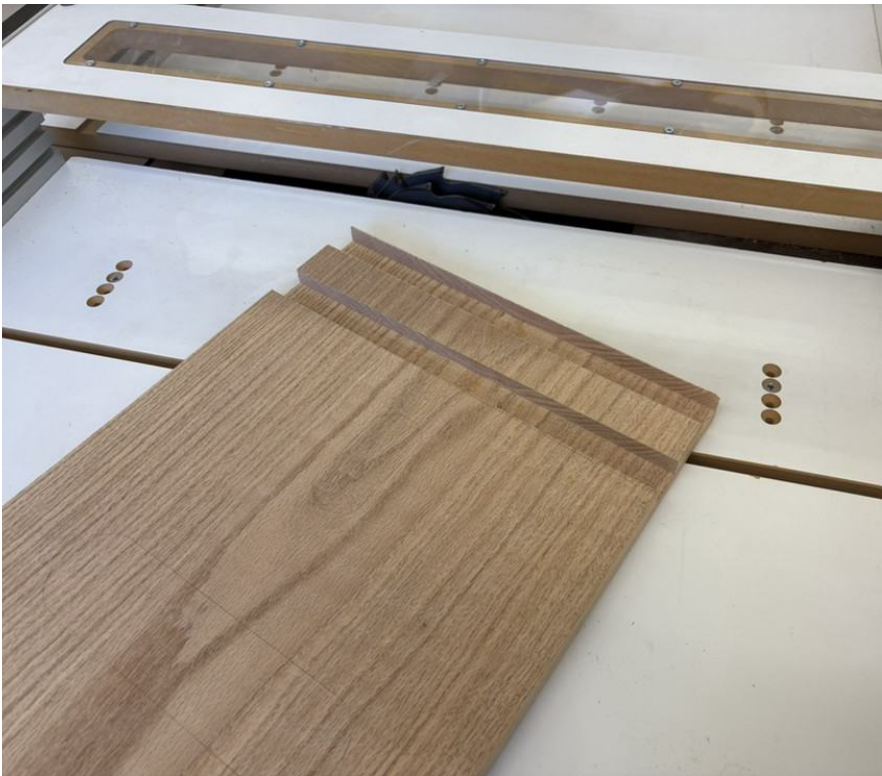
3D Printing



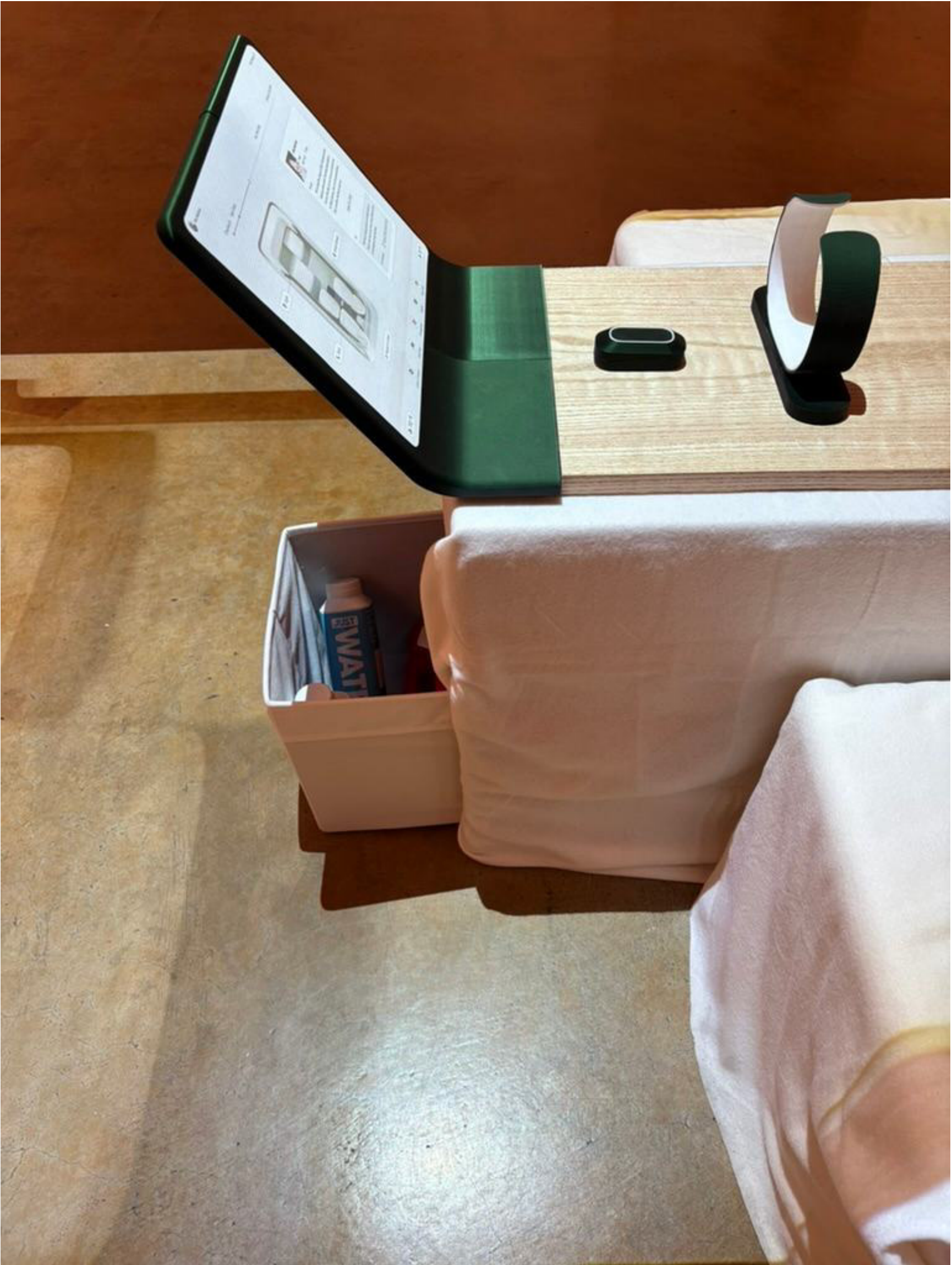
Masking & Painting



Table Saw Dado Cutting



Assembling



Design Prototype

Ride Experience in VR



Key Takeaways

My thesis project explores the potential of combining autonomous vehicle and telehealth technologies to create a new care and transport service — InstaCare. By integrating a health-focused mobile app with a robotaxi service, InstaCare aims to support patients and caregivers not just by offering a ride, but by providing clear medical information, emotional reassurance, and guidance before clinical intake.

At the same time, InstaCare is designed to avoid adding burdens to the already stressful urgent/emergent medical teams. Ideally, it can help streamline patient flow and make process of urgent/emergent care visit more predictable. I believe collaboration between medical teams, insurers, and autonomous vehicle service providers is key to bringing this vision to life.

Next Step

Due to limited access to insurance experts, I wasn’t able to learn about their current workflows when patients look for urgent medical care. I also wasn’t able to validate my overarching design concept with them. As a next step, I would want to reach out to health insurance experts to better understand their role in the existing journey of accessing urgent and emergent care, and to validate my design concept. I hope to learn more about the potential of implementing this service, the limitations and opportunities they foresee, and the legal responsibilities involved in delivering this remote care & robotaxi service.

I would also like to validate my design with medical providers to further improve InstaCare’s feasibility. Sharing the InstaCare journey with them could help uncover potential challenges from their perspective, as well as opportunities to better integrate the service into their workflows.

Reflection

I had a lot of fun developing this project, even though it requires a tons of time and effort because of the wide range of design touch points involved. Throughout the process, I enjoyed talking with people and learning about their stories and experiences. This helped me build confidence in reaching out to designers and experts to validate my concept. It also prepared me to ask the right questions during usability testings, helping me identify opportunities to improve my design — one of the most challenging, yet rewarding, parts of the project.

This was also my first time working on a project that combined UX, UI, digital modeling, physical modeling, and VR. It was fascinating to connect all the pieces and see the final design come together as a complete service. And I couldn't have done it without the support of my incredible team — my committee! If I could go back to the beginning, I would tell myself: have fun, find a great team, and trust the process.

Terms

Urgent Care

“Urgent care is the care for an illness, injury or condition serious enough that a reasonable person would seek care right away, but not so severe it requires emergency room care.”

[Healthcare.gov](#)

Emergency medical condition

“Emergency medical condition is an illness, injury, symptom or condition so serious that a reasonable person would seek care right away to avoid severe harm.”

[Healthcare.gov](#)

Transportation barriers

“Transportation barriers can affect a person’s access to health care services. These barriers may result in missed or delayed health care appointments, increased health expenditures and overall poorer health outcomes.”

“Transportation and the role of hospitals” Nov, 2017.

[American Hospital Association](#)

Emergency Medical Transportation

“Ambulance services for an emergency medical condition.”

[HealthCare.gov](#)

Non-emergency Medical Transportation (NEMT)

“Non-emergency medical transportation (NEMT) is transportation by ambulance, wheelchair van, or litter van for those who cannot use public or private transportation.”

Transportation to and from appointments for services covered by Medi-Cal [dhcs.ca.gov](#)

“Under Federal law, State Medicaid agencies must: ensure necessary transportation to and from providers, use the most appropriate form of transportation, include coverage for transportation and related travel expenses necessary to attend medical appointments.”

Non-Emergency Medical Transportation Defined [CMS.gov](#)

Self-driving cars/Autonomous vehicles

“Autonomous technology including a combination of hardware and software, remote and/or on-board, that has the capability to drive a vehicle without active physical control or monitoring by a human operator.”

[dmv.ca.gov](#)

Social Determinants of Health

“Social determinants of health (SDOH) are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks.”

[health.gov](#)

Resource Management (Healthcare)

“Resource management is emerging as the discipline to integrate the healthcare delivery process. Resources comprise time, money, people, facilities, equipment, information, pharmaceuticals, and fixed assets. The central question for every healthcare provider is: "How can I optimize resources to maximize patient wellness?"”

[National Library of Medicine](#)

Bibliography

1. Social Determinants of Health Series: Transportation and the Role of Hospitals, “<https://www.aha.org/ahahret-guides/2017-11-15-social-determinants-health-series-transportation-and-role-hospitals>”

2. Mary K. Wolfe and Noreen C. McDonald, “Innovative Health Care Mobility Services in the US,” BMC Public Health 20, no. 1 (December 2020): 906, <https://doi.org/10.1186/s12889-020-08803-5>.

3. Dale Harrow et al., Driverless Futures: Design for Acceptance and Adoption in Urban Environments (London: Royal College of Art, 2020), <http://gateway-project.org.uk>.

4. De Lew, Nancy, George Greenberg, and Kraig Kinchen. “A Layman’s Guide to the U.S. Health Care System.” Health Care Financing Review 14, no. 1 (1992): 151–69.

5. Maria Cramer [@NYTimesCramer], Tweet, Twitter, June 29, 2018, <https://twitter.com/NYTimesCramer/status/1012814279857360896>.

6. Automated vehicles for safety. Benefits. Mobility. <https://www.nhtsa.gov/vehicle-safety/automated-vehicles-safety#resources>

7. “Autonomous Vehicles Terms and Definitions,” California DMV, accessed February 26, 2024, <https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/autonomous-vehicle-definitions/>.

8. Levels of Automation, NHTSA, <https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-05/Level-of-Automation-052522-tag.pdf>

9. “What to Expect During an ER Visit,” Baton Rouge General, accessed February 23, 2024, <https://www.brgeneral.org/news-blog/2019/august/behind-the-scenes-what-to-expect-during-an-er-vi/>.

10. Ashley Blachford, “The ‘Triage’ Misnomer in Urgent Care,” Journal of Urgent Care Medicine (blog), February 1, 2023, <https://www.jucm.com/the-triage-misnomer-in-urgent-care/>.Patient Touchpoints in Urgent Care

11. Weber, Marc, “Where to? A History of Autonomous Vehicles,” CHM, May 8, 2014, <https://computerhistory.org/blog/where-to-a-history-of-autonomous-vehicles/>.

12. Levels of Automation, NHTSA, <https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-05/Level-of-Automation-052522-tag.pdf>

13. Most Americans Wary of Self-Driving Cars as Trust in Tesla Wanes: Study. <https://www.thedrive.com/news/most-americans-wary-of-self-driving-cars-as-trust-in-tesla-wanes-study>

14. The journey from design thinking to creative confidence. <https://www.ideo.com/blogs/inspiration/from-design-thinking-to-creative-confidence>

15. Healthy People 2030, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Retrieved [date graphic was accessed], from <https://health.gov/healthypeople/objectives-and-data/social-determinants-health>

16. Olsen JC. What is resource management? J Healthc Resour Manag. 1995 Jan;13(1):11-3. PMID: 10142824.



InstaCare