

Healthcare Record Challenge

Design Thinking

Team Project for Cornell University

Problem

Currently, each medical care system in the US provides a separate patient portal.

How can patients and caregivers manage and track all of their healthcare information in a meaningful and organized way?

Gathering lifelong detailed health information from various states, cities, hospital systems, & specialists for yourself or for a person you are caring for can be a nightmare.

Doctors often have a very limited view of your health history, such as allergies, past diagnoses, chronic conditions, medications, immunizations, etc., limiting the quality of healthcare they can provide.

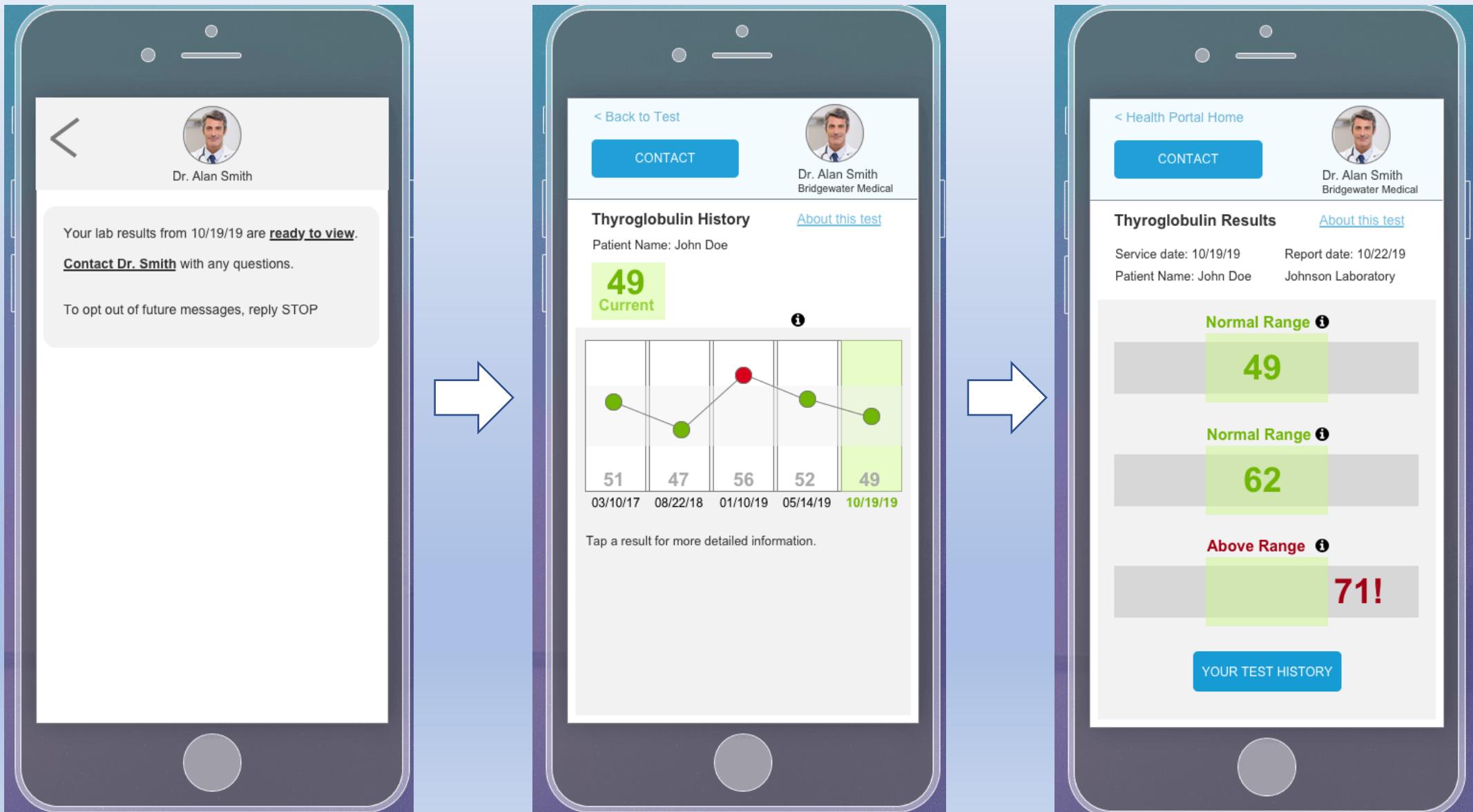
Challenge Statement

Design a secure, lifelong patient-centric tool for managing health information, incorporating medical records from varying Electronic Health Records (EHR) systems, in order to improve interoperability problems, patient-physician communication, and patient outcomes in the United States.

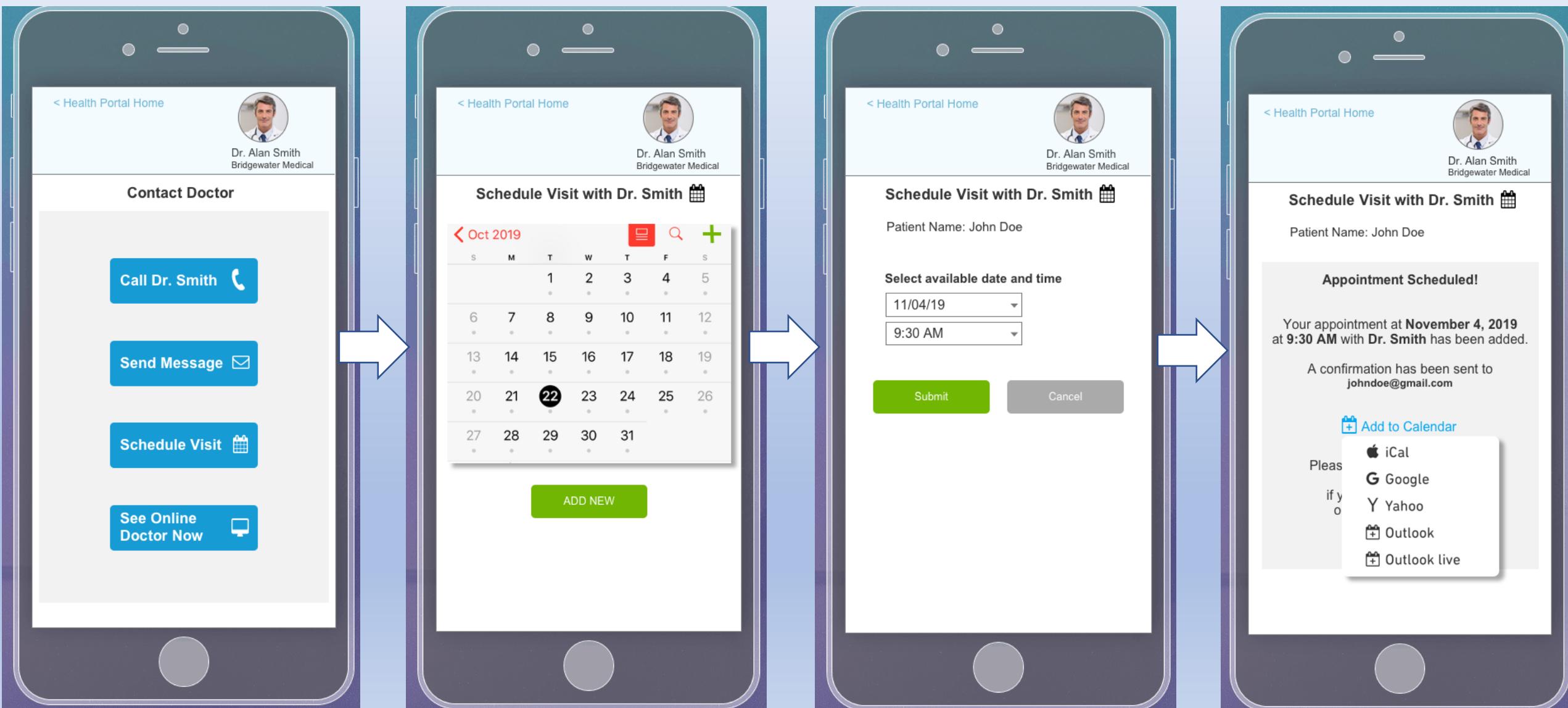
We envision a system where a patient's complete medical records are secure, in the patient's control, and harmonized across the various EHRs, so that they can travel with the patient and be accessed by any provider with the patient's permission.

Our goal is to provide a secure and efficient way for patients to access, store, view, and present their healthcare information over the course of their lifetime, providing a clear and holistic view of their healthcare data, so they are better able to partner with their providers, and have a positive impact overall on their healthcare.

Prototype



Prototype



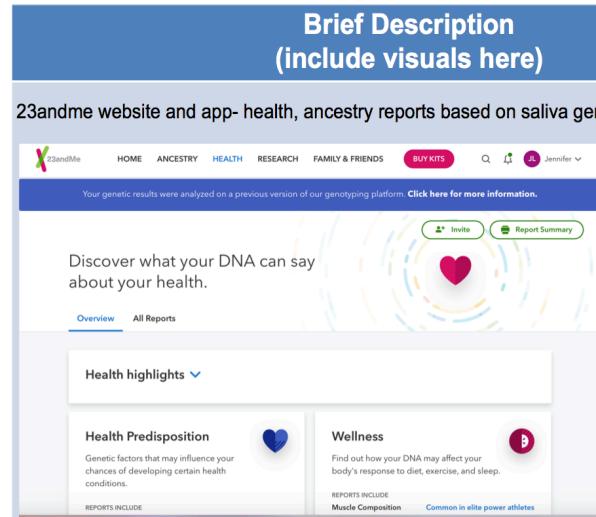
....How We Got There...

Research and Inspirations

We researched other similar projects in other countries and looked for inspirations in other industries and technologies

Inspiration #1: 23andme.com

<http://www.23andme.com>

Brief Description (include visuals here)	Summarize the takeaway (add to this over time)
 <p>23andme website and app- health, ancestry reports based on saliva genetic testing</p>	<p>Provides a history of information on the patient which is aggregated and cumulative (all of the data known at that point). User can log into see information at any time and it is portable. Can share it with others if the patient chooses to. Also, provides descriptions, some context, and its significance, and not just a "you have this gene" without any explanation.</p>

Inspiration #3: The nuclear power industry

<https://www.nrc.gov>

Brief Description (include visuals here)	Summarize the takeaway (add to this over time)
 <p>The nuclear industry- a private corporation that has specific regulations by the government</p>	<p>An example of a private corporation that nevertheless is regulated by a government organization- the Nuclear Regulatory Committee (NRC).</p>

Inspiration #7: Norway's Successfully Implemented National Electronic Medical Record System

<https://bmjmedinformdecmak.biomedcentral.com/articles/10.1186/1472-6947-7-26>

Brief Description (include visuals here)	Summarize the takeaway (add to this over time)
<p>Norway is deemed by many to have one of the most successfully implemented electronic health record systems for their nation and possibly the highest implementation rate (>98%) of any country.</p> <p>As it states in the abstract:</p> <p>"Background</p> <p>Personally controlled health records (PCHRs), a subset of personal health records (PHRs), enable a patient to assemble, maintain and manage a secure copy of his or her medical data. Indivo (formerly PING) is an open source, open standards PCHR with an open application programming interface (API).</p> <p>Results</p> <p>We describe how the PCHR platform can provide standard building blocks for networked PHR applications. Indivo allows the ready integration of diverse sources of medical data under a patient's control through the use of standards-based communication protocols and APIs for connecting PCHRs to existing and future health information systems.</p> <p>Conclusion</p> <p>The strict and transparent personal control model is designed to encourage widespread participation by patients, healthcare providers and institutions, thus creating the ecosystem for development of innovative, consumer-focused healthcare applications."</p>	<p>This implementation is a good role model for how we want to tackle the project for the United States. We want the product to be patient-centered and patient-controlled, and we want the medical data to be open standard and interoperable between various hospital systems. The system also needs to be secure, while allowing transparency. It has been successful so far in Norway, improving their healthcare.</p>

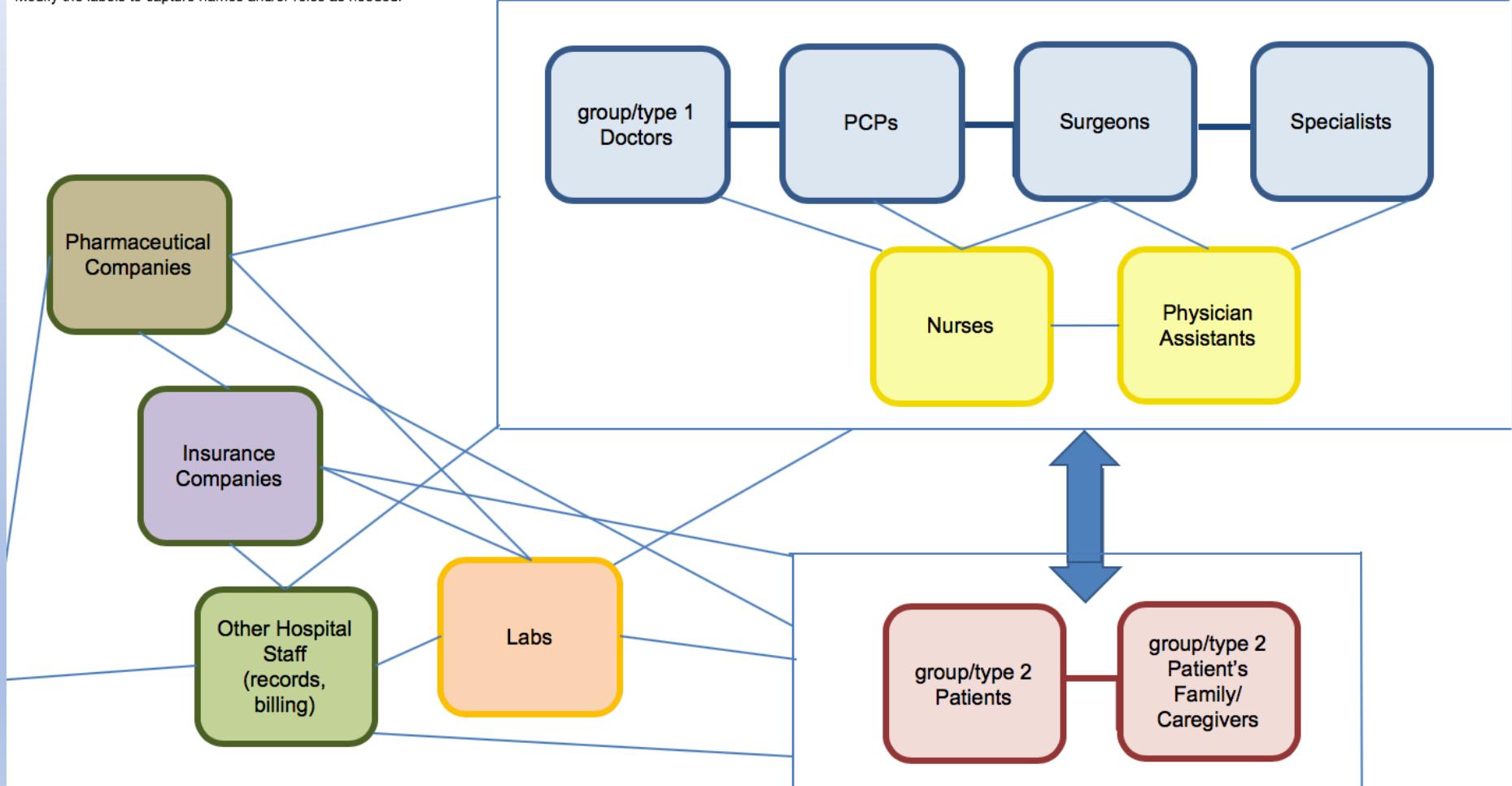
Users / Stakeholders

- **Patients** - Access to test results and the ability to communicate to the provider through patient portals
- **Parents or close family members of patients** - Access to test results (only when permissioned by the patient or when patient is a minor or a dependent adult) and the ability to communicate to the provider through patient portals
- **Caregivers** - Access to information about prescribed medication and treatment plans
- **Doctors** - Access the entire medical record to review the clinical information of the patient, including patient notes, operative records, imaging studies, test results, etc.. They need access to limited demographic information to contact the patient/and or other providers involved in the patient care. They need access to the patient portal.
- **Nurses** - Should have access to the medical portion of chart to review notes, enter their own clinical notes, review imaging studies, laboratory value
- **Non-medical hospital staff** - Should interact with the billing diagnosis codes, procedural codes and patient insurance information. There may be multiple levels of access, depending on the department and type of information required.
- **Lab Technicians** - Only have access to the orders and have the ability to enter results for a test. They should not have access to the complete medical record.
- **Insurance Companies** - Only have access to the billing codes, operative notes, problem list and procedural codes.

Users / Stakeholders

Stakeholder Relationships Template

Build your Stakeholder Relationships diagram here. Add groups as necessary.
Modify the labels to capture names and/or roles as needed.



Users / Stakeholders

Stakeholders

There is a number of stakeholders groups...sometimes working together, and sometimes at odds with each other.

Stakeholder name	Description of Stakeholder (including group or type, if any)	Also a Gatekeeper? (yes / no)	Also a User? (yes / no)	Group or Affiliation (if relevant)
Doctors	Primary care physicians, specialists, surgeons, etc.	yes	yes	With hospital
Medical Staff	Nurses/Physician Assistants	yes	yes	With hospital
Labs	Lab technicians, record keepers	yes	yes	With lab/hospital
Patients	Patients	yes	yes	
Approved family members of patient	Those who are allowed by patient to see patient's medical records, such as parents of minors, spouses, legal guardians, caretaker family members, etc.	yes	yes	
Hospital Staff	Those who deal with hospital billing, record keeping etc	yes	yes	
Insurance Companies	Those who work on patient insurance claims	no	Maybe?	Insurance Companies
Pharmaceutical Companies	Those who offer the medications that patients need or want	no	no	Pharmaceutical companies

Noting Constraints and Opportunities

Constraint	Opportunity
Doctors may not have time to answer questions to get information	Offer a quid pro quo - that we are endeavoring to save them time in the future
Insurance companies may not want to reveal their internal processes	Understand better what is considered standard vs. proprietary to them Demonstrate value for their participation in terms of ROI
Sensitivity to Information users share about what their needs are	Identify anonymous ways to gather input from users, like anonymous surveys for example Reinforce idea of control over views / access to the information
Culture and language	Identify advocates for culture / language / etc. to help guide discussions and collecting information from users.

Empathy Research of Users in their Environment – Notes, Observations, Sketches

3rd Person Empathy

Friday, March 8, 2019 5:30pm

Jennifer Lycke- Team ACDC

Hotspot: CVS Pharmacy in Smithfield, VA during after-work rush hour

User Scenario:

Observing patients in line for pickup and/or seated in the waiting area of CVS pharmacy

Location: CVS Pharmacy pickup area, Smithfield, VA

Environment: The pharmacy is located against the back wall of the drugstore. Rush hour after work is a busy time for people to pick up prescriptions, so there is a line of 3 people that flows into the store aisle. Also, there is an elderly couple sitting at 2 chairs in a very small waiting area next to the pharmacy.

3 patients of varying adult ages are in line waiting to pick up prescriptions, while one is actively at the pick-up counter. The line starts behind a line marker on the floor which is at the end of a store aisle. The aisles of products creates a certain level of privacy in that you cannot really see who is in line unless you are in the line (or in that aisle) yourself. The social norm is to not stand at the counter unless you are called up to give the current patient some privacy, and the people are following that norm. There is a woman behind the pick-up counter working with customers and pharmacists/techs in white coats busy behind the counter fulfilling prescriptions. Two of the people are standing empty-handed and are just looking ahead. A woman is carrying a shopping basket with a couple of small items in it while waiting in the line. She is also turning from side to side, looking at the products on the shelves near her while she is waiting. A cell phone rings, and the first person in line answers the call but then quickly puts the phone away. A peculiarity I notice is that the second person in line is surprisingly social and seems to know a couple people who work behind the counter. He recognizes a couple people and is speaking in a fairly loud voice as he greets them and makes small talk. He does not seem to have any privacy concerns, while the other patients are more subdued. There is an elderly couple sitting in 2 plastic chairs that are set aside on the other side of a privacy wall. They look calm and subdued like they may have been waiting a while, but they seem OK with it.



Empathy Research of Users in their Environment – Interviews

2nd Person Empathy

Saturday, March 9, 2019 10:00am

Jennifer Lycke- Team ACDC

Hotspot: Planned Interview with patient friend (mid-40s) who has not used his health records

User Scenario:

Interview with a patient who has not used his electronic health records before

Location: Patient's home in Newport News, VA

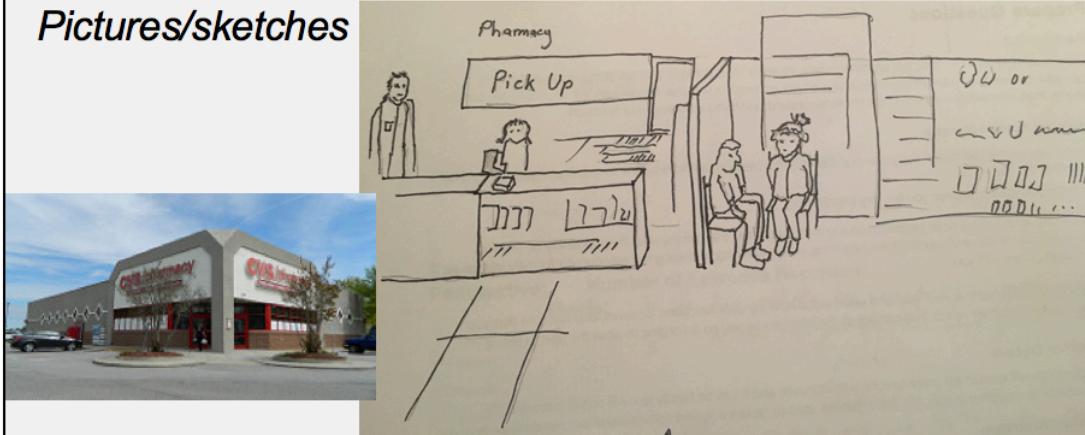
After explaining the challenge we are working on for our class, I began to ask our planned questions.

- "Tell me about the last time you visited a doctor"
Response: "It was an urgent care visit for...[patient is trying to remember] a cut on my hand. I remember that they used technology so that I can get in the waiting line online beforehand. That was pretty cool."
"How did that impact the experience?"
Response: "It made it better. I thought that was great that I didn't have to wait in their waiting room. Very efficient."
"That is cool. Great"
- "Tell me about a time you felt very engaged in your healthcare."
Response: "Umm, never. Sorry, I'm probably not a good person for your interview."
"No, that's perfectly fine...we want to talk with all kinds of patients."
- "What type of experience, if any, have you had using your healthcare records?"
Response: "Not much. I did get a copy of my medical records when I was discharged from the Navy, however."
"OK. What did you do with those records?"
Response: "Nothing."
"Did you ever share them with another doctor?"
Response: "No".
"Why not?"
Response: "Didn't see the need. There wasn't anything that important."
- "Have you ever looked up your medical records online?"
Response: "No".
"Why not?"
Response: "I had no desire to."
- "Would you know how to access them now if you needed to?"
Response: "No, I would call my PCP and hope he has it. Would he have it, I wonder?"
- "Have you had to switch doctors or see a specialist? If so, tell me about how you presented your medical history to the new physician"
Response: "Yes, I was referred to an audiologist to check my hearing. The nurse at work tested my hearing and said I might have ear issues or sinus problems. She sent a referral to my PCP, who then made a referral to the audiologist. That doctor gave me some hearing tests, but it turned out to be nothing."
"Oh, that's good. How did you present your medical history to the audiologist?"
Response: "I didn't really, I just explained to him what the referral was about- my hearing test. I didn't really give him anything else."
"OK, so by word of mouth."

Empathy Research of Users in their Environment- Studying Results and Insights

Ep 4J - Jen; Patients waiting at CVS 3/8 5:30pm

Pictures/sketches



WHAT/HOW

Patients (or caretakers of patients) waiting to pick up pharmacy prescription at CVS- both in line and in a very small waiting area with 2 plastic chairs next to a "privacy wall".

Most keep to themselves, and are quiet.

One person seemed to know people there and was vocal and social. ?

Some people keep themselves mildly occupied while waiting, either by browsing shelves, talking, or looking at their phone. Some just look down or straight ahead. One quickly got off the phone after his phone rang.

People follow the social norm of the 2nd person waiting behind the line to give current customer some space and privacy.

Waiting area is designed to give the sense of privacy, even though you can still hear and see the patients.

WHY

Subjective info here

E Most people seem quiet, serious, and private.

S Social interaction not encouraged, but also not prohibited.

C People there may be feeling sick or in pain.

C This is a local drugstore so there's a chance of seeing neighbors and friends.

• People distract themselves to pass the time

• Healthcare privacy is deemed important

E Mini-walls give psychological feeling of privacy, but

E probably does not actually block conversation or the view of the patient

N

- Get prescription
- Pass the time
- Maintain health privacy & security
- Stay or get healthy

- I Privacy and security are encouraged, but not forced upon patients/customers
- Most patients follow social norm of being quiet and not socializing
 - Patients use distractions to help pass time
 - Some can still be social while waiting/interacting with the pharmacy

S

- One person spoke in a loud voice while in line to those behind the counter-socializing and joking around with them. Apparently, he knew them personally.

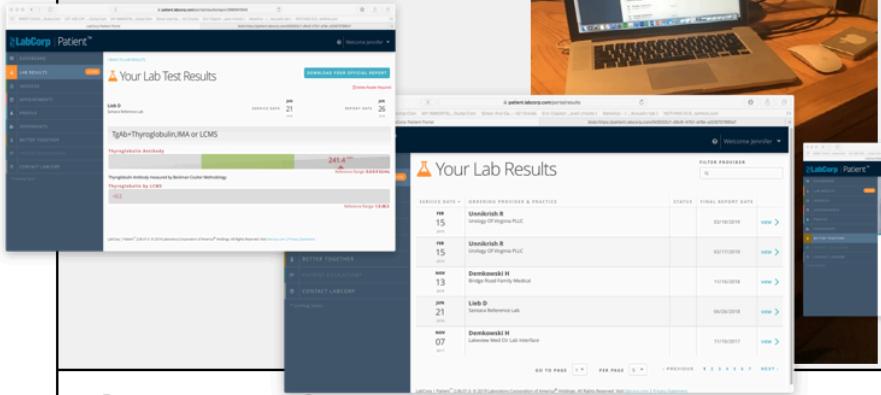
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- Tensions
- Contradictions
- Consistencies
- Synergies
- Hmm...?

Empathy Research of Users in their Environment- Studying Results and Insights

Ep 2J – Jen; Patient w/ Chronic Illness (40s, Woman) Checking Latest Test Results at home 3/8/19 7:30am

Pictures/sketches here



Objective info here

Patient had blood tests a week ago and she hasn't heard the results yet from her doc.
It sometimes takes 2-3 weeks for her doctor to communicate the results, so she wants to find out sooner.

Patient is very anxious about the results.

Patient goes online in the early morning and looks for her results on the LabCorp website.

Login info was already in her Mac, so she didn't need to remember it.

She saw her name, so knew she was properly logged in.

She saw the new information near the top of the welcome screen.

She clicked to view greater details about the new results.

She got the test results she was hoping for.

Subjective info here

- Feels results should be ready by now
- Has been anxious
- Jumps whenever the phone rings – is scared of bad news again
- Doesn't want the cancer to return
- Scared and worried about the ramifications - work, fatigue, pain, finances
- Nervously logs into website- barely pays attention to what's on the screen until finding the relevant info
- Sweaty palms and rapid heartbeat
- Deep breath
- Must be a good sign – sees green
- Likes the big clear numbers and color coding
- Feels emotional and relieved after reading the good results.
- Mildly confused and curious about one of the menu options not paid attention to earlier, but not interested after clicking because not relevant
- Wants to communicate good news to spouse
- Wants to celebrate

N

- To get results easily & quickly
- To log into LabCorp
- To be less anxious
- To be healthy
- To be safe
- To stay working & getting paid
- To stay on top of any medical bills

I

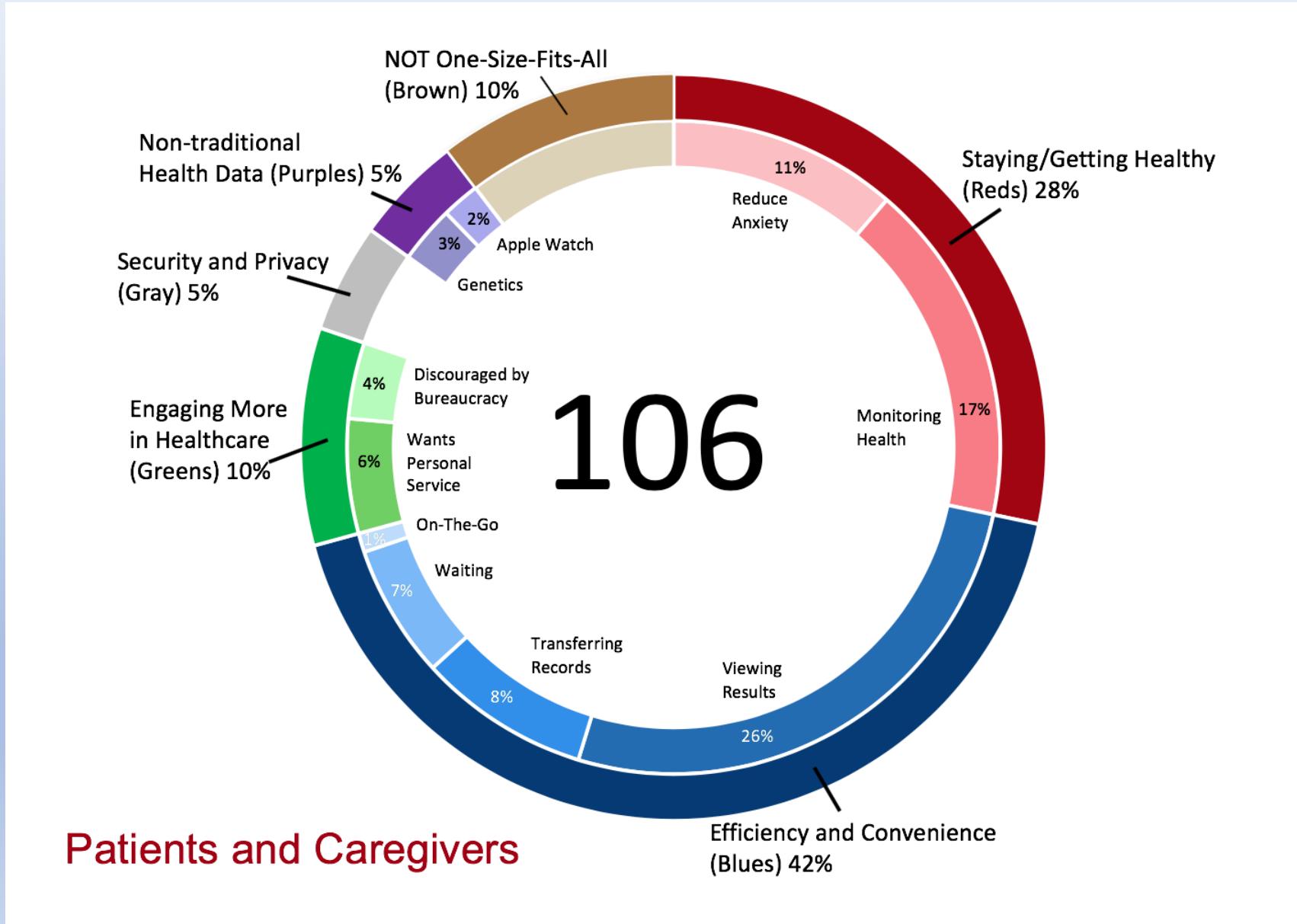
- Stressful not knowing results
- Stress during the actual act of retrieving results
- Patients with chronic conditions may understand test result numbers
- Can take long time for doc to communicate results
- Stressful waiting a long time
- Results often come in morning

S

- That patient could (and has) received important bad news, not in person
- The act of looking up results causes physical symptoms from anxiety
- That it could take so long for doc to communicate important results

Tensions
Contradictions
Consistencies
Synergies
Hmm...?

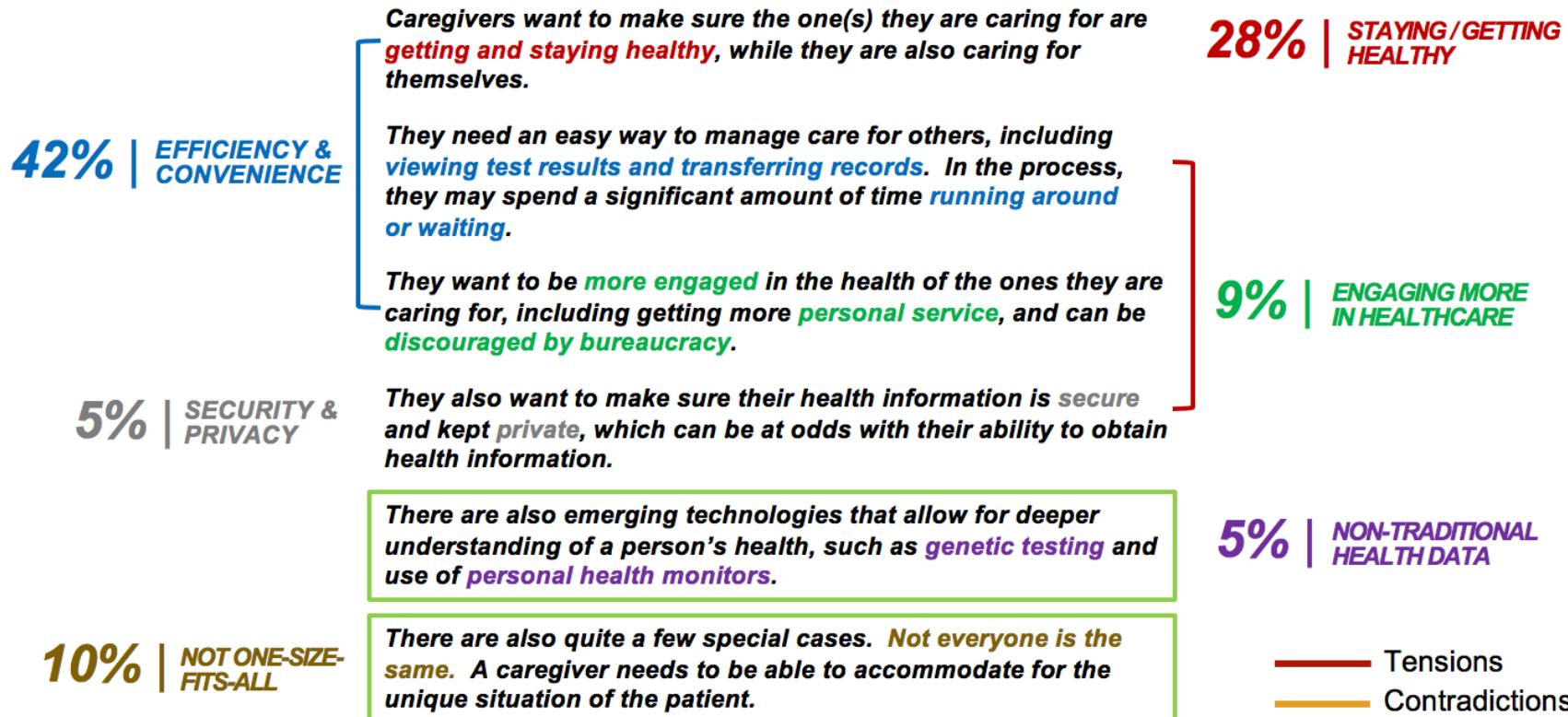
Modeling of Research Data



**Patients/Caregivers
want more
functionality from
their healthcare**

Empathy Research of Users

Flow of Thoughts for: Caregiver



- Tensions
- Contradictions
- Consistencies
- Synergies
- Hmm...?

Personas

NAME: Will

AGE: 47



QUOTE:

"I'd rather stay away from doctors, but I'll go get checked out if I'm sick or injured. When I do, I like it to be an efficient process where I can get in and get out."

KEY ATTRIBUTES:

- Is healthy overall, but occasionally needs to go to the doctor if sick or injured.
- likes efficiency and convenience
- is engaged in keeping track of his health, including lab results, family history, and activity levels.
- runs in the local park on weekends
- is tech savvy and likes having as much information in front of him as possible so he can make informed decisions.

SOCIAL LIFE:

- He lives with his wife, Maria, and daughter who is going to college locally
- He is too busy to do much except work during the week
- On weekends, they like to go out to dinner and a movie
- The couple also likes to go to athletic events for the daughter, who plays sports

WORK LIFE:

- He works full-time hours, including some overtime each week, 50-60 hour work weeks is the norm, taking work home with him.
- He is a project manager for a government contractor
- He travels for work once every couple of months, which he enjoys

Personas

NAME: Veronica

AGE: 39



QUOTE:

"I'll have to call you back. It's time to give Bryce his medicine, and then I need to check if his test results are back. I'm so beat!... What, buddy? You went pee-pee on the potty? Good job!... Oh, sorry, Deb. Gotta go... [Where's my wine?]"

KEY ATTRIBUTES:

She is the loving single mother of a 3-year old son.
She is a career woman who values her status as VP of Marketing for a tech company.
She knows her way around a computer and iPhone apps.
She has very little time between her son, her career, her friends, and her yoga classes.
She is very direct and doesn't suffer fools or BS well.
She often runs herself ragged.

SOCIAL LIFE:

She gets every other weekend free and tries to catch up with friends during that time.
She's fed up with dating apps and meeting terrible men online.
Most men who've tried to date her get tired of her constant intensity and impatience
She does yoga 5 days a week, including an immersive 3-hour session on Sundays.
She's known to crack open a bottle of wine after work, pour a large glass, and then crash out before she's finished it

WORK LIFE:

She is good at her job and somewhat intimidating.
She used to work long days, but now she tries to limit them to 9 hours so that she can spend time with her son.
She's detail-oriented, but she's not a micro-manager - she expects everyone to do their job and do it well.
She is constantly multi-tasking and often gets caught not paying attention in meetings because she's doing something else.

Personas

NAME: Daisy

AGE: 48



QUOTE:

"When I interact with the patient (through the portal), it seems impersonal. I cannot possibly answer the questions to the level of details that the patient wants. Then they(the patients) have more questions. I cannot sit at the computer 24/7 to answer the questions. I have kids."

KEY ATTRIBUTES:

- She likes to travel.
- She is very detail oriented.
- She likes to be efficient and thorough.
- She likes to spend time with her children.
- She likes to travel.
- She had children later in life.

SOCIAL LIFE:

She is a single mother with 5 year old twins. She recently lost her mother to congestive heart failure. Her family dog recently passed away. She spends her free time with her twins. She travels to Florida on the weekends to check on her father. She occasionally moonlights to earn extra income to pay for her children's education. She is a very private person who values her privacy and personal time.

WORK LIFE:

She has an MD from the UT Houston and attended a residency program in obstetrics and gynecology there as well. She worked in a 2 physician group for 15 years. She recently joined a 5 physician group after giving birth to her twins. She is responsible for seeing patient in the office, performing surgeries, delivery babies and the general health care of her patients. She does not work normal business hours. With the advent of EHRs, she is now taking work home with her.

Planning System Capabilities to Meet User Needs

How Might We

create a secure system where **patients and caregivers** can efficiently and intuitively view and utilize lifelong health records to increase patient engagement, reduce anxiety, and improve patient health

?

Capability:

Enable patients to efficiently and intuitively view and utilize lifelong health records at their convenience

Sub Capability

Display easy-to-read lab results as quickly as possible

Sub Capability

Allow medical records from other doctors/hospital systems to be easily viewable

Sub Capability

Include all health-related lifetime results for the patient

Sub Capability

Allow patient to communicate personally with provider

Sub Capability

Allow patients to view pertinent information while on-the-go on mobile devices

Sub Capability

Create visualizations and intuitive interface to facilitate patient understanding

Team Brainstorming to Determine Solutions

Jen
Mike R
Michael M
Vidya

Voting:

Desirability



Feasibility/Viability



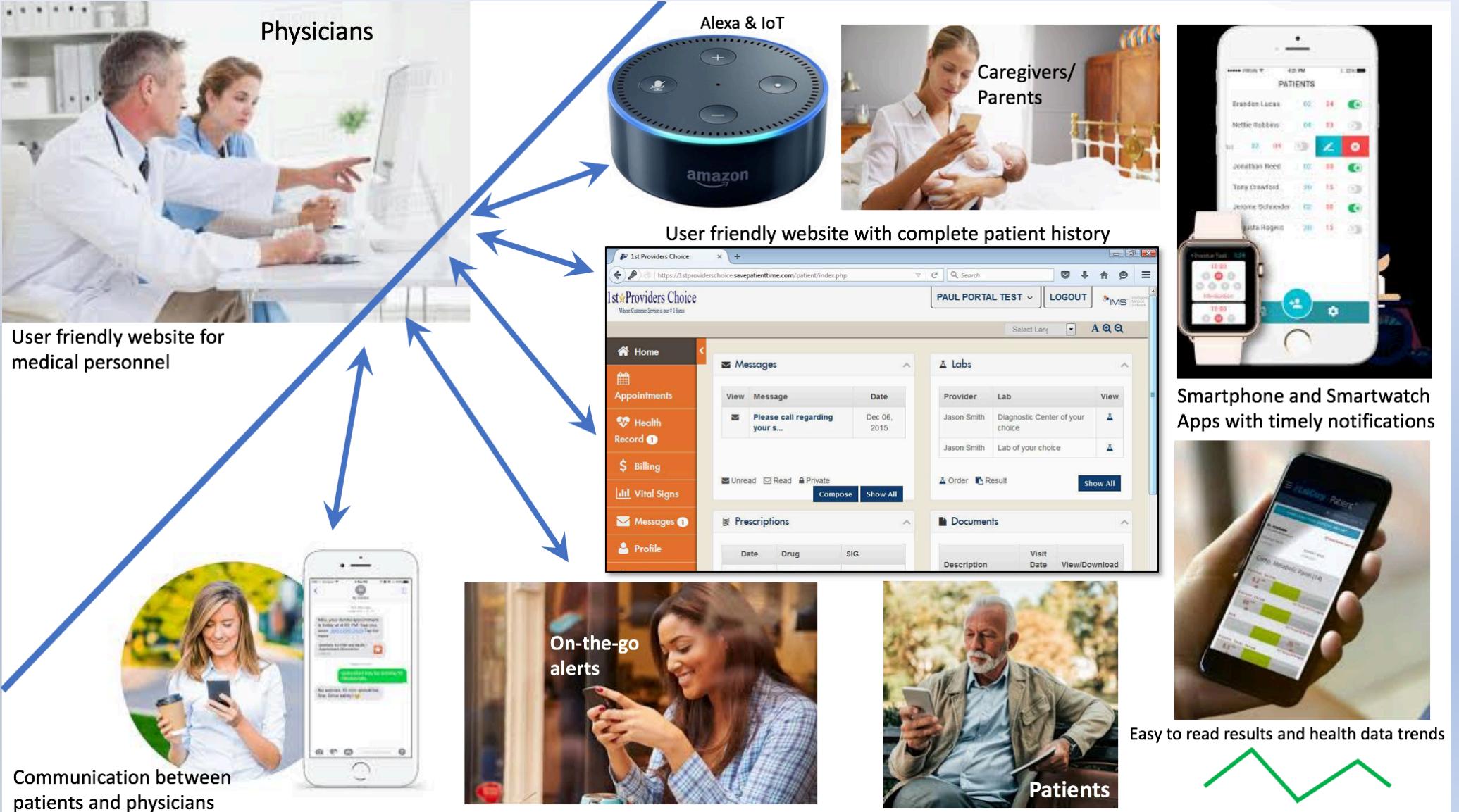
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TOPIC: User Experience

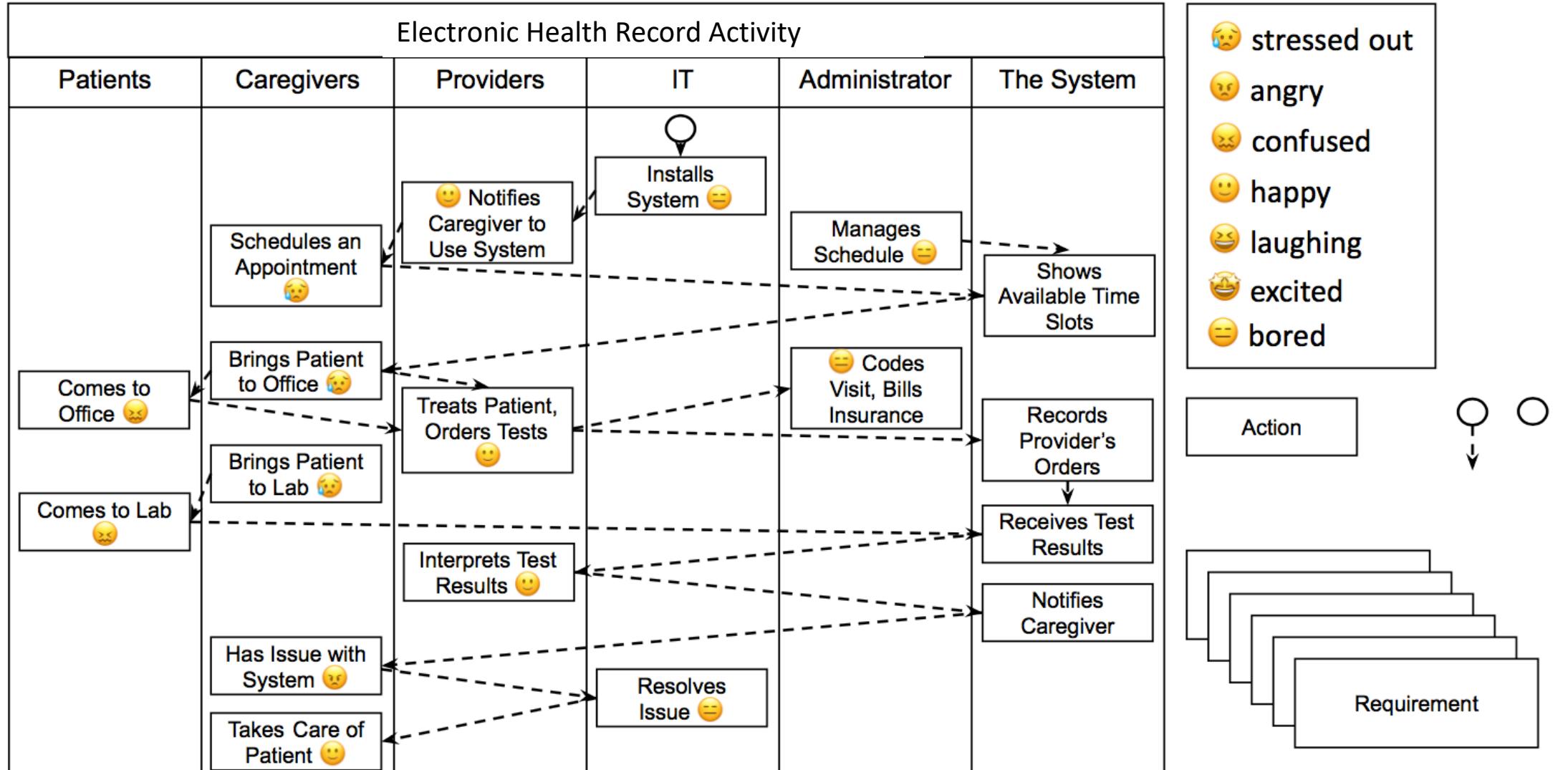


Personas Concept Sketch –

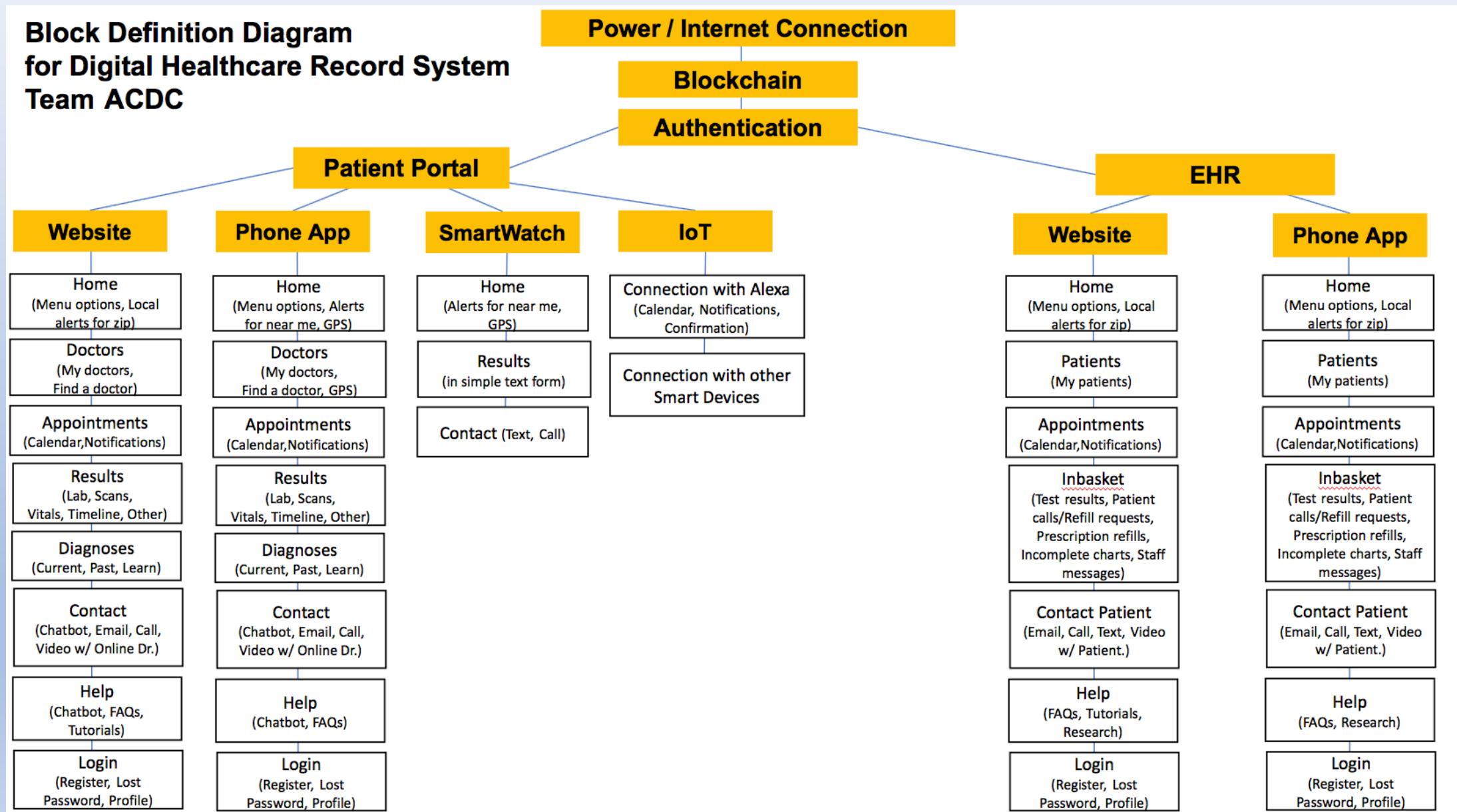
How users will interact with our system



User Journeys

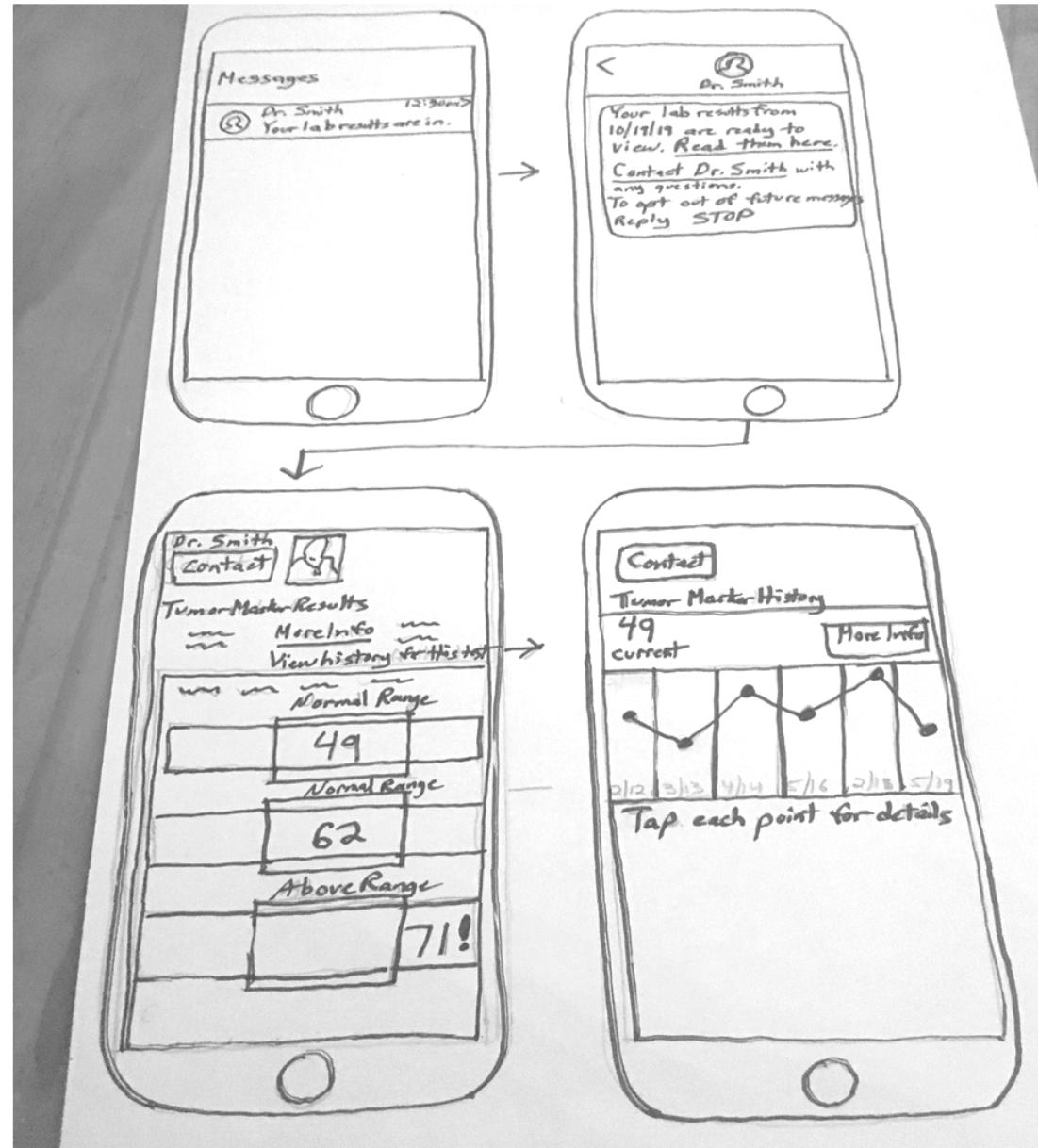


Block Definition Diagram



Lo-Fi Wireframe Development

User Scenario #1: Patient with Chronic Illness (Michelle) receives text notification that lab results are ready. Patient goes to check results then compares results to lifetime history for that test.



Testing and Iteration – Develop User Testing Plan for User Scenarios

User Testing Plan- Jen

Tester Number and Name; Persona: #1, Kelly- Patient

Location: Tester's home

Setup: Existing bodystorming paper prototype sketches were used and new ones were created to expand the possible user tasks available. Each screen sketch was cut out individually, and the tester was shown one screen sketch at a time, until an option was “tapped” by tester. Then the appropriate follow-up screen sketch was shown. The scenarios below were followed, one at a time by the tester. Observations were made, notes were taken, and the questions at the bottom were asked of the tester after each task was performed.

User Scenarios / Tasks. After getting a text notification from our medical records system, you want to see your latest lab results, then:

1. See how it compares to previous results
2. Call your doctor who referred you to the test
3. Initiate an online virtual appointment with an available doctor
4. Schedule an appointment with the doctor who referred you to the test
5. Learn more about these results????

After each task, ask the tester:

- a. Was there anything confusing about this task? Explain why or why not?
- b. How did this task make you feel?
- c. Would you use this feature? Explain why or why not.
- d. Is there anything else you would like to see here?

Testing and Iteration

Paper Prototype Test- Lab Text Notifications / Contacting Dr., Patient (Kelly), Her Home 6/22/19



5 tasks were set up for the user scenario (see User Testing Scenario doc). She "tapped" the links, buttons, etc. for each task. She said she really liked the options available to get a notification on-the-go on her phone and the ability to contact a doctor in a variety of ways. She said the screen layouts and options were intuitive. She would likely use these features and she said they made her feel "in control of her health". She didn't want to be able to remember a password, so if she didn't have to enter it each time she was getting results would be a plus. She also liked she could contact a doctor right away, so that they could explain any confusing results, that she could talk to someone right away, and she "wouldn't have to live in fear for weeks". She really liked the calendar option to be able to book an appointment online, rather than calling and going back and forth with an available time by phone. When sending a message, she liked it said "Secure" message and that it kept her security and privacy in mind. With the calendar option, she liked that she could add to a variety of digital calendar platforms, so the ability to add to one calendar, then go back and add to a 2nd calendar would be convenient. She doesn't own an Alexa, so was neutral about the ability to integrate with Alexa. When asked to initiate an online virtual appointment with an available doctor, she first tapped the wrong button (the one saying "Book an appointment" instead of "Online Doctor Appointment"), so this verbiage should be reworded to minimize any hesitation or confusion. Also, tapping a specific result and having it show more info would be great.

What is inferred

Overall, this functionality and layout is intuitive and helpful to patients. This app would help improve patients' emotional state by helping them feel in control of their health and by helping them make unpleasant tasks, such as making doctor appointments, more efficient. Fear would be reduced, even if there was a potentially scary test result. The ability to communicate with a doctor in a variety of ways is very important. Also, a variety of ways to save appointments to various calendar platforms would be helpful. Verbiage for making a future in-person appointment and an immediate virtual appointment should be made clear and distinct, and should be tested further. Showing as much information and context for the test result as possible would be helpful. Alexa functionality would be a niche feature, at least at the present time.

N

- Patients need to feel in control of their health
- Patients need to communicate with doctors in a variety of ways and quickly
 - Patients need to be healthy
 - Patients need to efficiently make appointments

T

- This functionality and layout is on the right track for patients
- Emphasizing various means of communication /contact with doctors will be helpful
- Be careful with wording for buttons and integration of cutting-edge technology that patients may not be used to (virtual dr. appts)

S

- Layouts were clear at relaying how to perform tasks
- There was slight confusion with how to initiate online virtual appt vs. in-person appt
- This app made user really feel in charge, compared to what she's used to in healthcare

- Tensions
- Contradictions
- Consistencies
- Synergies
- Hmm...?

Testing and Iteration- Analyzing Results to Determine Necessary Prototype Revisions

Flow of Thoughts for: Health Records Challenge User Testing

Feel in Control — Patients like the feeling of being in control of their health that this app brings.

Intuitive — Patients like the intuitive interface of this app, but we need to be careful of how we word options, especially with unfamiliar cutting edge technology options such as virtual online appointments.

Cutting Edge Tech — Patients like having as much information available at their fingertips as possible, such as explanations of lab results, patient history, trends, and resources.

Communication — Patients like the flexible options and compatibility, such as a variety of communication methods and syncing with a variety of calendar platforms (iCal, Outlook, Google, etc.).

Filters Info — Providers/Admin want the information brought to them and want their information filtered, so that only the important data stands out. We need to provide a good search engine, with filters and recent/urgent notifications.

Brings Info to You — Patients, providers/admin want simplicity and ease of use. Providers are concerned that this system will overload them with data. We need to make sure to filter and highlight the crucial information for providers. We also need to provide a good help system for all users, with multiple levels of support.

Easy to use —

Efficiency —

IoT —

Security —

Caregivers are busy, so want efficiency and a hands-free method for seeing data.



CAPABILITIES

- Display easy-to-read results quickly
- Include all health-related lifetime results
- Allow users to view pertinent information while on-the-go on mobile devices
- Allow medical records from other doctors /hospital systems to be easily viewable
- Allow patient/caregiver to communicate personally with provider
- Create visualizations and intuitive interface to facilitate patient/caregiver understanding
- Reduces stress and anxiety to patients, caregivers, and providers
- Maintains privacy and confidentiality of provider/patient/caregiver relationship
- Easy to use: less steps
- Nonintrusive for the providers

- Tensions
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