Improving the User Experience in Healthcare through Service Design: Developing a Digital Identity Solution for Patients

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Abstract

Current healthcare systems are decentralized and siloed, comprised of multiple technologies and platforms lacking integration. Because of the absence of consolidated medical records, patient care is based on incomplete information. Currently, patients have limited access or control of their health records. A shift in ownership of medical records to the patient would serve to improve the user experience while supporting a more useful integration of patient information within the healthcare system. The field of service design examines the systems and processes at work in a chain of relationships with the goal of seeking out opportunities for improving a user's experience. This thesis contributes to service design discourse by demonstrating the value of adopting a service design framework for the development of a blockchain-based digital platform to serve as a secure patient record repository. Six healthcare providers and six patients of care participated in two studies. The first study comprised of in-depth interviews and co-design sessions. The results revealed pain points within the current healthcare system which were categorized into six themes: communication, care, control, privacy, information and repetition. In response, a blockchain-based digital mobile application prototype was designed to address the pain points. The application places the patient at the forefront of their care journey by giving them ownership over their electronic medical records. In the second study, the prototype was tested with the same 12 participants through a user-testing session. Responses from the second study showed patients were satisfied with the features. Healthcare providers thought the application would improve their work experience and interactions with patients. Additionally, two studies demonstrate the value of adopting a service design methodology to improve service experiences. This framework can be applied to improve user experiences in digital transformations within healthcare.

Keywords: service design, blockchain technology, co-design, user-centered design, healthcare, patient experience

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Introduction

The twenty-first century is inundated with wicked problems confounding human societies. At the forefront of these complex and networked problems are healthcare concerns (Buchanan, 1992; Dorst, 2019; Jones, 2017; Penin, 2018). While The Canada Health Act states that all healthcare should be 'portable' ensuring all patients have the right to choose where and when they receive care, health records remain siloed (Persaud, 2019; Webster, 2015). In the current healthcare data landscape, patients do not have access to their health records (Persaud, 2019). Physicians are responsible for tracking and accessing patient medical histories in individualized systems that do not connect with each other. The result is a decentralized healthcare system employing multiple technologies and platforms containing billions of records that cannot be shared or easily accessed (Ontario Ministry of Health, 2019; Ministry of Health and Long-Term Care and eHealth Ontario, 2016).

The development of new information and communication technologies led to the growth of design fields including interaction design, experience design, transformation design and service design (Kimbell, 2009). Against the background of technological innovation, this thesis focuses specifically on contributing to the advancement of service design as an emerging field within the design discipline (Cipolla & Manzini, 2009; Cooper et al., 2018; Junginger, 2017; Morelli, 2002; Penin, 2018; Pinhanez, 2009; Secomandi & Snelders, 2011; Stickdorn & Schneider, 2011). As stated by Kimbell (2009), service design has yet to define its own formal practices. According to Krippendorff (2006) and echoed by Kimbell (2009), service design has shown signs of becoming a discourse community but discord exists amongst designers in their understanding of its vocabulary, methods and approaches. As a result, service design presents designers with a new realm of opportunities, beyond aesthetic concerns of form and function into a more profound intellectual and strategic practice focused on creating a deeper social impact (Penin, 2018).

This study demonstrates the potential value of using a service design methodology consisting of four phases: exploration, creation, reflection and implementation in the development of service innovations. Specifically, this study seeks to improve the patient (user) experience when interacting within the healthcare system. The use of the emerging technology known as blockchain in a service design framework provides relatively unexplored research potential, exemplified through the lack of existing academic literature investigating the synthesis of both these neoteric concepts. Inspired by

blockchain technology and the processes, material and visualization practices of a service design framework, the design solution that emerged is a blockchain-based digital electronic medical record for patients. This study seeks to contribute to the growing service design discourse by providing a framework that embraces emerging technology in developing a solution to improve user experiences.

The next section contextualizes the thesis work by presenting the current state of medical records and trends in patient-centered care, emerging technology and service design. The section closes with highlighting the gaps and opportunities for an improved patient experience.

Context

Current State of Medical Records

The adoption of electronic medical record (EMR) systems is a matter of priority in Canada. In 2010, the Canada Health Infoway invested a total of $380 million toward acceleration of EMR implementation (Price, Singer, & Kim, 2013). However, a fragmented patient record management system lacking interoperability defines the current EMR landscape (Chang & Gupta, 2015). Patients do not have access to their electronic health record (EHR) data. As noted by Price, Singer and Kim (2013), healthcare providers are responsible for maintaining a patient's medical record in the current healthcare system, using a combination of paper-based and EMR systems. As a result, a patient's medical record is made up of fragmented files in multiple formats and standards. Additionally, the current healthcare system is decentralized. A patient's medical record is spread across multiple healthcare providers and numerous systems.

Recently, the University Health Network (UHN) in Toronto launched a patient portal, giving patients limited access to their health records online. Information available on the UHN portal include: health card number, medical record number, clinic notes, test results, reports and discharge summaries (Portal, 2002). However, records are limited to patient interactions with UHN healthcare facilities only, thus lacking a comprehensive view of a patient's entire medical history. Similarly, MyChart at Mackenzie Health was launched in July 2017 to provide patients access to their health information online. However, information is limited solely to patient interactions within Mackenzie Health's network of healthcare facilities. While both UHN and Mackenzie Health have utilized technology to empower patients with easy access to their health records, each system works independently from the other. Patient medical information is limited to interactions within a specific network, thus, a

patient does not have access to a comprehensive medical record. As noted by Hillestad, et al., (2005), it is increasingly clear that a lengthy, uneven adoption of non-standardized, non-interoperable EMR systems will only delay the chance to move closer to a transformed health care system.

Currently, diagnostic results are sent directly to family physicians upon completion and it is the responsibility of the patient to follow-up with their physician for results. In critical cases, the patient's physician will initiate contact with the patient for a follow-up consultation. Diagnostic laboratories have started providing patients access to view results online through 'patient portals'. For example, *MyQuest* (Quest Diagnostics, 2020) and *myresults* (LifeLabs, 2020b) are patient portals for Quest Laboratories and LifeLabs respectively. Similar to the UHN and Mackenzie Health, each diagnostic lab system only holds records for their respective patients, resulting in a decentralized system. Furthermore, on December 17, 2019, LifeLabs publicly confirmed a cyberattack of their computer systems. The personal and health information of 15 million Canadians was extracted by cyber criminals. Patient information including: names, addresses, emails, customer logins and passwords, date of birth, health card numbers (from 2016 and earlier) and lab test results in 2016 (for 85,000 Ontario customers) were compromised (LifeLabs, 2020a).

While the transition to electronic medical records eliminates paper-based records, a patient's medical record remains spread between different healthcare providers in a decentralized system. In addition to cyberattacks, the theft or loss of computers, notebooks, smartphones, tablets, USB keys, or portable hard drives, and the improper disposal or transfer of patient files contribute to patient privacy breaches. EMR systems offer benefits for storing and accessing patient health information to improve the management of patient care. However, the attributes that make electronic records appealing—accessibility, transferability, and portability of patient health information—also pose privacy risks. As healthcare providers move towards embracing technology in improving healthcare services, every system still operates independently, thus the urgency to develop a secure, integrated healthcare system.

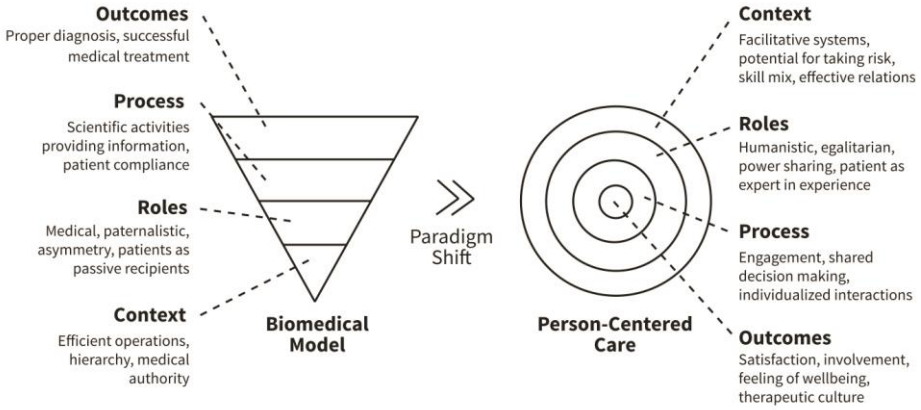
Trends in Patient-Centered Care (PCC)

Healthcare is under increasing pressure to improve its response to patients' needs and integrate resources. This has led to a paradigm shift from the conventional model of medicine—the biomedical

model—towards a 'person-centered' approach (Figure 1) facilitating a greater involvement of patients in their own care (Malmberg & Wetter-Edman, 2016; Mead & Bower, 2000).

Figure 1

The Paradigm Shift Towards Person-Centered Care through Four Dimensions



Note. Reprinted from "Service Design and Service Thinking in Healthcare and Hospital Management" by L. Malmberg, V. Rodrigues, L. Lännerström, K. Wetter-Edman, J. Vink and S. Holmlid, 2019, Switzerland: Springer Nature. Copyright 2019 by Springer Nature.

The challenges that face the public sector today need to incorporate service users as partners and resources in the continuous renewal of services. Introduction of service design approaches and methods that provide tools for involvement and enhanced understanding of user needs is one popular strategy. (Malmberg & Wetter-Edman, 2016)

As illustrated in Figure 1, person (patient)-centered care brings forth a more humanistic and egalitarian relationship between the healthcare provider and the patient through changes across four dimensions: context, roles, process and outcomes. The move from the conventional paternalistic view of the patient role and relationship with healthcare professionals implies the sharing of ownership and responsibility between the patient and healthcare provider. The patient's limited knowledge and experience of their own care is valued on a level equal with the expertise of the healthcare provider. Thereby, in the transition toward patient-centered care, the patient moves from a passive recipient to active participant and potential critic (Malmberg, et al., 2019).

Malmberg, et al. (2019) argue that service design can act as both a support and driver for the transformation towards patient-centred care. In a transformative approach, service design offers methods and tools (Wetter-Edman, et al., 2014) that can help healthcare transition toward patient-centered care. As noted by Trischler, et al. (2018), engaging with end-users or patients throughout

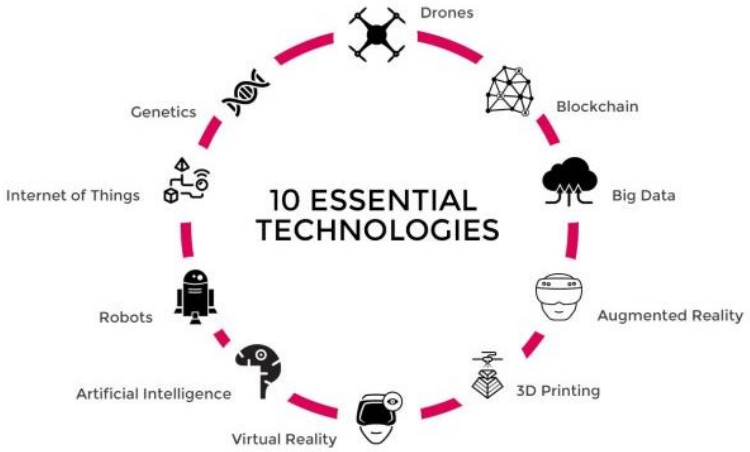
the design process leads to a better understanding of patient needs. Furthermore, Malmberg, et al. (2019) note the mapping of patient journeys and supporting processes through service design methods demonstrate how service design processes can help work toward the outcomes of patient-centered care. For example, journey maps provide a method for comprehensive understanding of the service from a user perspective which help service designers develop user-centric solutions.

Emerging Technology

The 'Fourth Industrial Revolution' continues to gain momentum defining the current sociotechnical landscape. It is defined by both public and private institutions as the 'inchoate transformation of production of goods and services resulting from the application of a new wave of technological innovations (Caruso, 2018, p. 379)' (Figure 2). The Fourth Industrial Revolution can transform the ways we live and the environments we live in.

Figure 2

New Wave of Technological Innovations Included in the Fourth Industrial Revolution



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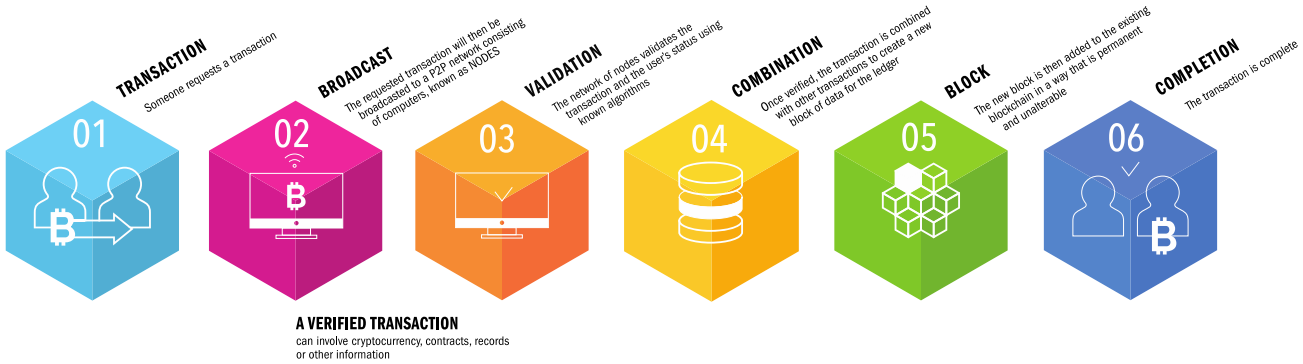
According to Caruso (2018) and Degryse (2016), digital information forms the strategic resource of the 'digital economy' wherein the network can be viewed as the chief organizing principle of the economy and society as a whole. For example, blockchain-based platforms work to exchange digital information within a network of users. An emerging technology, blockchain has the ability to fundamentally transform the ways in which people transact, collaborate, organize and identify themselves (Crosby, Nachiappan, Pattanayak, Verma, & Kalyanaraman, 2016; De Filippi, 2017; Tapscott & Tapscott, 2011; Tsilidou & Foroglou, 2015). The platform provides the benefits of

immutability, transparency, data verifiability, security, control, convenience and efficiency across a decentralized ledger on a peer-to-peer network (Figure 3) in which users can verify transactions without the need for a central certifying authority (Stanley, 2018).

Figure 3
What is Blockchain Technology?



In a healthcare context, blockchain technology can be used as a platform to hold a patient's medical record. This would shift ownership of the records to the patient providing a consolidated and interoperable digital account of their care journey. Each patient record is date and time stamped and then verified and authenticated by its network users. The result is an immutable patient electronic medical record that can be shared between a patient and healthcare providers which supports the patient-centered care model. Blockchain is innovative because it provides a universal, widely accessible and secure replacement for all paper records and separate databases, thus completely digitizing medical records.

Service Design

Service design originated as an amalgamation of concepts and tools adapted from various design disciplines (product design, communication design, interaction design, etc.) and service marketing and management (e.g. customer journey, service encounter) (Sangiorgi & Prendiville, 2017), using 'designerly ways of changing and innovating' (Sangiorgi & Junginger, 2015). In the last two decades, service design has transitioned from its initial pursuit to establish legitimacy within the design field by integrating with other design practices. The original focus of service design practice and research has been the interfaces and interactions between the supplier and users (Holmlid, 2007; Sangiorgi, 2009). It has since evolved to include the understanding of human experiences by designers which translated into the design of improved customer journeys. Furthermore, the co-produced nature of

service delivery has led to the development of collaborative design approaches based on participatory design methodologies (Greenbaum & Kyng, 1991; Schuler & Namioka, 1993):

> A human-centred design approach to services manifests itself in the capacity and methods to investigate and understand people's experiences, interactions and practices as main sources of inspiration for redesigning or imagining new services [...] On another level a human-centred approach to services manifests itself in the capacity to engage people in the design and transformation processes (Meroni & Sangiorgi, 2011, p. 203)

While two-dimensional graphic design and product design are focused on the production of tangible artifacts or interactions with technology (Kimbell, 2009; Penin, 2018), designing for services is embedded in social interactions that occur over time. Service design involves the designing of the "material and immaterial conditions for interactions and experiences, flows, and systems" (Penin, 2018, p. 12) while attempting to consistently and holistically integrate the systems, processes and touchpoints of a service. It is a collaborative, interdisciplinary, iterative approach that includes co-design activities and visualization tools to create and orchestrate experiences that respond to both user and stakeholder needs (Stickdorn, Lawrence, Hormess, & Schneider, 2018a). Stickdorn (2011) presents an iterative four step service design methodology consisting of: exploration, creation, reflection and implementation. Exploration is a process of discovery and the framing of a problem from a variety of perspectives; creation encompasses the conceptualizing, developing and prototyping of ideas through an iterative process of gradual improvement and reflection involves the testing of ideas and concepts to determine how to further improve solutions. The implementation phase provides ways to transfer the new or improved service solution into the real world, thus putting ideas into action. In the context of this thesis, a service design approach provides the framework to gain a holistic understanding of the current state of healthcare to develop a viable design solution to improve patient experience.

Gaps and Opportunities

Within the healthcare system, the lack of uniform national technological standards has resulted in a multitude of disparate electronic health information systems that cannot interoperate with other systems (Webster, 2015). As stated by Persaud (2019), patient care is frequently based on incomplete information, resulting from the lack of a consolidated patient medical record. Fragmented medical information puts patients at risk of harm resulting from incorrect diagnoses and avoidable side effects from prescription medications to the intravenous dye injections used by

radiologists when performing x-rays (Persaud, 2019). Giving patients control of their own care through the ownership of their medical record facilitates the transformation of the healthcare system towards a patient-centered approach.

Service design is being recognized as a catalyst for organizational change and transformation (Junginger, 2015; Mead & Bower, 2000; Sangiorgi, 2011; Yu & Sangiorgi, 2018) because it examines the systems and processes at work in a chain of relationships to seek out possible opportunities for improving the user experience (Penin, 2018; Stickdorn & Schneider, 2011). Blockchain's disruptive technology ideally pairs with research and service design discourse. Penin (2018) notes, the increasing use of technology-enabled services needs service design's methods. Service design makes use of user-centered and participatory design approaches, management and organizational sciences, marketing and product developments to "put people back at the center of digital technology developments, counterbalancing the tech-centric mindset of engineers and developers" (p. 87). Further to Penin's argument, Kimbell (2009) states that a designers' skills, methods and user-centred approaches can enable improvements in services so that they become more effective and get close to people's day-to-day lives. Further to this argument, Stickdorn and Schneider (2011) utilize the rigorous design process to illustrate the potential of designers to contribute to strategic discussions beyond mere facilitators of form:

> Designers possess more than simply an ability to style products; they are practitioners of an applied process of creative skills: identifying problems, researching, analysing, evaluating, synthesising and then conceptualising, testing and communicating solutions. Design, whatever the discipline, is not only about an end product, but rather a systematic process of identifying problems, then researching, creating, testing and implementing solutions (Stickdorn & Schneider, 2011, p.87).

This thesis will investigate how service design can incorporate emerging technology to improve the patient experience within healthcare systems. This study will demonstrate how a service design framework can:

1. Provide a comprehensive overview of the patient experience;
2. Help to identify pain points with the current healthcare system; and,
3. Support the implementation of technology to improve user experiences.

Service Design Framework

This thesis adapts Stickdorn's (2011) service design framework to include three of the four iterative phases: exploration, creation, and reflection and reserves the implementation phase for future work. In the context of this thesis, the exploration phase includes research gathering through existing literature and user studies to identify opportunities for service design intervention. The creation phase generates potential design solutions responding to user insights. Reflection occurs continually throughout these two phases. It is important to reflect on the research collected in the exploration phase to extract relevant opportunities for service improvement. Additionally, it is vital to reflect on the design solutions generated from the creation phase to determine viable solutions for further development and user testing. As recommended by Stickdorn (2011), iterations within these three phases of the framework works to ensure the final design solution respond to all stakeholder and user needs, thus, ensuring service improvement.

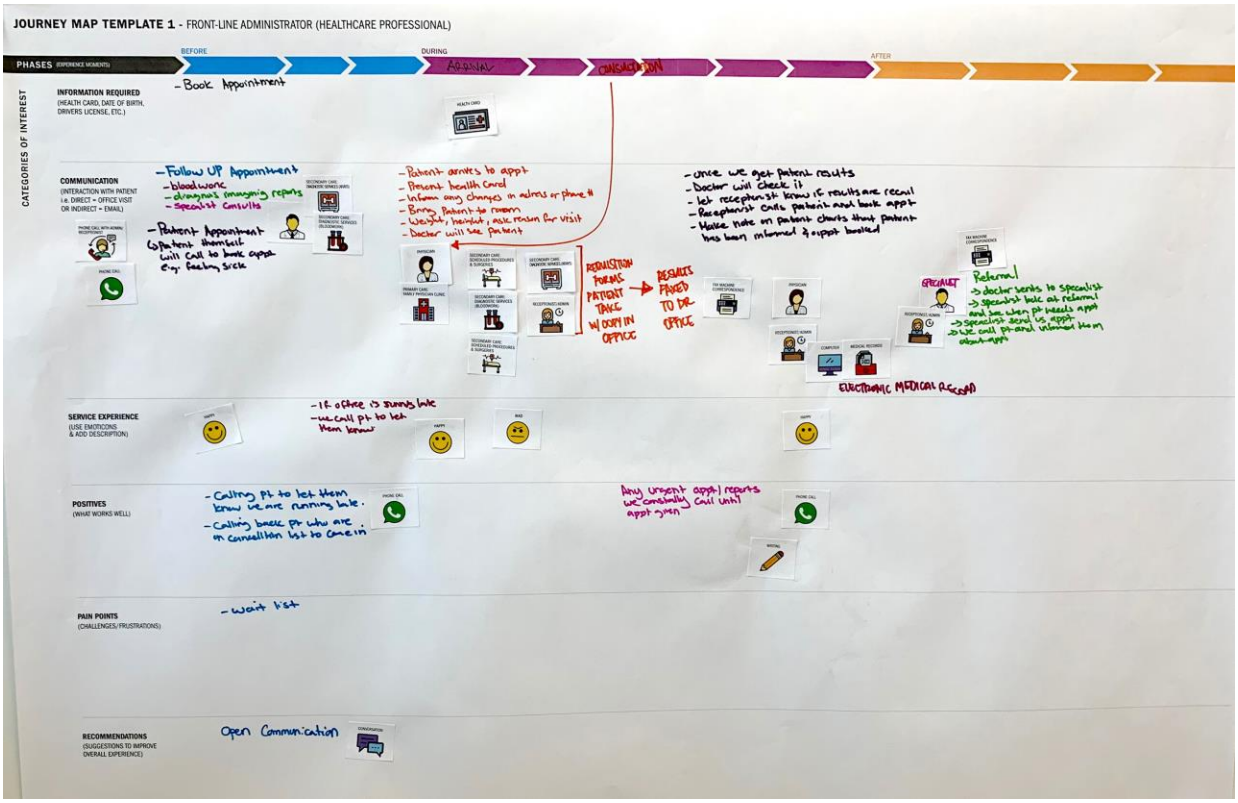
This thesis considered both healthcare providers and end-user experiences, which led to the deliberate recruitment of six healthcare professionals, representing healthcare providers and six patients of care, representing the end-user. The 'exploration' phase (the first study) consisting of in-depth interviews and co-design sessions with healthcare providers and patients (Figure 4).

Figure 4
In-Depth Interview and Co-Design Session with a Patient Participant

The insights garnered from the first study informed the ‘creation’ phase of the framework. This resulted in the development of a servicescape consisting of data visualizations in the form of journey maps and service blueprints through the visualizing, synthesizing and analysis of the data collected (Figure 5). The servicescape formed the basis for the explorations of potential design solutions to address the problems within the current health care system.

Figure 5

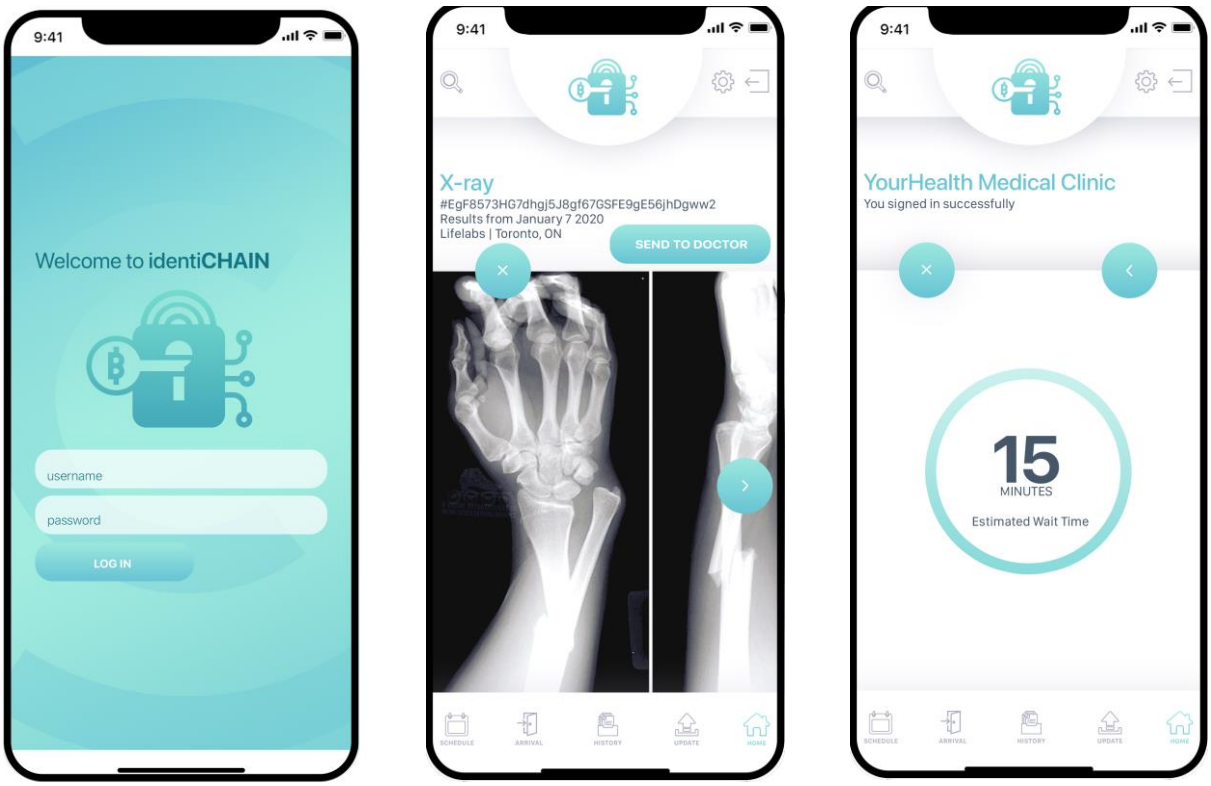
Co-Designed Journey Map with Healthcare Provider Participant



The ‘reflection’ phase of the framework guided the development of a prototype for a digital patient identity mobile application that best addressed the majority of pain points identified from the first study (Figure 6).

Figure 6

Digital Patient Identity Mobile Application Prototype

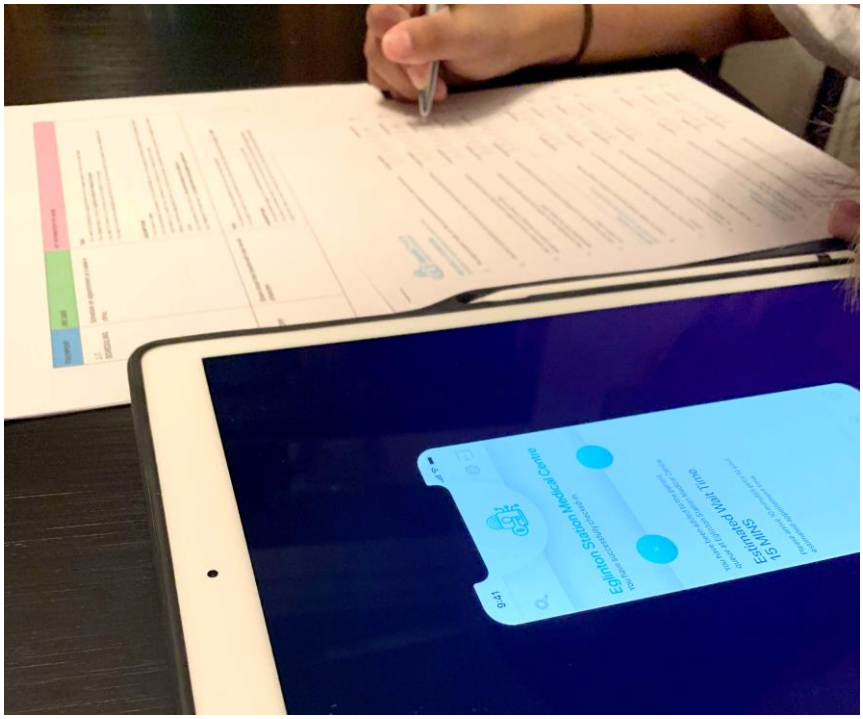


Service design considers the invisible components of the service including the technology and system interactions and thus requires an interface where interactions can occur. This led to the exploration of emerging technology and the potential for the incorporation of blockchain to facilitate the security, control and immutability requirements of the proposed digital patient identity application.

Following the iterative nature of the framework, the researcher returned to the 'exploration' phase to gather participant feedback on the digital patient identity app prototype with a second study, consisting of a usability testing session (Figure 7).

Figure 7

User Testing Session with Patient Participant



Following a service design methodology that engaged stakeholders at each stage of the design process, the same 12 participants from the first study participated in a second study. The goal of the study was to test whether the digital patient identity app successfully addressed the pain points revealed in the first study. Each participant was required to complete a questionnaire during the user testing session, responding to questions specifically tailored towards the pre-defined usability goals including: efficiency, effectiveness, safety, utility, learnability and memorability. See Appendix L (pp.155–159) for the questionnaire. A service design framework relies on an iterative process. Therefore, participant feedback from the user testing sessions was analyzed and used to provide recommendations for further refinement. The following is a comprehensive explanation of the two studies, based on the service design framework.

Exploration—First Study

Qualitative research aims to provide an in-depth, socio-contextual and detailed description and interpretation of the research topic (Vaismoradi, Jones, Turunen, & Snelgrove, 2016). The collection of qualitative data during the exploration phase provides a comprehensive understanding of the existing healthcare system from both the healthcare provider and patient perspectives. These

insights helped to define the problems existing with the current state of the healthcare system and inform the subsequent exploration and development of a viable solution to improve the patient experience.

First Study: In-Depth Interviews and Co-Design Session

The framework for the first study of this thesis was adopted from the Consumers Health Forum of Australia's *Patient Life Journey Framework* (Consumers Health Forum of Australia, n.d.). See Appendix A (pp. 85–88) for the complete framework for the first study. Focused on facilitating policy-makers, consumer organizations and health services in their understanding of the healthcare system from a patient-centered perspective, this flexible framework aligned seamlessly with the research requirements of this thesis. 'Every person has a story to tell about their health, and their experience of the healthcare system. If we want better health outcomes, we must listen to consumer experience, and act on it' (Consumers Health Forum of Australia, p.3). As opposed to quantitative research, people's stories about their own healthcare journey provides information about *whole of life* and *whole of system* experiences of health, healthcare and health outcomes. Also noted as significant by the Consumers Health Forum of Australia and demonstrated through the in-depth insights gathered through this first study, is the strong evidence that patient narratives provide valuable information for improving healthcare. However, it remains relatively uncommon for health services and health policy agencies to collect and use this information in a systematic way (Consumers Health Forum of Australia, n.d.).

Methodology.

In-depth interviews. Ethics approval to conduct in-depth interviews and co-design sessions was obtained from the Human Participants Review Sub Committee, York University's Ethics Review Board in October 2019. See Appendix M (pp.160–161) for ethics approval certificate. A series of 12 sessions averaging one hour in length was conducted with each participant. Sessions took place at York University's MDes Studio or a participant's place of employment (Figure 8).

Figure 8
First Study Session Set-Up

In-depth interviews uncovered the pain points and positive features of the current healthcare system. Along with the discovery of pain points, the successful attributes of the existing system were important to document in order to be incorporated into the development of the new solution. To gain an understanding of a typical patient's journey within the healthcare system through a patient's most frequented points of interaction, users were recruited using purposive sampling for two distinct studies. Participants were recruited based on their interactions within common touchpoints with the healthcare system ranging from acute care (hospital emergency visits), primary care (family medical clinic visits) and secondary care (scheduled procedures or diagnostic laboratories). These three main categories of care were determined as the common patient touchpoints within healthcare based on the stages in the patient life journey including: a change in health, seeking assistance, diagnosis, treatment and life with a health issue (Consumers Health Forum of Australia, n.d.).

Healthcare professionals interviewed included a family medical physician, a long-term care unit nurse, a rehabilitation unit nurse, an acute care nurse, an anaesthesiologist and a family medical clinic administrator. Interviewed care patients represented a diverse range of patient interactions within the healthcare system based on the aforementioned common healthcare touchpoints.

The sessions began with a set of four preliminary questions designed to develop a sense of ease and comfort with the participant before beginning the journey mapping component. Each of the two

participant pools had their own question set, specifically generated for the respective pool. Healthcare professionals were asked questions related to their everyday tasks and patient interactions while patients of care began the session responding to questions targeted to their most recent healthcare experience. See Appendix A (p.86) for complete list of preliminary questions.

A semi-structured interview format allowed participants to speak freely of their own healthcare journey. Additionally, this interview format provided opportunities for the interviewer to ask prompt questions about the patient experience at each touchpoint including: before, during and after care throughout the co-design session. The prompt questions were developed based on the following criteria: coordination of care, continuity of care, informed consent, access to health services, respectful care and treatment and overall experience of care. See Appendix A (p.88) for complete list of prompt questions.

Co-design sessions. Participants were asked to co-create a journey map of their healthcare experience with the researcher during each interview session. (Figure 9).

Figure 9
Co-Designing Journey Maps with Participants

Steen (2013) describes co-design as an exploratory process of 'joint inquiry and imagination where problem and solution coevolve'. Co-design empowers the end-user to actively participate in the design process, thereby, adding another dimension to the design process. By engaging users in co-design sessions, service design can help enhance the benefit of service concepts for patients (Malmberg, et al., 2019). As noted by Stickdorn, et al. (2018), in-depth interviews can be supported by creating boundary objects such as journey maps, co-created with the interviewee to support a mutual understanding of complex issues. Journey maps will be used as a tool to help visualize the participant's healthcare journey and facilitate discussion.

Journey maps focus on human experiences by visualizing the story of a specific actor as a sequence of steps (Stickdorn, et al., 2018). In combination with in-depth interviews, this approach revealed rich insights that would not have been possible to discover had interviews been the only method employed in this study. The goal of this first study was to provide a framework to allow patients to tell their healthcare story in their own words and to ensure they would include important experiences. The information garnered from these patient stories identified critical intervention points for improving the patient experience.

The value of journey mapping is derived from the creativity used in determining its metrics. The participants visualization of their journey and experiences at each touchpoint allows the researcher to understand the pain points. Therefore, in lieu of providing a blank canvas for each participant to draw their own journey map, a deliberately-designed template was provided to each participant. See Table 1 for journey map template components. See Appendix B (p.89) for journey map template design.

The questions that informed the categories of interest for the journey map template included:

1. What forms of identification were required for a patient to present when visiting healthcare providers?
2. What communication methods were used by patients in correspondence with healthcare providers?
3. How did patient's feel about their service experience with the multiple touchpoints in their healthcare journey?
4. Were all medical records available at each point of care?
5. What are the participant's expectations of their own health journey and of their healthcare providers?

Table 1

Journey Map Template Components

Phases (Experience Moments)		Before	During	After
Categories of Interest	Information Required (Health card, date of birth, driver's license, etc.)			
	Communication (Interaction with patient/ healthcare provider) e.g. Direct = Office Visit; Indirect = Email			
	Service Experience (Use emoticons and add description)			
	Positives (What works well)			
	Pain Points (Challenges/frustrations)			
	Recommendations (Suggestions to improve overall experience)			

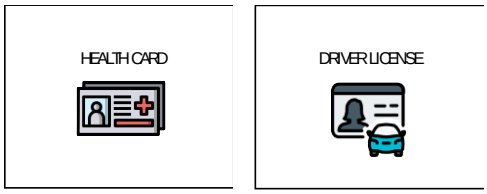
Each session was set-up with a variety of tools to help participants visualize their patient journeys (Figure 8). In addition to a journey map template and writing tools, participants were also provided with visual probes consisting of a toolbox of pre-cut icons and emoticons to use to create their journey maps. This method accommodated for participants who preferred not to draw and helped participants focus their attention on telling their healthcare journey (Figures 10, 11). See Appendix C (p.90) for complete list of icons and emoticons provided.

Figure 10

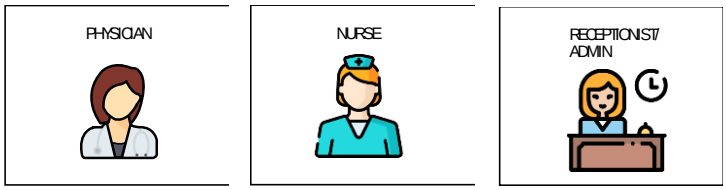
Visual Probes Facilitating Journey Map Activity

Icons were chosen based on the following criteria:

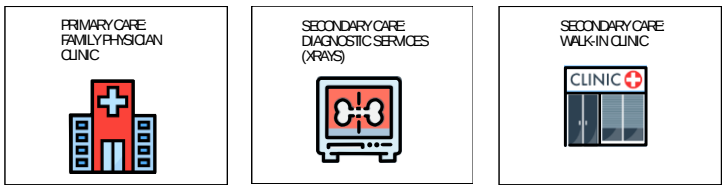
1. Information required: (e.g. health card, driver's license);



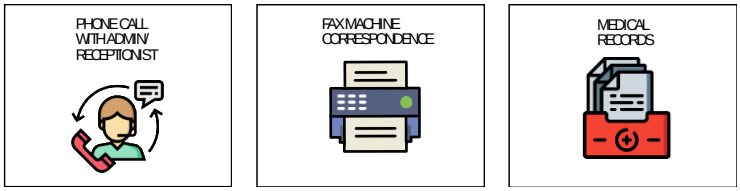
2. Direct communication methods (e.g. physician, nurse, receptionist);



3. Categories of care (e.g. family physician clinic, diagnostic services, walk-in clinic); and,



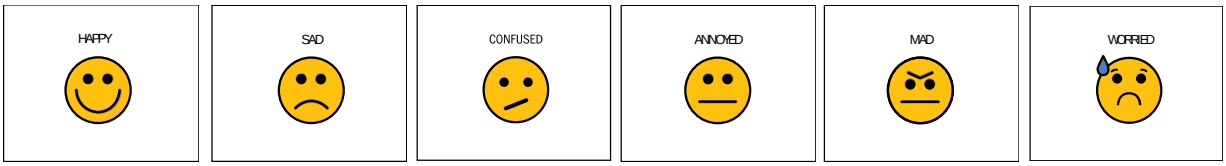
4. Indirect communication (e.g. phone call, computer, cell phone, writing, fax machine, paper, etc.).



A series of six emoticons—happy, sad, confused, annoyed, mad and worried—were chosen for patients to use to complete the 'service experience' section of the journey map (Figure 11). As noted by the Consumer Health Forum of Australia, emoticons are an easy-to-understand method to present experience points that aid in visually representing key experiences in a patient journey. The use of this limited series of emoticons as a standard metric used by all participants to gauge their service experience was proven in the subsequent analysis phase as an effective method to generate a compelling sense of a patient's overall healthcare experience.

Figure 11

Six Emoticons Provided to Participants to Help Map Their Service Experience



User-test session. A healthcare professional who was not a part of the participant pool participated in a user test session of the protocol, prior to the researcher conducting the in-depth interview and co-design sessions to determine:

1. The success of the protocol developed in facilitating the flow of communication with the participant;
2. The required length of each interview to allow for continual interest and engagement by the participant; and,
3. The effectiveness of co-designing a patient journey map with the visual probes provided in relaying the participant's narrative.

The test session proved beneficial because it uncovered both the successful components of the protocol along with required refinements including:

1. Minimal preliminary questions were needed at the start of the session as the majority of the information was repeated during the co-design journey mapping activity. This change helped to reduce the session length from over 2 hours (test session) to an average of 1 hour, which kept the participant engaged in the session;

2. Additional icons such as one for physiotherapist and blank templates for participants to draw on themselves were recommended to be added into the toolbox based on the feedback from the healthcare professional recruited for the test session; and,

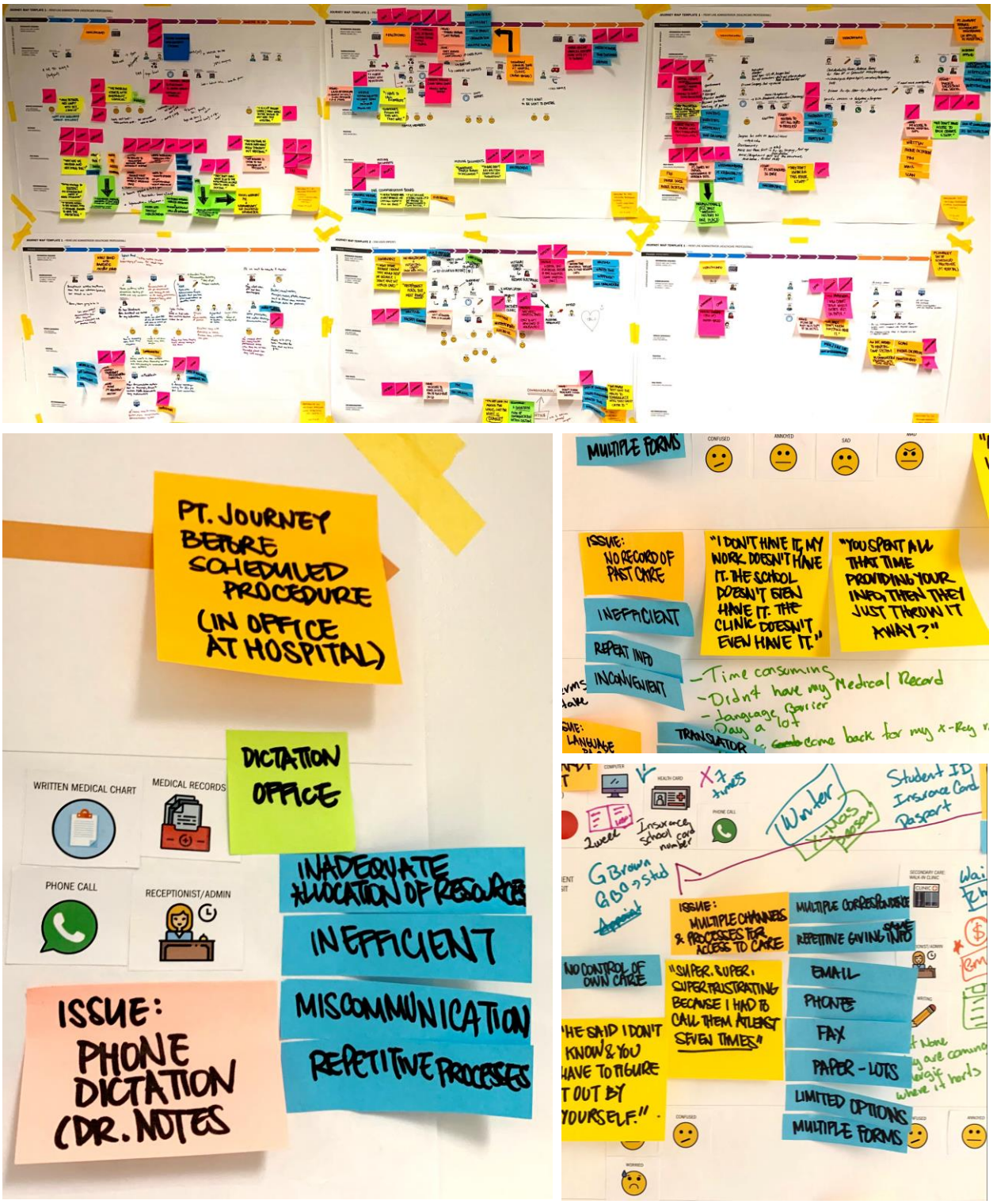
3. The prompt questions were effective in maintaining the flow of conversation during the sessions, especially during long pauses when the participant was focused on drawing the journey map.

Analysis.

Thematic Analysis. Thematic analysis, a method used to analyze textual data and elucidate themes through a systematic process of coding, examining of meaning and provision of a description of the social reality through the creation of theme (Braun & Clarke, 2006; Jodi, 1994; Vaismoradi et al., 2016; Vaismoradi, Turunen, & Bondas, 2013), was used to generate a logical and methodical data set (Figure 12).

Figure 12

Analysis of Patient Journey Maps Using Thematic Analysis



Themes consolidated the mass of data in a comprehensible manner to inform the subsequent stages of the service design framework. The data was organized into meaningful groupings through the transformation of raw data to higher-level insights or abstractions employing an inductive approach. The themes that emerged from the data enabled the identification of specific problems existing within the healthcare system. Themes were coded through 'participant perspective code' (Vaismoradi, et al., 2016), identifying the participant's positive, negative, or indifferent comments about their healthcare journey.

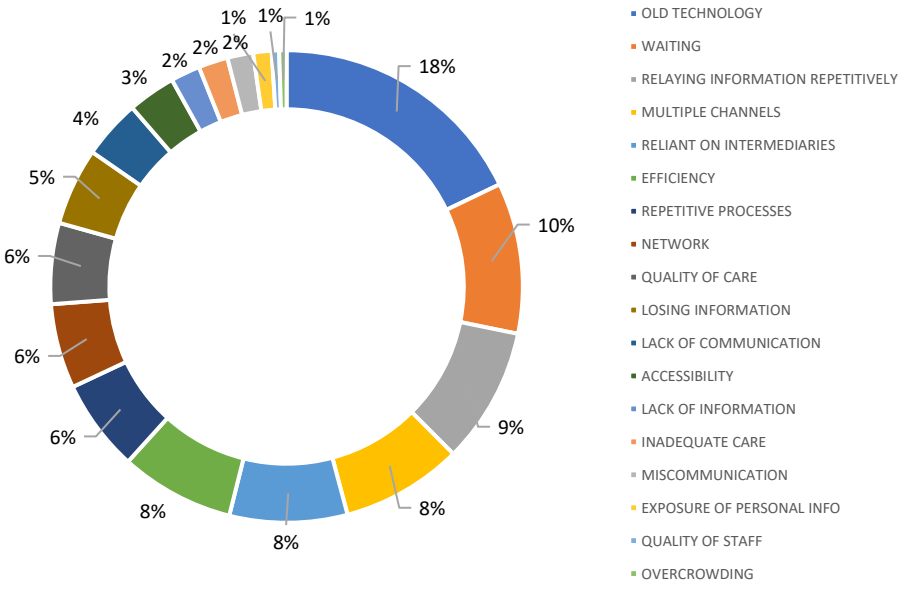
Results.

The data collected from the first study through the transcriptions of the in-depth interviews combined with the journey maps (Figure 12) yielded a large amount of data for analysis. See Appendix D (pp.91–102) for thematic analysis applied to complete set of journey maps.

Themes and Pain Points. The coded data yielded 405 instances that were categorized into 18 subthemes (Figure 13). The most frequently mentioned included: out-dated technology (71 instances), waiting (41), relaying information repetitively (37), multiple channels (33) and efficiency (31). Keywords extracted from each instance determined subtheme classifications.

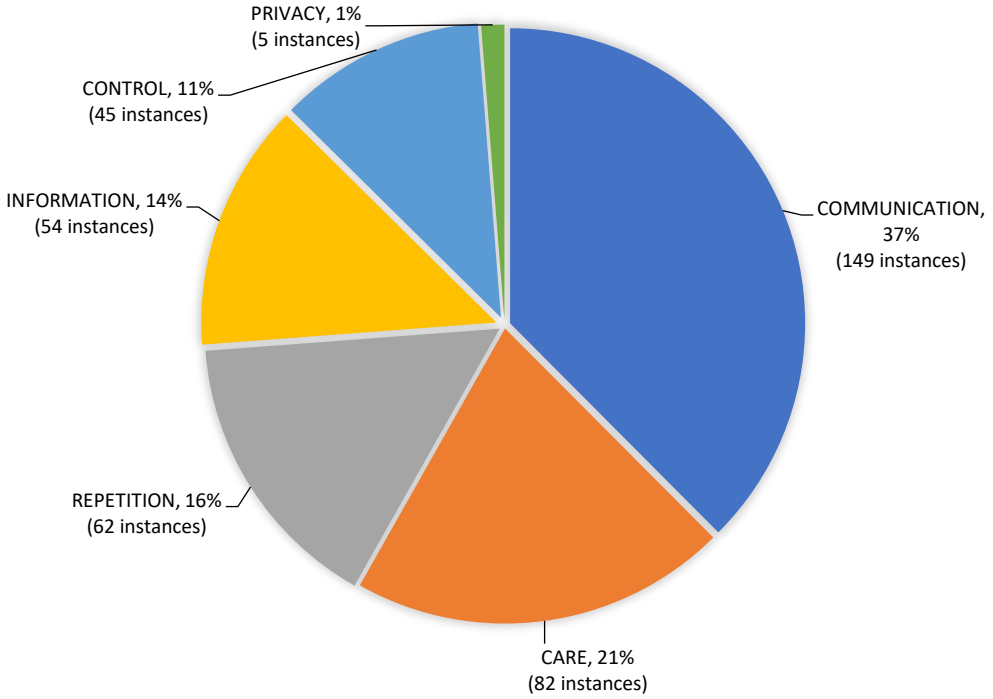
Figure 13

18 Subthemes Revealed from the First Study through Thematic Analysis



When the data was aggregated by subthemes, patterns emerged, leading to a reduction of the 18 subthemes into six main themes: communication, care, repetition, information, control and privacy (Figure 14).

Figure 14
Six Themes Revealed from the First Study through Thematic Analysis



The thematic analysis process defined the pain points to be addressed in the subsequent creation and reflection phases of the framework. See Table 2 for the compiled pain points revealed through the first study.

Table 2

Participant Pain Points Identified Based on the Six Themes Revealed through the First Study

Theme	Subthemes/Keywords	Pain Points Identified
Communication	Inefficiencies	A lack of a patient's full medical history at consultations impedes communication between patient and healthcare provider (e.g. processes have to be repeated or a patient has to go through multiple channels before adequate care is received).
	Lack of Communication	A lack of communication between patient and healthcare provider leads to a negative service experience (e.g. nurse does not communicate wait times or patient has to repeat healthcare processes because each healthcare provider uses an independent system).
	Miscommunication	Miscommunication between patient and healthcare providers based on language barriers (e.g. patient cannot understand investigations).
	Multiple Uncoordinated Channels of Communication	A patient's healthcare journey consists of multiple healthcare providers which leads to multiple channels of communication.
	Multiple Platforms	The current healthcare system is decentralized encompassing multiple healthcare providers with different electronic medical record systems without interconnectivity.
	Out-dated Technology	The reliance on paper-based medical records and old technology such as fax and phones as the methods of relaying information between different healthcare providers leads to miscommunication. Some walk-in clinics did not keep a copy of patient's previous records. Current healthcare system relies predominantly on old technology (e.g. fax and phone systems) to send vital patient information between multiple healthcare providers. As a result, misplaced or lost records, waiting for responses and miscommunication affect the ability for patients to receive care in a timely and efficient manner.
Care	Overcrowding	Healthcare offices are constantly filled with patients waiting for care.
	Quality of Care	Patient or healthcare provider not having a complete patient's medical record hinders the quality of care a patient receives from their healthcare provider.
	Long Wait Times	Patients frustrated with healthcare service experience because of long wait times for healthcare appointments and in waiting rooms (e.g. 2 weeks for a diagnostic test; 6 months for a specialist appointment).

Theme	Keywords	Pain Points Identified (cont.)
Control	Lack of Control Over Medical Records	In the current healthcare system, patients do not have access to their medical record unless they specifically request copies and compile their own medical record through multiple channels using multiple technologies (e.g. paper-based records and CDs for diagnostic images).
	Reliance on Intermediaries	Patients are reliant on healthcare providers to transfer their medical information, most often through fax machines, lacking security and efficiency (e.g. diagnostic lab results are sent to family physicians directly).
Privacy	Exposure of Personal Information	The main method of communication of patient information between healthcare providers is through fax machines which is not secure.
Information	Lack of Access to Information	Patients do not have access to their complete medical record and some healthcare providers do not keep a copy of patient consultations.
	Losing Information	A patient typically compiles fragmented pieces of their medical record through paper photocopies or paid images of diagnostic results such as x-rays. This method of record keeping makes it challenging for the patient to keep an accurate and consolidated record of their medical history.
	Out-dated Technology	A patient's current medical records is compiled through paper-based photocopies.
Repetition	Relaying Information, Repetitively	Patient is required to bring health card to every visit with healthcare providers.
		Patients is required to bring requisition forms to every diagnostic test.
		Patients often have to communicate their medical issues repetitively to multiple health care providers along their care journey because systems do not connect with one another.
	Repetitive Processes Due to Lack of Coordination	Healthcare providers have different systems to hold patient records that do not connect with each other. As a result, patients have to go through repetitive processes throughout their care journey (e.g. independent diagnostic labs have decentralized systems and do not recognize test results from other labs, often making patients repeat tests).
		Patients have to complete multiple paper-based forms throughout their healthcare journey.

Positive components of the current healthcare system should be taken into consideration and incorporated into the proposed solution where applicable because of their proven success in real world application. 63 of the 405 participant insights gathered from this first study were categorized as positive attributes and categorized within the aforementioned six main themes and 18 subthemes. See Table 3 for the compiled positive insights revealed through the first study.

Table 3

Positive Attributes Identified Based on the Six Themes Revealed through the First Study

Theme	Keywords	Positive Attributes
Communication	Efficiencies	Currently, some diagnostic laboratories allow patients to view their diagnostic tests online. Multiple participants expressed a positive service experience at diagnostic labs attributed to efficiency. Technology increases efficiency at select healthcare providers (e.g. sign in kiosks at walk-in clinic reduces wait times).
	Effective Communication	Addressing the lack of communication issue between healthcare providers and patients, multiple healthcare professional participants expressed direct and constant communication as important factors in establishing positive patient service experiences (e.g. continuous calling from administrator and updating patient of wait time remaining for appointment).
	Multiple Coordinated Channels/Network	Providing a paper-based copy of a patient's medical record if they are required to seek acute care treatment prior to their arrival to the hospital enables more efficient care and improved communication.
Information	Loss of Information	Select hospitals will send a patient's electronic medical record from emergency room visit to their family physician. All diagnostic test results are currently sent to your family physician directly.
Repetition	Support for Relaying Information Repetitively	Wristbands and hospital card containing select patient medical information has proven to provide a positive patient healthcare experience because patient does not have to repeat same information at multiple touchpoints.

Discussion.

The process of thematic analysis helped to amalgamate and categorize the data into six themes: communication, care, control, privacy, information and repetition. These insights provided a basis for developing a practical solution to improve the patient experience.

Communication. A lack of communication between healthcare providers and patients resulting from a disjointed paper-based health system and use of out-dated technology hinders the efficiency and quality of care. Both a patient and healthcare provider described their experiences:

> *'At the walk-in clinic they would have lots of paper files… everything was by hand. Nobody saved anything on their computer'*
> (Walk-in Clinic Patient (PC1), participant).

> *'It's helpful when some patients get copies of all their information, then it saves you all that time. If they come with it, amazing… loose pieces of paper that they photocopied themselves or somehow get a copy of'*
> (Anesthesiologist (HP6), participant).

A self-initiated, disjointed paper-based medical file does not equip patients with the information needed to access quality care in a timely manner. Patients need to have a comprehensive medical record to facilitate better communication with healthcare providers.

A patient's care journey consists of multiple touchpoints within the current decentralized healthcare system. This decentralized system results in numerous opportunities for miscommunication. A patient expressed frustration with the lack of integration:

> *'The doctor has everything digital. But the minute you go to another place, they have nothing and they have to start all over again. They ask you the same questions… there is no communication, no communication between anyone'*
> (Family Medical Clinic and Diagnostic Lab Patient (PC5), participant).

A critical care nurse commented:

> *'There's no comprehensive kind of access to what both the physicians do'*
> (Critical Care Nurse (HP1), participant).

Multiple participants recommended the integration of technology as a tool to facilitate better communication between patients and healthcare providers. One patient explained the frustrations encountered through multiple channels of miscommunication during their healthcare journey:

> *'If you just had digital access to any information we had and if somehow a doctor could go in the system and say, "Oh, you need an MRI on your hip", it will automatically pop up. You can do everything like a one stop shop. You go in, you make a visit, you immediately know what your next path is and the timelines and who you're going to be visiting and what you're going to be expecting'*
> (Family Medical Clinic and Diagnostic Lab Patient (PC5), participant).

In the current healthcare system, healthcare providers manage records using independent systems without interconnectivity. A patient's healthcare journey can include multiple healthcare providers, thereby increasing the chances for miscommunication.

Care. Long wait times for physician consultations in primary and acute care waiting rooms results in a poor patient experience. Multiple participants expressed their irritation with waiting long periods at healthcare facilities:

> *'At a walk-in clinic, you have to wait a long time. They give you a number and you have to be there really early in the morning. I was annoyed. I waited two hours just so they can give me the form. And then once they give you that form, I wait another hour. They then give you a number and you wait for your number to be called to see the doctor'*
> (Walk-in Clinic Patient (PC1), participant).

> *'The problem starts with emergency services. It's because of the long wait'*
> (Critical Care Nurse (HP1), participant).

Additionally, the long wait period for healthcare services was recognized by multiple participants as a pain point. Both a patient and healthcare provider acknowledge this issue:

> *'I think it was about a month when she had their first appointment available'*
> (Family Medical Clinic Patient (PC6), participant).

> *'I think that's pretty much the biggest challenge in healthcare for Canada. It's just the wait time. Especially if you want to get an appointment for a CT or MRI, you have to wait a couple of months'*
> (Medical Clinic Administrator (HP2), participant).

In addition to long wait times, participants also reported that the quality of care received by patients was negatively impacted owing to a reliance on out-dated communication technology and predominantly paper-based methods of record-keeping. Two healthcare

participants revealed the importance of having a comprehensive patient medical record to provide care:

> *'If a patient doesn't have all their papers and everything, then they have to come back or they would have to fax it'*
> (Long-term Care Nurse (HP4), participant).

> *'One of the main challenges is that you don't have it all. Then, you can't do a correct diagnosis without all the information'*
> (Anesthesiologist (HP6), participant).

The subthemes of 'out-dated technology' and 'long wait times' made up most of the participant insights with 18% (71 instances) and 10% (41 instances) respectively of the 405 total instances gathered from the first study. As a result, the two subthemes presented the greatest opportunity to intervene and improve the patient experience.

Control. In the current healthcare system, a patient's medical record is maintained through multiple healthcare providers using independent systems that lack interconnectivity. As a result, a patient has limited access and control of their own medical records. Both patients and healthcare providers expressed their frustration with a disjointed medical record:

> *'I need a copy to make my own file but they wouldn't give me a copy'*
> (Walk-in Clinic Patient (PC1), participant).

> *'They don't tell me. After this is all done, they'll be like, your results will be passed along to your doctor and she'll give you a call if anything happens. They don't really say when'*
> (Family Medical Clinic Patient (PC3), participant).

The self-directed compilation of a patient's own medical record predominantly through photocopies demonstrates that patients want to have an amalgamated medical record to improve their care experience. The reliance on intermediaries to access and maintain medical records in the current system results in a fragmented patient history. Solutions need to be explored to integrate records from multiple healthcare providers into an organized way for patients to access to improve their healthcare experience.

Privacy. The main method of communication between healthcare providers is predominantly via fax or telephone. Out-dated technology risks exposing a patient's personal medical information via insecure channels. This risk is multiplied by the reliance on multiple intermediaries to maintain a patient's medical record. While patient participants did not provide direct insights related to medical

record security, the insights revealed through the themes of communication, care and information present an opportunity to develop a solution that enables secure information transactions. The transfer of vital patient information between healthcare channels should be secure and seamless. An anesthesiologist explains the convoluted method to transcribe surgeon's notes through multiple channels:

> *'After the surgery, the surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor'*
> (Anesthesiologist (HP6), participant).

Information. The current healthcare system's reliance on out-dated technology such as fax and paper-based records often results in the loss or lack of information when a patient arrives for healthcare services. Multiple participants expressed frustration with the current paper-based healthcare system:

> *'Some hospitals are just still paper, which is absolutely horrible'*
> (Rehabilitation Nurse (HP5), participant).

> *'They fill all these forms and I'm sure they're annoyed that we don't have all this information'*
> (Anesthesiologist (HP6), participant).

> *'Sometimes people will ask about their bloodwork results and we will give them a paper copy'*
> (Family Medical Physician (HP3), participant).

> *'I lost those papers. Who is going to keep papers?'*
> (Walk-in Clinic Patient (PC1), participant).

> *'You have pages you have to fill out, all the paper forms and the forms were really hard for me because I'm new to this country'*
> (Walk-in Clinic Patient (PC2), participant).

The integration of technology can transform healthcare into a paper-less system and alleviate patient frustrations with maintaining paper copies.

Repetition. As reflected in the 62 instances expressed by participants, the repetitive delivery of information and performing of processes was one of the main concerns. Participants expressed their annoyance and discomfort with having to repeat the same information at multiple healthcare visits:

> *'A walk-in clinic, it does feel kind of uncomfortable because this person doesn't know your history. You have to go through the process of explaining everything and what you need to get done'*
> (Family Medical Clinic Patient (PC3), participant).

> *'I went through it all over again. I went back to the same clinic and did the same paper work because they didn't have any records like the forms and insurance, so I had to do all the process from stage one'*
> (Walk-in Clinic Patient (PC1), participant).

A participant expressed their frustration with repetitive phone calls:

> *'It was super, super, super, super frustrating because I had to call them at least seven times'*
> (Walk-in Clinic Patient (PC1), participant).

One participant revealed their journey included multiple phone calls and repetitive diagnostic tests resulting from a lack of integration within the healthcare system:

> *'There are a lot of phone calls… to confirm—will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare anyone because we were misled'*
> (Family Medical Clinic and Diagnostic Lab Patient (PC5), participant).

Main Findings from the First Study. The sessions with healthcare providers provided invaluable insights into the current workings of the healthcare system. The main findings from this study include:

1. Frustration with repetitive processes;
2. Miscommunication between patients and healthcare providers;
3. Outdated technology impacting the quality of care;
4. Inefficiencies due to lack of information at time of care delivery; and,
5. Irritation due to long wait times.

The dependence on out-dated technology (fax, phone systems and paper-based communications) to transfer patient information between healthcare providers is alarming. Limited patient access to personal medical records is also concerning. Moving forward, making processes that are currently paper-based such as forms and digitally accessible diagnostic results is recommended. Additionally, providing a consolidated patient medical history, available to both healthcare providers and patients is recommended. The need for patients to convey their information repeatedly across multiple healthcare providers will be minimized thus alleviating patient frustration. The first study was successful in gathering a holistic view of the overall healthcare system and the specific pain points,

confirming the relevance of this thesis work and the urgency to develop solutions to improve the patient experience.

Limitations. This study had some limitations. Six clinicians representing acute care, primary care and secondary care were recruited for this study. While the small sample size of 12 participants garnered rich insights about the current healthcare system, increasing the participant pool and including a more diverse group of healthcare providers and patients is recommended for future research.

Creation & Reflection

The creation phase of this service design framework consisted of translating insights garnered from the exploration phase to develop tangible solutions. Stickdorn and Schneider (2011) suggest, 'One of the main features of service design thinking is that this approach is not about avoiding mistakes, but rather about exploring as many mistakes as possible' (p.130). Preliminary ideas were quickly produced to address the identified pain points and in-depth insights generated in the exploration phase. This phase focused on idea generation as opposed to well-thought out solutions. Stickdorn's (2011) five principles of service design thinking guided the development of potential solutions:

1. User-Centered: Services should be experienced through the patient's eyes;
2. Co-Creative: All stakeholders should be included in the service design process;
3. Sequencing: The service should be visualized as a sequence of interrelated actions;
4. Evidencing: Intangible services should be visualised as physical artefacts; and,
5. Holistic: The entire environment of a service should be considered.

Following the five principles, potential solutions focused on the whole touchpoint sequence of a patient's journey.

Servicescape

Defined as a series of visualizations capturing the processes, channels and touchpoints of a service (Stickdorn, et al., 2018b), a 'servicescape' is a service design tool used to gain a holistic perspective of a service. A servicescape including journey maps (12 co-created with users) and service blueprints (collected from external sources) were used to inform the development of solutions to improve the patient experience.

Co-Created Journey Maps.

Journey maps are a human-centered tool to help visualize the service experience over time by identifying gaps in user experiences (Stickdorn, et al., 2018a). The series of 12 co-created journey maps uncovered a large amount of insights regarding the current state of healthcare. Co-design sessions with both patients (Figure 15) and healthcare providers (Figure 16) provided insights from differing perspectives to ensure solutions considered multiple stakeholder input.

Figure 15

A Journey Map of a Patient's Primary Care Journey

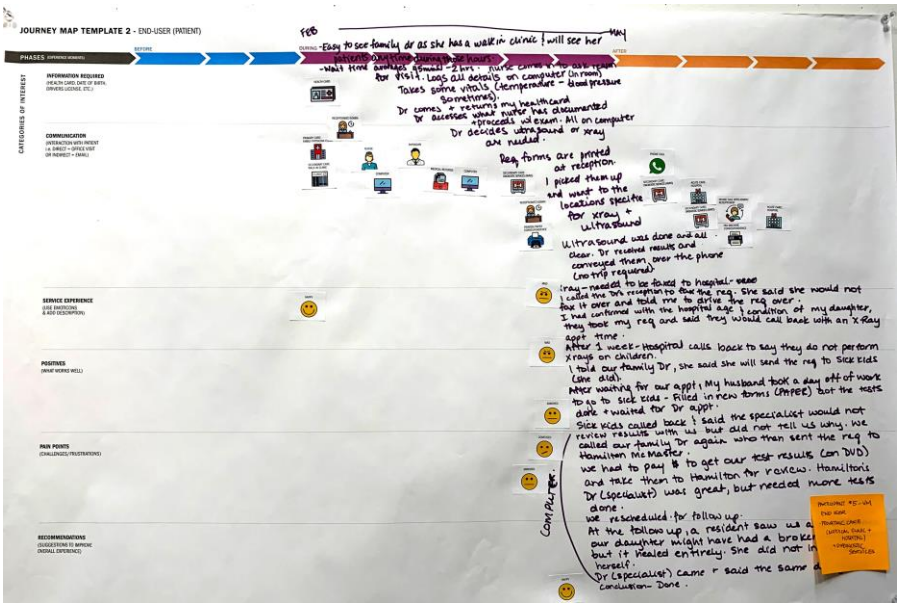


Figure 16

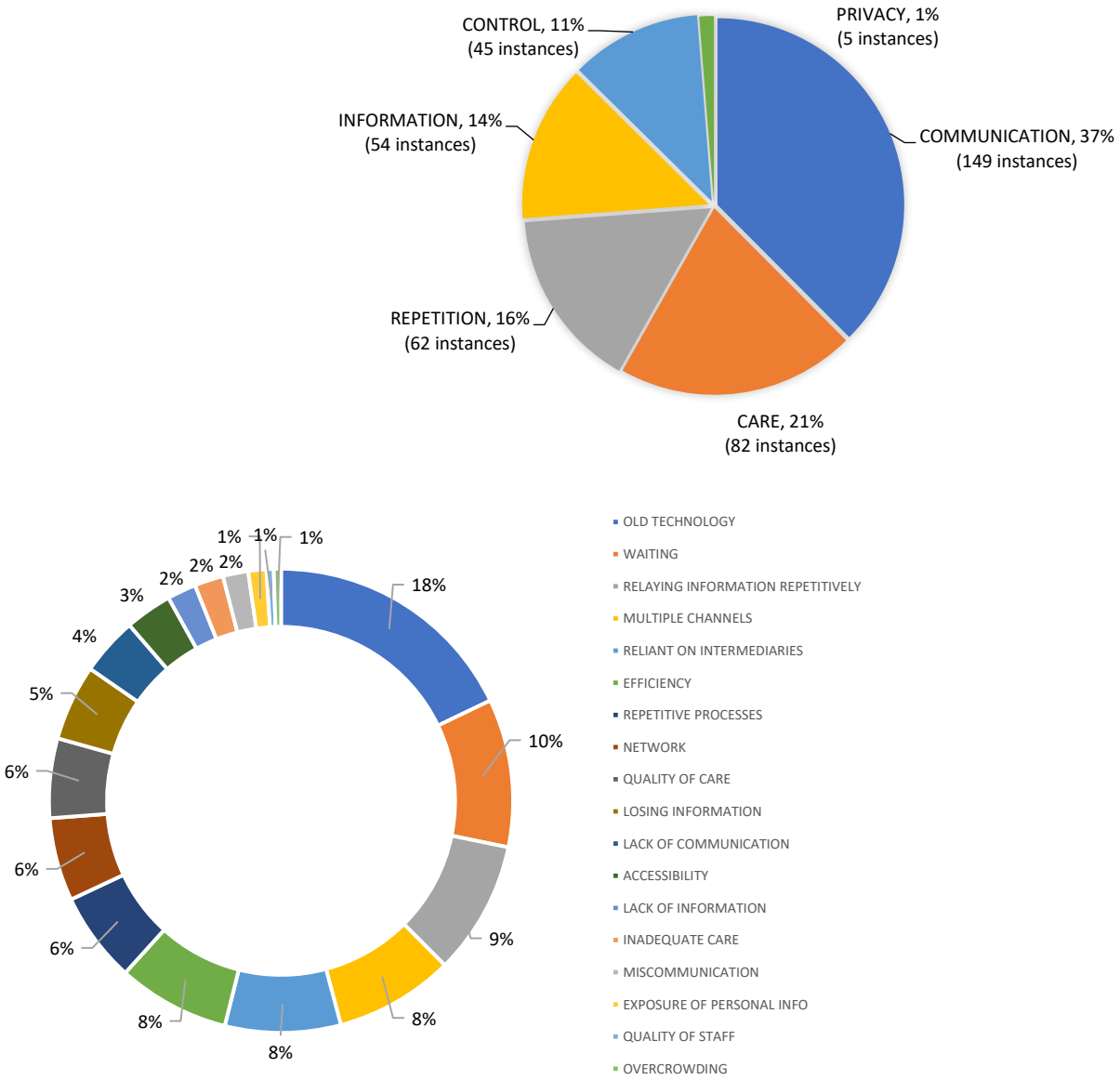
A Journey Map of a Rehabilitation Nurse's Experience

Data Visualizations.

Data visualizations (Figure 17) were created from the research collected from the first study. The data needed to be presented in an organized form to enable the efficient retrieval of key pain points. By visualizing key information from the data collected, common pain points were easily identified. This enabled the researcher to produce quick ideas in response to user pain points. It also allowed the researcher to evaluate commonalities when deciding whether to refine or discard user identified pain points.

Figure 17

Data Visualizations of Research Collected from First Study



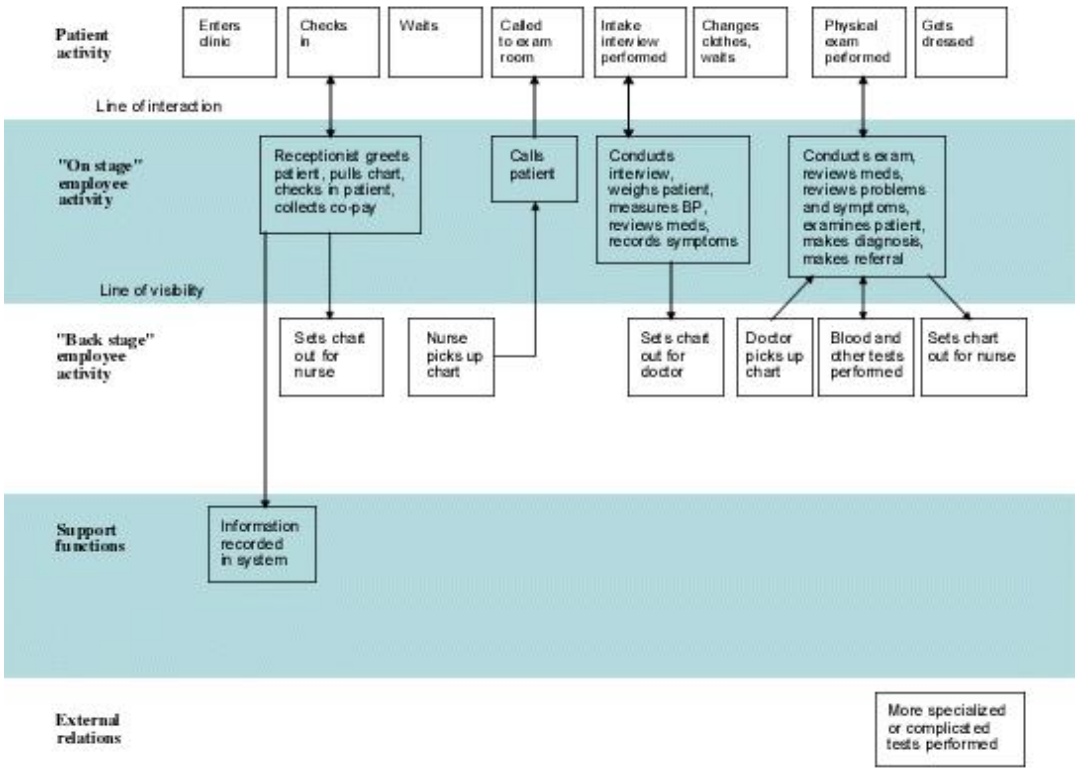
Service Blueprints.

Service blueprints are used to visualize the relationships and dependencies between the 'frontstage' and 'backstage' processes of a service (Stickdorn et al., 2018a). Capturing both the actors and processes with which a user has direct contact and those which are invisible to the user, service blueprints were collected to gain a comprehensive understanding. Service blueprints touched on: primary care, acute care and secondary care.

Primary Care. As defined in the first study, primary care includes patient visits to their family medical clinic for a non-emergency medical issue. Figure 18 shows the service blueprint of a patient's typical visit to a family physician.

Figure 18

Service Blueprint of a Patient's Visit to a Family Physician

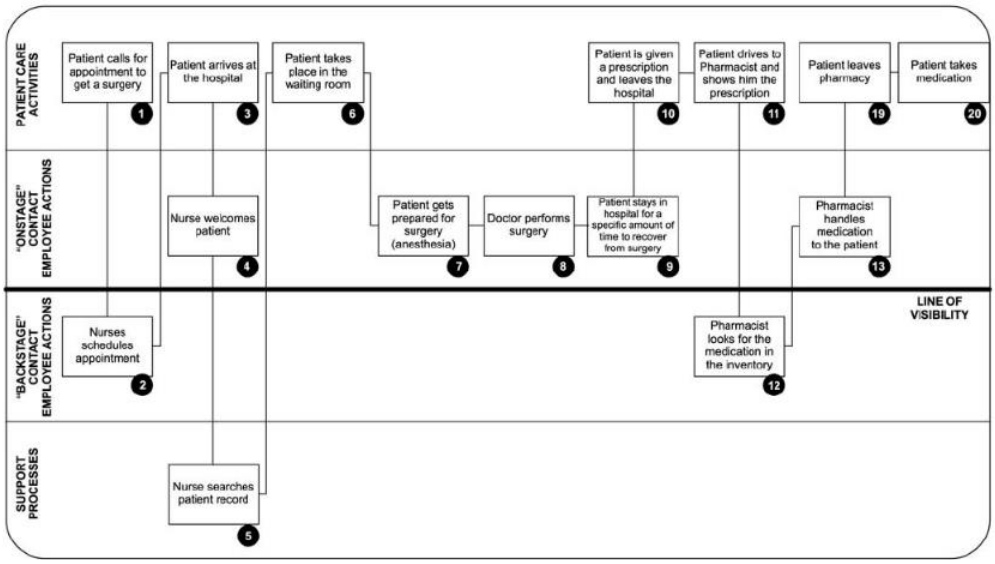


Note. Reprinted from 'Improve Quality by Understanding Your Care Process', by Pol, L., Rodie, A. & Crabtree, B. 1999, June 6. Retrieved from https://www.aafp.org/fpm/1999/0600/p45.html

Acute Care. Acute care includes patient visits to the emergency ward at hospitals for a urgent medical issue. Figure 19 shows the service blueprint of a patient's typical visit to the hospital emergency ward.

Figure 19

Service Blueprint of Patient's Hospital Emergency Ward Visit

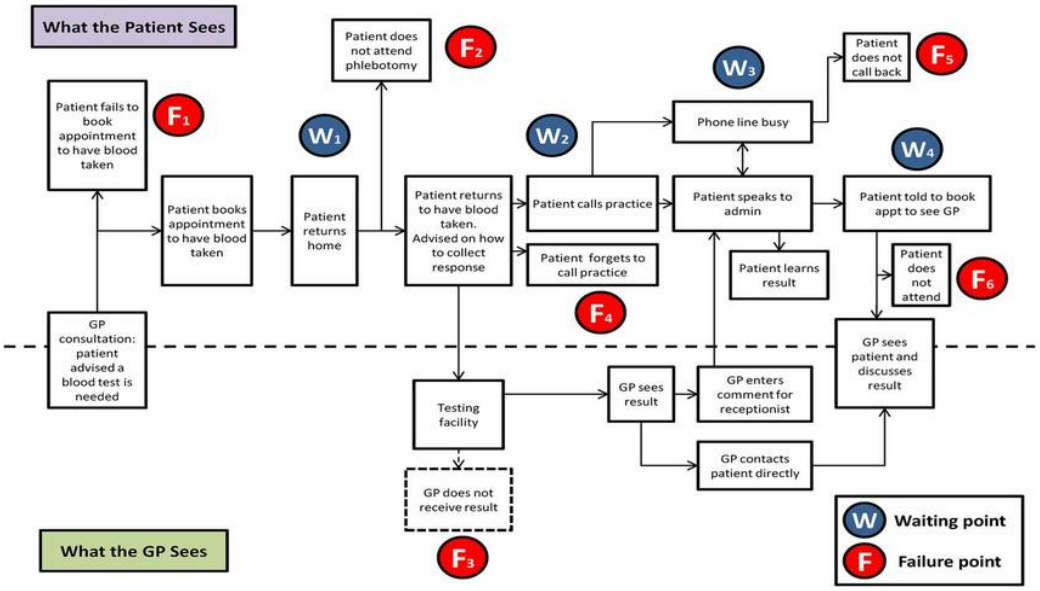


Note. Reprinted from 'Eliminating US Hospital Medical Errors', by Kumar, S. & Steinebach, M. 2008. Retrieved from https://www.researchgate.net/publication/23252508_Eliminating_US_Hospital_Medical_Errors

Secondary Care. A patient's visit to diagnostic laboratories define secondary care procedures for the purpose of this thesis. Figure 20 shows the service blueprint of a patient's visit to diagnostic laboratories for diagnostic tests.

Figure 20

Service Blueprint of Patient's Diagnostic Laboratory Visit



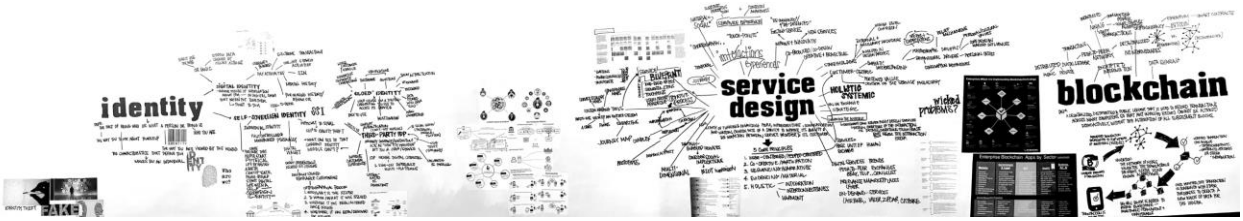
Note. Reprinted from 'Routine Failures in the Process for Blood Testing and the Communication of Results to Patients in Primary Care in the UK: A Qualitative Exploration of Patient and Provider Perspectives', Litchfield, et al. 2015. Retrieved from https://www.researchgate.net/figure/Figure2-Service-blueprint-for-diagnostic-blood-test-communication-in-primary-care_fig2_280910727

Mindmap.

Mind-mapping is an ideation technique used to stimulate idea generation (Stickdorn & Schneider, 2011). By visually mapping out the main features of the two main areas of interest in this thesis, the researcher was able to find intersections between service design and blockchain technology (Figure 21).

Figure 21

Mindmap Investigating the Connections Between Service Design and Blockchain Technology



Main connections linking service design (Figure 22) and blockchain technology (Figure 23) extracted from the mindmap include:

- Blockchain technology enables the secure sharing of information throughout a user's service experience;
- Services should be visualized as a series of interrelated actions and blockchain technology provides a transparent account of all user transactions; and,
- Blockchain technology gives users control of their information.

'Identity' emerged as a re-occurring theme, thus 'identity' was added to the mindmap to investigate how service design and blockchain technology contribute to the definition of identity (Figure 24).

Figure 22

Mindmap Investigating Service Design Concepts

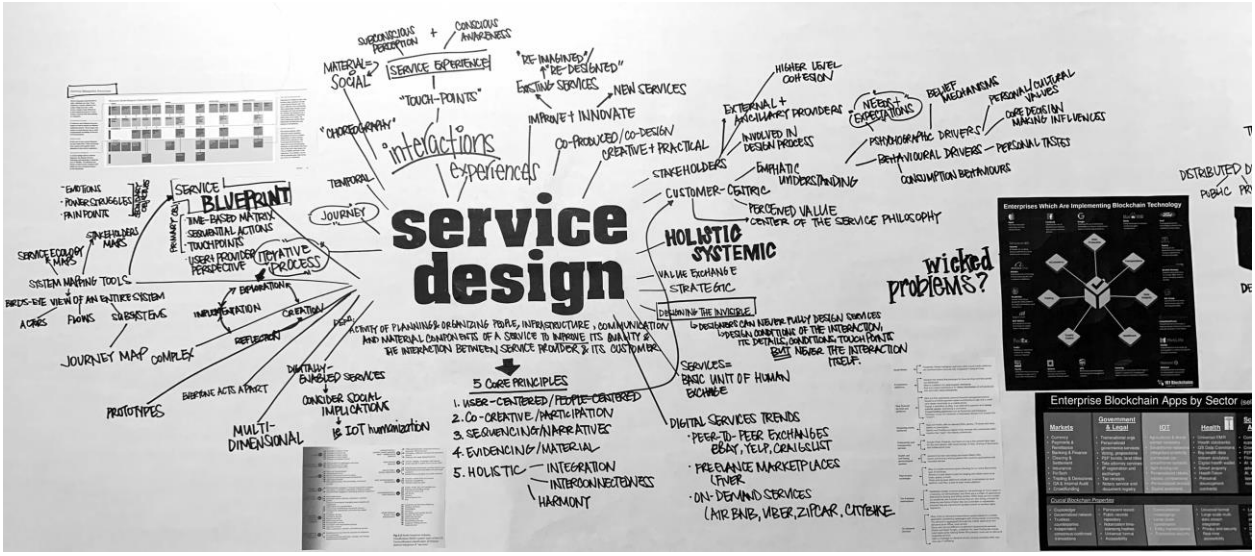


Figure 23

Mindmap Investigating Blockchain Concepts

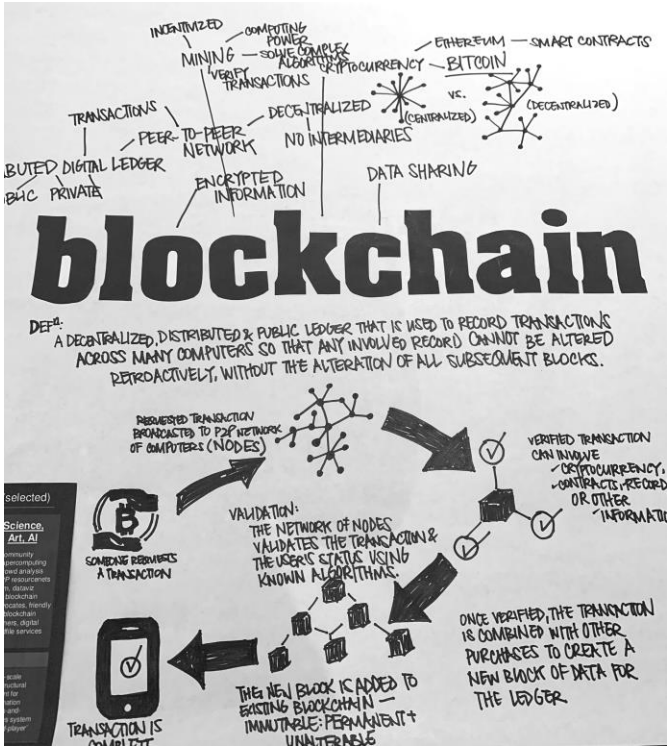
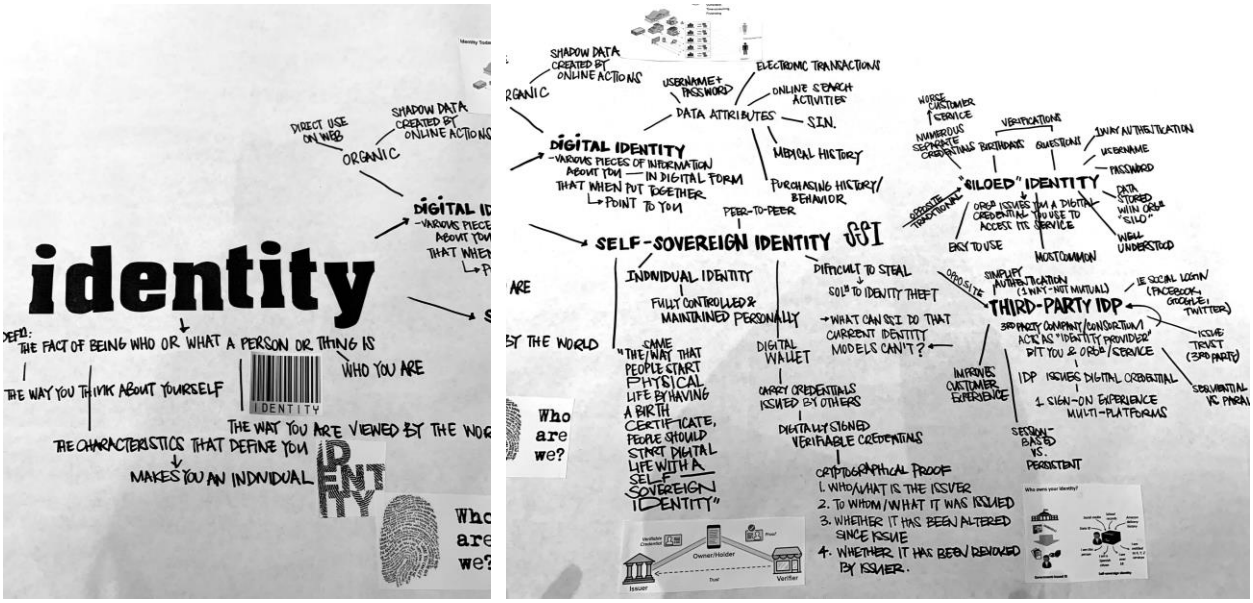


Figure 24

The Theme of 'identity' Explored in a Mindmap Connecting to Service Design and Blockchain Technology



Using mindmapping to seek connections between service design, blockchain technology and identity led the researcher to identify a patient's medical identity as the link to connect all three concepts. A patient's medical 'identity' is represented by their medical record. Literature revealed the urgency to develop solutions to integrate a patient's medical record that is currently fragmented across a network of multiple healthcare providers. A servicescape that visualized patients' and healthcare providers' existing pain points identified intervention points for service design to improve patient experience. The trend towards patient-centered care puts an emphasis on patients taking control of their own healthcare journey. Based on a series of explorations, the ideal solution that emerged from the requisite requirements is a *digital patient identity*.

Prototype

The six themes revealed in the exploration phase formed the basis for the investigation of design solutions in the creation phase. The process of mindmapping led to the design of a digital patient identity solution. The reflection phase focused on the development of an interface in the form of a digital application. Four main factors guided the design of a prototype: technological requirements, usability, language and aesthetics.

Technological Requirements

During the first study, 71 instances revealed out-dated technology to be a major theme. Thus, it became the most important consideration driving the design investigation. This was aptly summed up by a critical care nurse (HP1) who commented, 'We have moved so much digital, why are we waiting and not doing this?' Service design methods consider both the visible and invisible components of a system. Technology allows the transformation of interactions that are analog (visible) into the digital equivalent (invisible). A visual interface is required to make the performance of interactions possible. The goal was to design an improved patient experience facilitated by technology.

The Apple iOS platform was chosen as the operating system for the application based on the researcher's experience and expertise. The Apple iOS Human Interface Guidelines (Apple Developer, 2020) was referenced throughout each stage of the design process. Recommended iOS guidelines include:

- Subtle use of colour and avoid using the same color for interactive and noninteractive elements;
- Use of familiar and understandable words and phrases;
- Keep interface text clear and concise;
- Minimize the number of typefaces used in your interface; and,
- Keep icons consistent in terms of level of detail, optical weight, stroke weight, position and perspective.

Usability

System Requirements. Analysis of each participant's journey map revealed the common touchpoints of a patient's journey:

1. Before Care, for example, scheduling healthcare visits;
2. During Care, for example, on-site consultations with healthcare providers and conducting diagnostic tests at laboratories or hospitals; and,
3. After Care, for example, scheduling of follow up visits.

The system-user interaction requirements of the digital application were defined based on the above touchpoints. These included:

1. The requirements (actions of the system);
2. The content (objects needed to visualize each system action); and,
3. The interface function enabling each action. See Table 4 for example of the system requirement for scheduling a healthcare appointment. See Appendix F (pp.123–124) for the complete list of requirements defined for the application system.

Table 4

An Example of the System Requirement for Scheduling a Healthcare Appointment

Touchpoint	Requirement [actions]	Content [objects]	Function [functions]
SCHEDULING	1.0 The system needs to provide scheduling options for patients visiting healthcare providers	• Date • Time • Healthcare providers include: a. Family Medical Clinic b. Walk-in Clinic c. Diagnostic Labs d. Specialists e. Hospitals	• A calendar that provides access to select date and time for appointment • Shows only times available • A confirmation email to be sent to both healthcare provider and patient • Option to add appointment to user's calendar and healthcare provider calendar *(NOTE: Data can be populated from the Ontario healthcare directory listing contact for all hospitals, labs, medical clinics – for pilot study can start with onboarding GTA healthcare providers)*

Use Cases. Following the mapping of the system requirements, ten text-based use cases were developed focusing on the user-system interactions from the user's perspective. Each use case was composed based on real world situations in which a user would use the application within their healthcare journey. Based on the application's four core functions: scheduling, arrival, history and update, use cases were designed to address the pain points revealed by the six themes from the exploration phase. See Appendix G (pp.112–119) for full description of ten text-based use cases. For instance, due to the current disjointed healthcare system, patients and healthcare providers both stressed that inefficiency in scheduling appointments coupled with extensive wait times resulted in negative patient service experiences. In response, use case 1.0 addresses this issue. The proposed application provides walk-in clinic patients with an ease in scheduling and editing walk-in clinic appointments via minimal steps. See Table 5 for example of a text-based use case to schedule an appointment at a walk-in clinic.

Table 5

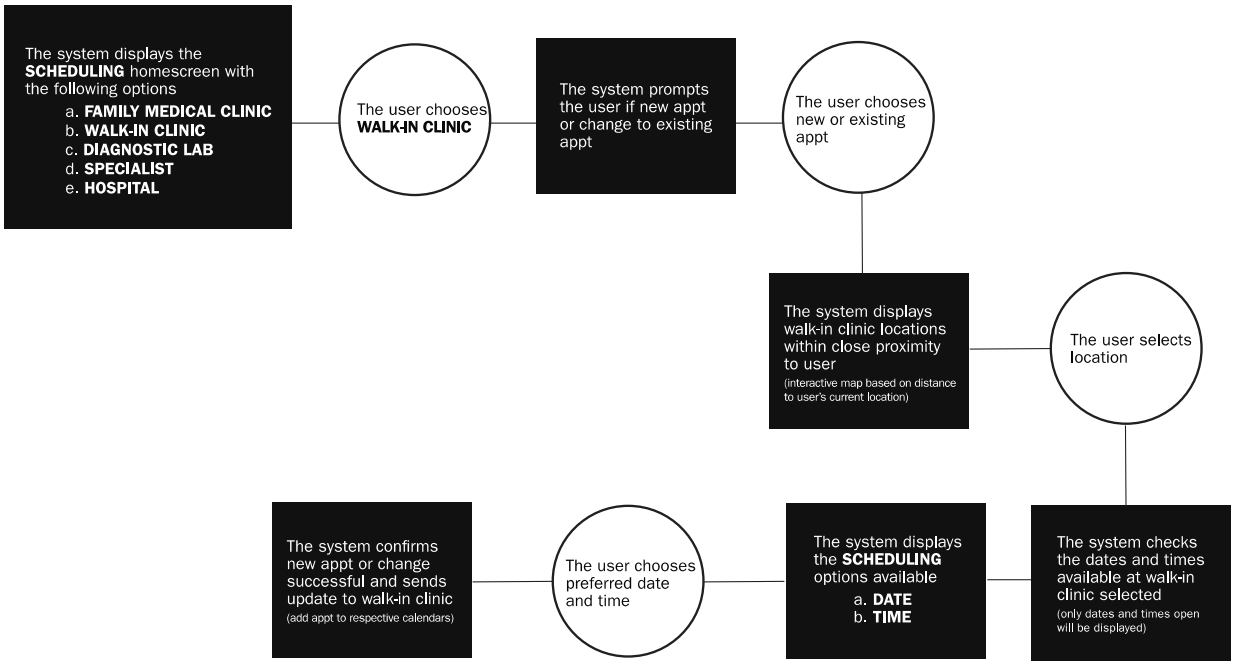
An Example of a Text-Based Use Case to Schedule an Appointment at a Walk-In Clinic

Touchpoint	Use Case	User and System Actions
SCHEDULING	Schedule an appointment at a walk-in clinic. Imagine you need to visit a walk-in clinic for a minor health issue. Instead of having to go to the walk-in clinic and wait for more than two hours, you can choose your preferred location. You can proceed to the walk-in clinic closer to your estimated appointment time, minimizing your wait time at the clinic. Let's go through the app and see how you can do this.	1.1 | The system prompts user to login to app. 1.2 | The user enters their user name (PUBLIC KEY) and password (PRIVATE KEY) and chooses option to log in to app. 1.3 | The system prompts the user to select profile to access: Jane, Peter, Chelsea, Luke, Janice 1.4 | The user selects Jane. 1.5 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.6 | The user selects Schedule. 1.7 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital or View All Appointments 1.8 | The user selects Walk-In Clinic. 1.9 | The system checks database to display map with Walk-In Clinics near user populated by Google Maps using user's current location. 1.10 | The system displays each location's estimated wait time. 1.11 | The user selects Eglinton Station Medical Centre. 1.12 | The system displays options for user to call Walk-in Clinic selected or to proceed to check-in. 1.13 | The user selects Check-In. 1.14 | The system prompts user to give permission for identiCHAIN to send health card information to walk-in clinic through pop-up. 1.15| The user selects Yes, I give permission. 1.16 | The system displays confirmation message with estimated wait time. 1.17 | The system updates Walk-In Clinic's calendar with user's new appointment adding the user to the queue of patients for the day.

Flow Diagrams. The translation of the use cases into the structure of the application required the creation of a flow diagrams (Figure 25) to map out the complex system actions and user responses for each use case. See Appendix H (pp.120–127) for all ten flow diagrams.

Figure 25

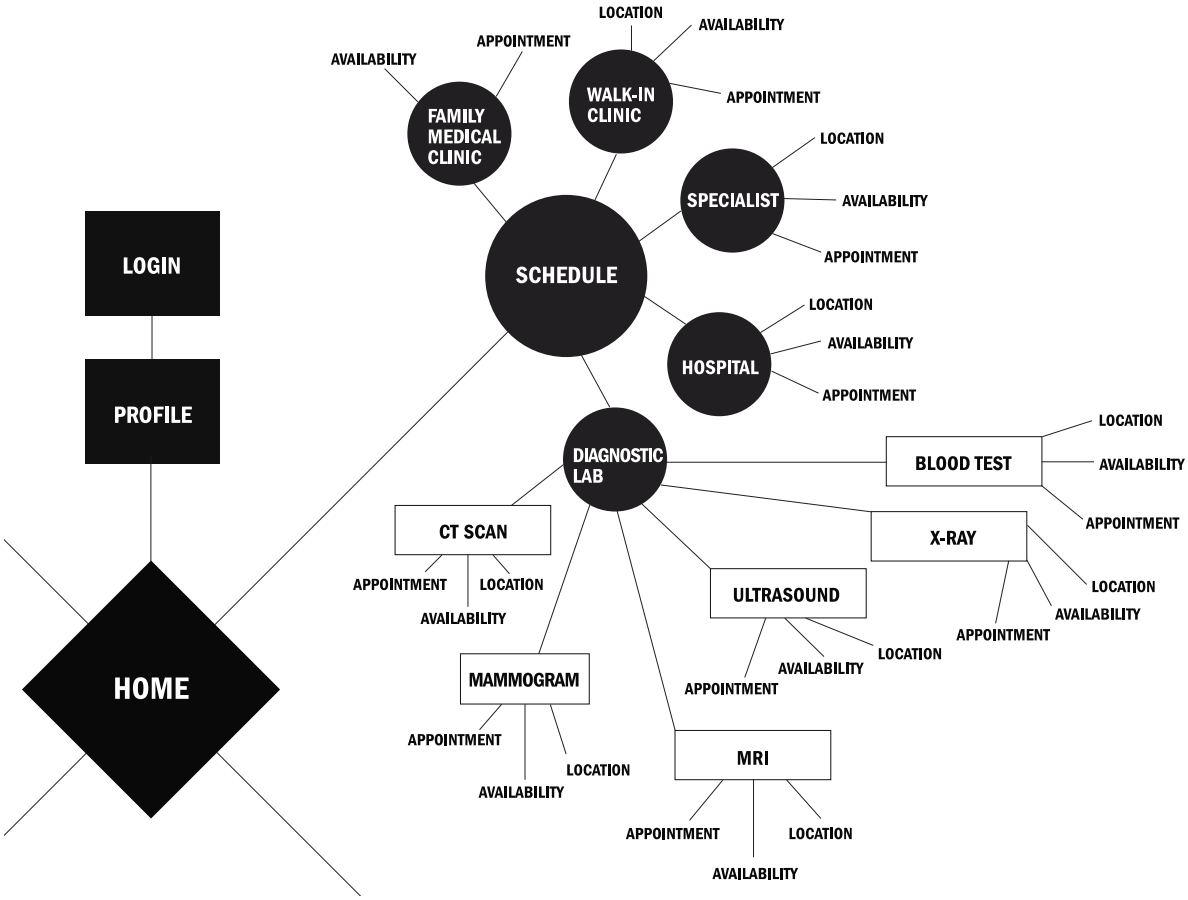
A Flow Diagram Depicting User-System Actions When Scheduling an Appointment with a Walk-in Clinic



System Map. Following the development of the use cases and corresponding flow diagrams, a system map was created to understand the overall structure of the system (Figure 26). The system map provided the basis for the visual design of the application. See Appendix I (p.128) for complete system map.

Figure 26

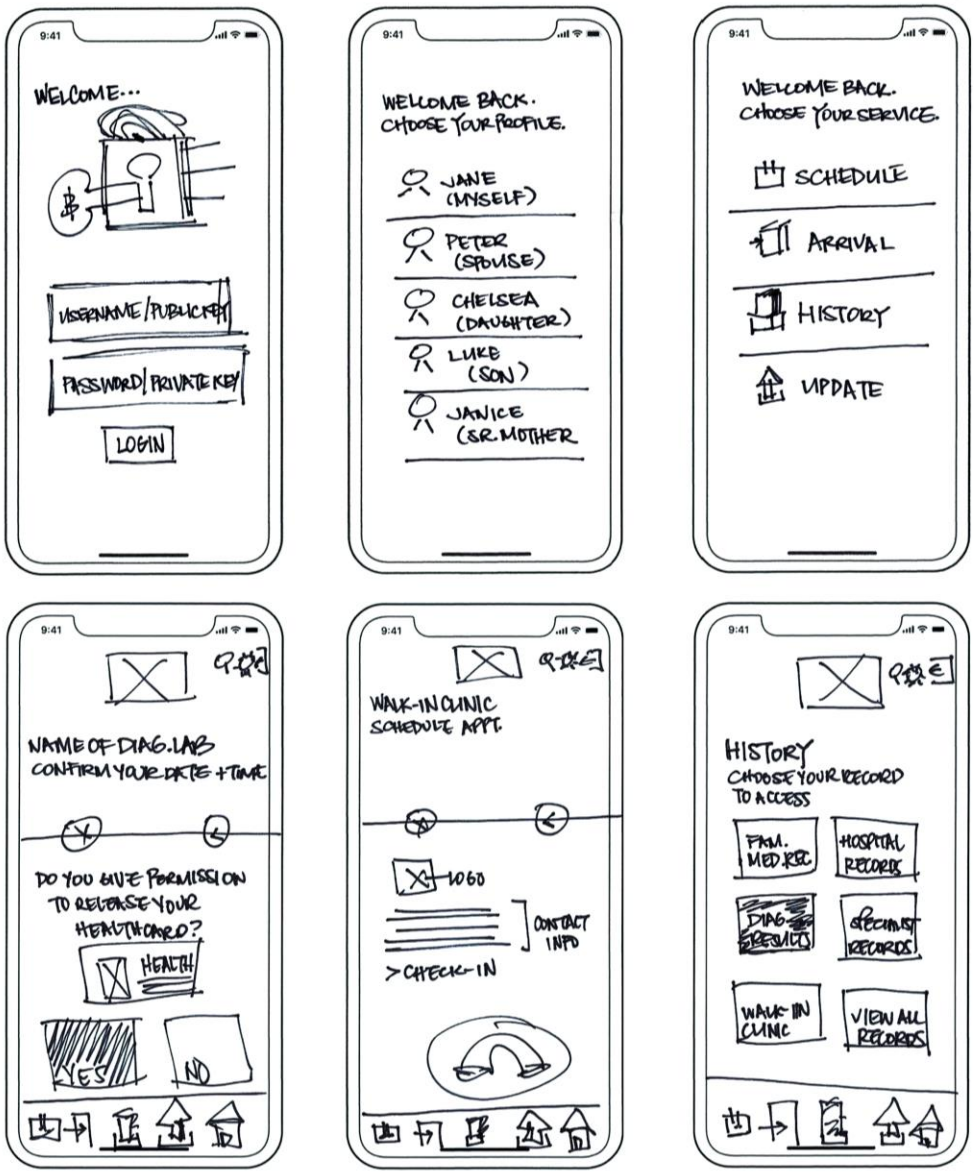
A Partial System Map Showing the Application's 'Scheduling' function



Wireframes. Visualizing user-system interactions at the onset of the design process served as an invaluable tool in determining the navigation flow of the application. The wireframe design process helped determine what individual screens were necessary for a high-fidelity prototype that might simulate real-world usage (Figure 27). The wireframes were integral to determine the necessary content and functionality for each screen before embarking on the visual design of the application's interface.

Figure 27

Sample of Wireframes Used to Determine Overall Functionality of the Application Prototype



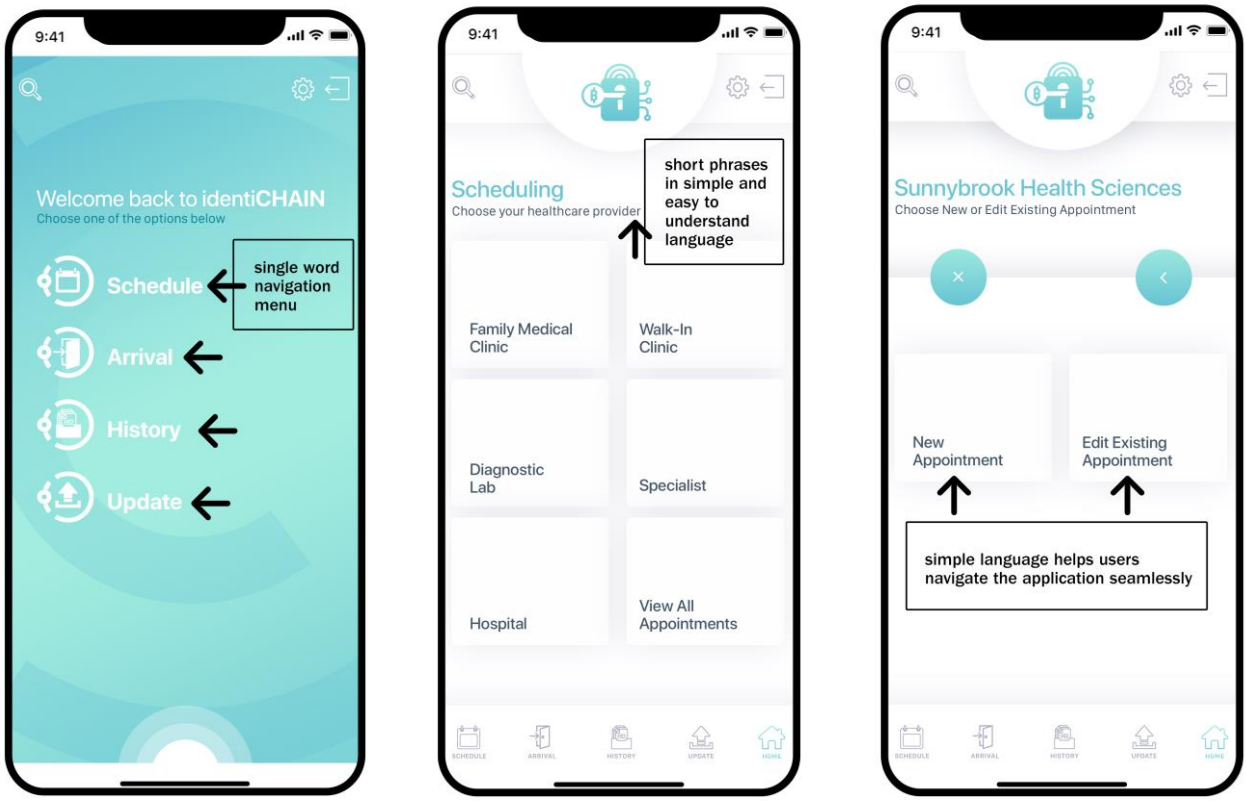
Language

Research results revealed frustration with the use of medical terms during patient healthcare experiences. In one session, a participant (PC1) expressed their recent negative service experience at a walk-in clinic as a result of a lack of understanding the medical vocabulary used on required paperwork, 'Because of the language barrier—doctor terms or hospital terms—they are terms that I do not know. It was super frustrating.' A similar pain point was echoed by another patient participant (PC2), 'It's about the medical and the medicine terms, it's not everyday English.' Therefore, it was

deemed essential to use clear, simple and easy to understand language to reduce instances of miscommunication and confusion.

Following the iOS defined language guidelines, the application utilizes single words for the main navigation menu (Figure 28): schedule, arrival, history and update. These four main menu items capture the patient's actions in the three main touchpoints of the patient healthcare journey: before, during and aftercare. The use of single words or short phrases ensures information is conveyed in a clear and concise manner. As recommended by the iOS guidelines, 'use what you know about your audience to determine whether certain words or phrases are appropriate' (Apple Developer, 2020). Using simple language helps users navigate the application seamlessly.

Figure 28
Examples of Clear Language Applied Within the Application Prototype



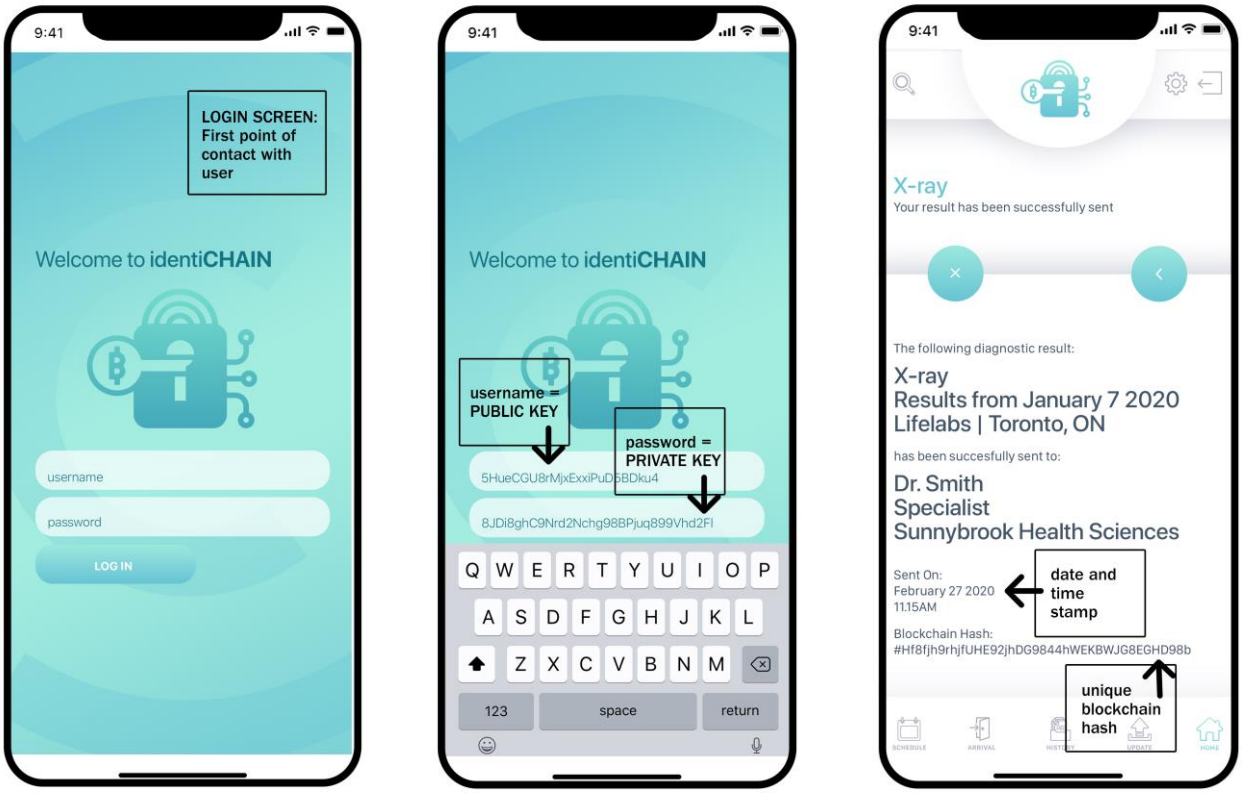
Visualizing blockchain benefits. Blockchain was selected as the technology to power the components of the application. It is the integration of blockchain technology that makes this application innovative when compared with current healthcare applications. Electronic medical

records are currently stored in centralized databases vulnerable to cybersecurity complications including hacking and data infringements. Blockchain is decentralized. It requires numerous public and private key pairs to access individual records. Systems that have employed blockchain technology have not been hacked to date, making it invaluable to store medical records. Blockchain technology will exist as the underlying structure for the application, invisible to users. At the same time, it was necessary to investigate how to visually convey the secure nature of blockchain technology to users. The use of text-based terms would be a key approach to present a visual form of what is otherwise invisible technology. A list of blockchain benefits include security, immutability, transparency, verifiability, control, convenience and efficiency. These security features were demonstrated through language by visually showing a unique alphanumeric sequence at the confirmation screens of each completed task. This display of applied blockchain technology assigns a unique alphanumeric sequence or a hash to each verified and completed transaction once it has been added to the chain. Blockchain technology also adds a date and time stamp for all verified transactions. The confirmation screens of the application, titled identiCHAIN, convey this information to reinforce the secure benefits of the technology (Figure 29).

The first point of contact with the user of identiCHAIN is the login screen (Figure 29). This screen presented an opportunity to introduce the secure technology by using blockchain terminology. Similar to login processes with other platforms, user verification occurs by entering a "public key" (username) and a "private key" (password). The terms 'username' and 'password' were used on the login screen in lieu of 'public' and 'private key' to avoid confusing the user with new terminology. The interviewer verbally explained to participants 'public key' represents 'username' and 'public key' represents 'password'. The 'public' and 'private key' are two distinct alphanumeric sequences comprised of up to 256 characters given to blockchain users to verify their identity. The combination of inputting a patient's unique public and private key sequences demonstrates to users the security of blockchain technology reflective in its complexity and inability to be hacked. When designing the login screen for the prototype, the inputting of the public and private key manually was simulated to give users the sense of using this login method to gauge if the participant was comfortable with the security benefits of the application (Figure 29).

Figure 29

Blockchain Visualizations through Language on the Application's Login and Confirmation Screens



Aesthetics and Visual Design

The aesthetics of the application adhered to the design principles distinguishing iOS platforms: aesthetic integrity, consistency, feedback, metaphors and user control (Apple Developer, 2020).

Visual concept. The mindmap produced in the creation phase of this framework served as the inspiration for the design of the application interface. When initially investigating connections in literature between the core concepts of this thesis, service design and blockchain technology, 'identity' emerged as a reoccurring theme. Possible names explored for the application included: onCHAIN, medCHAIN, blockID, idBlock and medBLOCK. The selected name 'identiCHAIN' (Figure 30) signifies placement of one's medical identity on the blockchain. The logo depicting a lock represents the security aspect of blockchain technology for storing a patient's medical record (Figure 31). The key represents the user's ability to control intermediary access to their medical identity, drawing parallels to a house key securing your home. By using identiCHAIN to manage the components of one's own medical information, a patient can unlock their medical information at their discretion.

The top of the lock is composed of lines representing a user's thumbprint, a signifier of the patient's medical identity. The lines emerging from the right of the lock represent the various components comprising a patient's medical identity such as physician medical records and diagnostic test results.

iOS guidelines suggest providing 'enough branding to give people context in your app, but not so much that it becomes a distraction' (Apple Developer, 2020). Effective application design is easy to navigate, easy to use and focuses on content. The visual interface design should not distract the user from the content of the application. iOS guidelines suggest 'applications that help people perform a serious task can keep them focused by using subtle, unobtrusive graphics, standard controls, and predictable behaviors (Apple Developer, 2020). Following these iOS branding guidelines, the logo was subtly integrated into the interface using a darker colour scheme compared to the background. Further, colour and typographic choices adhered to the same aesthetic integrity to ensure branding did not interfere with the user experience.

Figure 30
identiCHAIN Name Origins

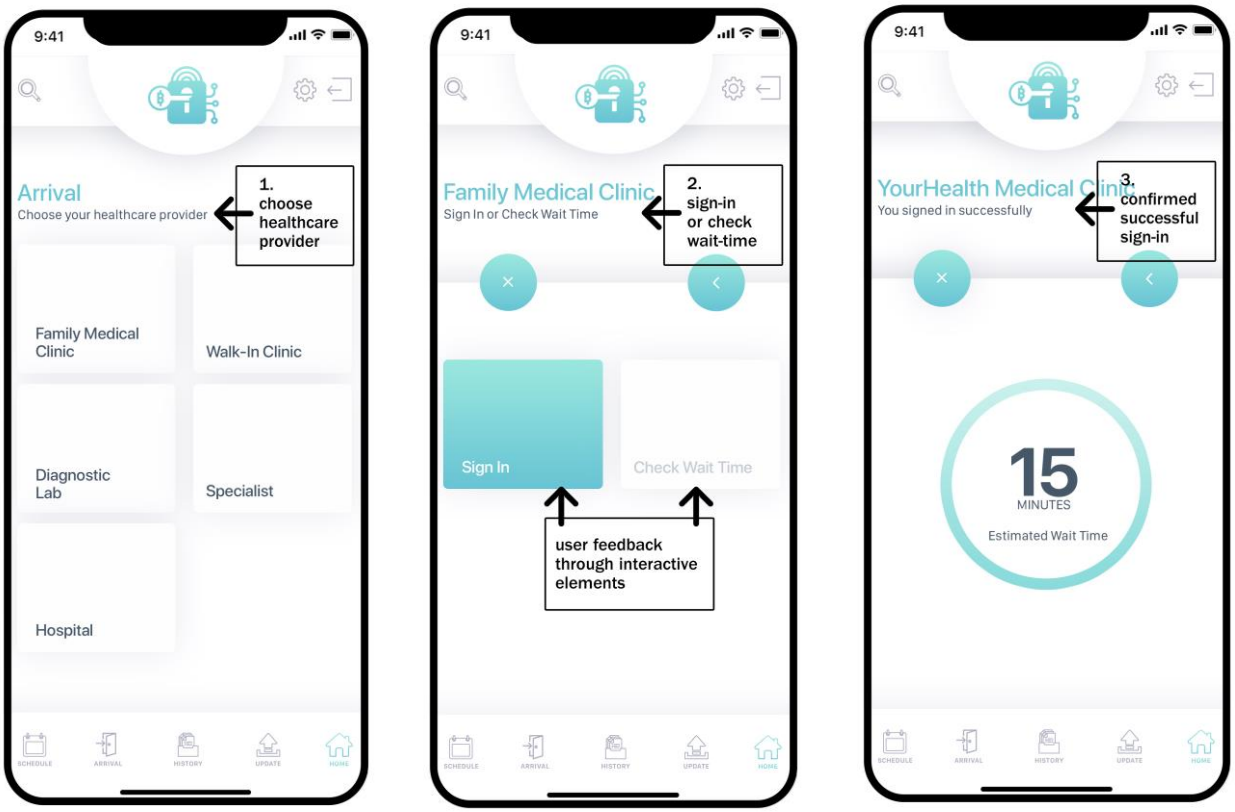
identiCHAIN

Figure 31
identiCHAIN logo

Colours. The recommended iOS guidelines define clarity as 'a sharpened focus on functionality motivating the design and negative space, color, fonts, graphics, and interface elements subtly highlighting important content and conveying interactivity' (Apple Developer, 2020). Green (#137584) was chosen as the dominant colour used throughout the application. It is used to emphasize the main elements of each screen, including the logo, the main headers and main interactive items such as, the 'close' and 'back' buttons and the 'sign in' button (Figure 32). Subtle gradations incorporated into the background, main heading text and interactive items created a sense of depth positioning the essential information in the foreground. Main headings on each screen along with secondary text links used the same green colour consistently through the application for user action items. As a result, a user's navigation path through the application is clearly distinguished by keeping interactive elements familiar and predictable (Figure 32). iOS guidelines suggest avoid using the same colour for interactive and noninteractive elements ensuring

users know where to tap (Apple Developer, 2020). Additionally, providing feedback to users by highlighting interactive elements to keep users informed is recommended to help clarify the results of actions (Apple Developer, 2020). In the application, once a user completes an action such as 'Sign In', the green button will become grey and the next action step will be highlighted in green such as 'Check Wait Time', indicating the completion of one action to trigger another (Figure 32). A secondary dark blue colour (#445568) was chosen to complement the green and used for the static body content of each screen.

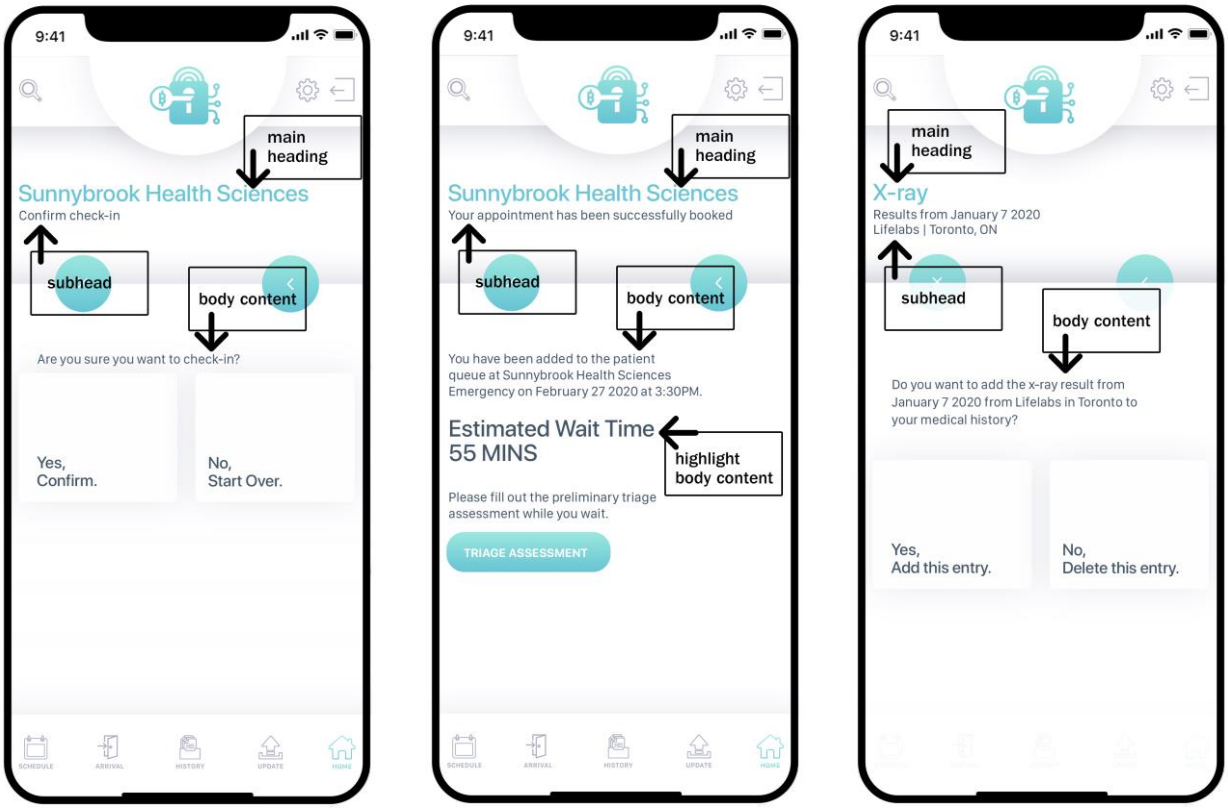
Figure 32
Navigation Path for User to Sign-In at Family Medical Clinic



Typography. Designed to match the visual clarity of the iOS user interface, the Apple system font, San Francisco (SF) was chosen for this app. iOS guidelines recommend the use of SF for applications because 'the flexibility of system fonts helps achieve optimal legibility at every point size and gives you the breadth and depth you need for precision typesetting throughout your app' (Apple Developer, 2020). The application uses main levels of typographic hierarchy on each screen including: main heading (title of the screen), subhead (specific user action required for each screen)

and body content (supplementary content on the screen) (Figure 33). Typographic contrast through the use of multiple weights, sizes and styles of the SF typeface provided the flexibility needed for visualizing the multiple levels of information while maintaining a consistent look and feel throughout the application. Since the emphasis of the application is digital usage, the high level of hinting embedded in the use of an OS typeface helps retain the fonts legibility, even at very small point sizes.

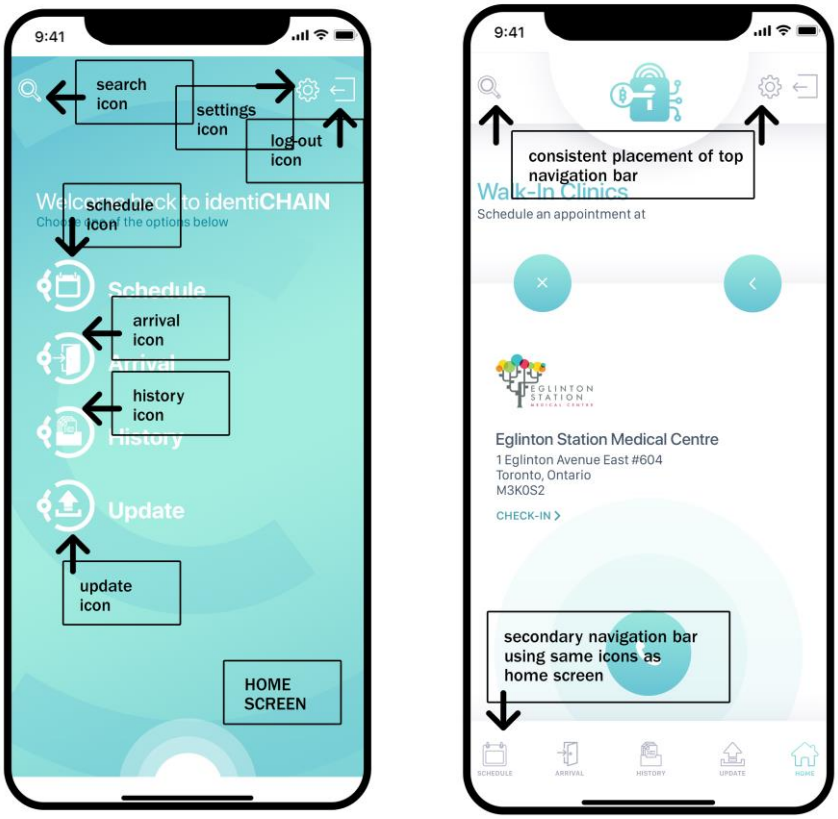
Figure 33
Typographic Hierarchy within the Application



Icons. Custom icons were created to represent the main navigation items in the app to help users navigate easily navigate the application by providing a consistent visual language from screen to screen (Figure 34). Each icon uses a familiar visual metaphor directly related to the actions they initiate. For example, a calendar icon represents schedule; an opened door with an arrow represents arrival; a folder with files represents history and an arrow pointing up represents update. As suggested in the iOS guidelines, 'people learn more quickly when an app's virtual objects and actions are metaphors for familiar experiences' (Apple Developer, 2020). Following the iOS

guidelines to keep the design of icons consistent (Apple Developer, 2020), each icon was designed using the same optical weight, stroke weight, position and perspective.

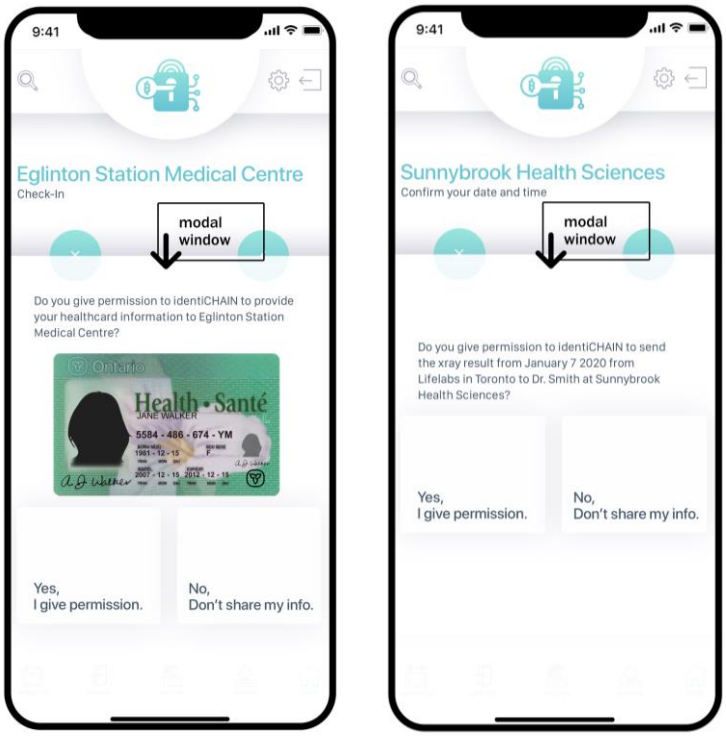
Figure 34
Icons Created to Help Users Easily Navigate through the Application



Modality. As the user navigates the application, some user actions within specific tasks require more attention. For instance, it is vital to maintain the security of a patient's medical information when scheduling a healthcare appointment. To address this, a system prompt requires the user to grant permission to send health card information to healthcare providers upon booking. 'Modal windows' is a temporary mode used to separate from the user's previous current context and requires explicit action to exit (Apple Developer, 2020). Modal windows used in the application isolated critical user tasks. For example, a modal window would open on top of the user's current screen when the system action required the release of health card information to providers (Figure 35). A user would have to either grant or deny permission before the modal window would close to enable users to continue with their task. This ensures the user can focus their attention on a self-contained task and act on critical information when they are in the midst of conducting a larger task. The modal window appears as an overlay that partially covers the underlying content preventing further interaction with the task below. The top edge of the parent screen is visible beneath the current window to ensure the user is aware they are in the midst of a task that has been temporarily suspended.

Figure 35

Example of Using Modality to Direct User to Give Permission to Release Healthcare Information



Moving beyond the traditional framework of graphic design, service design considers a holistic view encompassing both the visible and invisible components of the system to improve the overall service experience. Both the invisible (technological requirements and usability concerns) and the visible (language and aesthetics) components of the system were considered in the application design process. The high-fidelity prototype demonstrates the value of incorporating a service design framework to improve a service experience. The six themes discovered in the first study—communication, care, control, privacy, information and repetition—informed the application. The prototype provides a tangible and viable solution that will be tested with users in the implementation phase. See Appendix J (pp.129–152) for the complete visual design of the prototype.

Exploration—Second Study

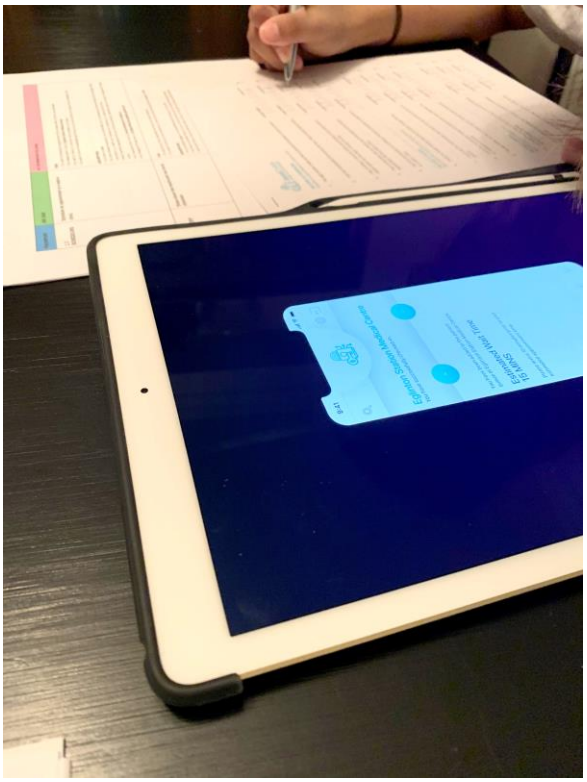
Stickdorn and Schneider (2011) discuss a strong connection between design and ethnographic research as vital to the success of service design projects:

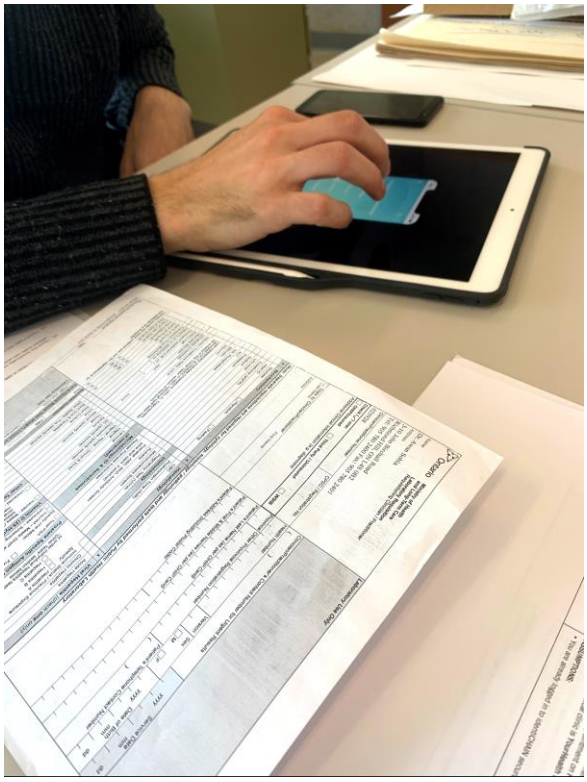
> The emphatic conversations between the various people and parties involved require both a sensitive attitude and a strong, visually engaging approach. The research activities and materials need to be well designed in order to get people involved and elicit useful and inspiring results. And the subsequent new designs need to be researched again, to make sure that the final results not only takes inspiration from everyday life, it puts it at the heart of the design process. (p. 115)

Following this methodology, the exploration, creation and reflection stages of the service design framework resulted in the creation of a high-fidelity digital patient identity application prototype. In this implementation phase, user testing sessions (Figure 36) were conducted with the same 12 participants from the first study to determine the application's ability to improve the patient experience.

Figure 36

Photos Taken During User Testing Sessions Showing Participants Interacting with the Prototype





Second Study: User Testing Session

Ethics approval to conduct a user testing session was obtained from the Human Participants Review Sub Committee, York University's Ethics Review Board on December 2019. See Appendix M (p.160) for ethics approval certificate. A series of 12 user testing sessions, 30 minutes in length were conducted with each participant. Sessions took place at York University's MDes Studio user lab or a participant's place of employment.

The goal of the second study was to evaluate the success of the application prototype in response to the six themes revealed in the first study: communication, care, control, privacy, information and repetition. Additionally, the sessions enabled direct user testing of the application's functions and usability. According to Sharp, Rogers and Preece (2015), usability of interactive products can be accessed through the achievement of six usability goals from the end-user's perspective: efficiency, effectiveness, safety, utility, learnability and memorability. Each user-testing session required participants to complete a set of ten use cases simulating real world scenarios. Patient participant

responses during the session, combined with answers to the questionnaire, provided feedback. Participants also provided valuable recommendations for future research.

While both the patients of care and the healthcare providers participated in the tasks, the questionnaire was divided into two portions:

1. The first, directed to patients of care, to extract opinions of their experience through the journey with the support of the digital application, and
2. The second, for healthcare providers, to help determine the usefulness of the digital application from a healthcare perspective.

Methodology.

Each session began with a brief introduction of the thesis and an explanation of the main features of the application. See Appendix K (pp.153–154) for the introduction script. The introduction provided participants with foundational knowledge about blockchain technology and its benefits relative to existing database technology.

Before engaging in the use cases, it was explained to participants that during the sign-up process, all pertinent patient identification information (Ontario health card, address and family physician contact details) had already been 'uploaded' to the system to simulate a true application experience. In addition, consent to access other family members profiles had been granted upon sign-up and a participant's current medical record was accessible through the application. See Appendix G (p.112) for explanation of assumptions. By communicating the assumptions prior to the start of conducting the use cases, participants were able to focus their attention on completing the use case tasks. Participants performed tasks on a 12.9" Apple iPad prototype (Figure 33).

Use Cases. Use cases are used to emulate tasks in the initial stages of a development project (Kruchten, 2004). They are comprised of a sequence of actions performed by a system and yield an observable result of value to a specific actor. Use cases focus on what a system should do rather than how it should do it. The six patient participants interacted with the prototype with ten real-world healthcare experiences. See Appendix G (pp.112–119) for use case descriptions. Each use case was informed by the patient healthcare 'journeys' from the first study: family medical clinic, hospital, walk-in clinic and diagnostic laboratory visits. This method proved effective in demonstrating how the application was directly informed by the participant insights from the first study. Because the tasks were designed from the patient perspective, the healthcare provider

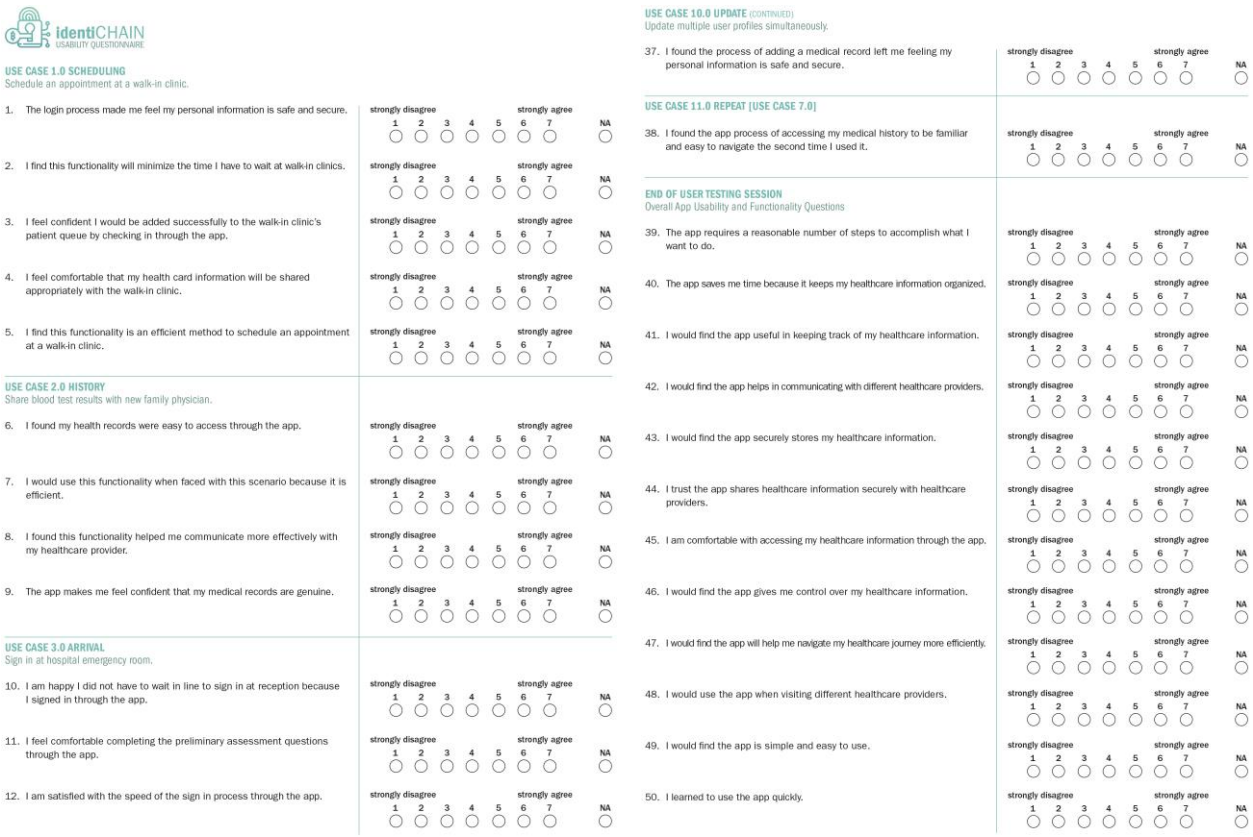
participant questions were written to elicit their opinions about how this might affect both their own and the patient experience.

Talk Aloud Method. Each session utilized the talk aloud method to elicit unbiased participant comments while interacting with a mobile device application. The talk aloud method maps 'users tasks and strategies in performing these tasks and triggers the cognitive dynamics of the user in such a way that the intended tasks can be accomplished with minimal cognitive effort' (Jaspers, Steen, Bos, & Geenen, 2004). Each participant was encouraged to verbalize their actions and thoughts as they performed the tasks for each use case. By talking as they were 'doing', unfiltered insights emerged for specific tasks. Sessions were transcribed and audio recorded.

Questionnaire. Patient participants were asked to respond to three to five questions after completing each use case (Figure 37). See Appendix L (pp.155–159) for complete questionnaire. Designed to elicit information about the usability of the application, questionnaires have long been used to evaluate user interfaces (Root & Draper, 1983). The questionnaire consisted of 59 questions focused on revealing participant insights related to six common themes revealed from the first study; six usability goals of the application; and seven blockchain benefits. For example, two questions addressed communication with the seventh use case. One of the questions for this task included, 'I find the functionality to show and send my diagnostic results a useful tool to help manage my health care journey more efficiently'.

Figure 37

Sample of Participant Questionnaire



identiCHAIN
USABILITY QUESTIONNAIRE

USE CASE 1.0 SCHEDULING
Schedule an appointment at a walk-in clinic.

1. The login process made me feel my personal information is safe and secure.
2. I find this functionality will minimize the time I have to wait at walk-in clinics.
3. I feel confident I would be added successfully to the walk-in clinic's patient queue by checking in through the app.
4. I feel comfortable that my health card information will be shared appropriately with the walk-in clinic.
5. I find this functionality is an efficient method to schedule an appointment at a walk-in clinic.

USE CASE 2.0 HISTORY
Share blood test results with new family physician.

6. I found my health records were easy to access through the app.
7. I would use this functionality when faced with this scenario because it is efficient.
8. I found this functionality helped me communicate more effectively with my healthcare provider.
9. The app makes me feel confident that my medical records are genuine.

USE CASE 3.0 ARRIVAL
Sign in at hospital emergency room.

10. I am happy I did not have to wait in line to sign in at reception because I signed in through the app.
11. I feel comfortable completing the preliminary assessment questions through the app.
12. I am satisfied with the speed of the sign in process through the app.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

USE CASE 10.0 UPDATE (CONTINUED)
Update multiple user profiles simultaneously.

37. I found the process of adding a medical record left me feeling my personal information is safe and secure.

USE CASE 11.0 REPEAT [USE CASE 7.0]

38. I found the app process of accessing my medical history to be familiar and easy to navigate the second time I used it.

END OF USER TESTING SESSION
Overall App Usability and Functionality Questions

39. The app requires a reasonable number of steps to accomplish what I want to do.
40. The app saves me time because it keeps my healthcare information organized.
41. I would find the app useful in keeping track of my healthcare information.
42. I would find the app helps in communicating with different healthcare providers.
43. I would find the app securely stores my healthcare information.
44. I trust the app shares healthcare information securely with healthcare providers.
45. I am comfortable with accessing my healthcare information through the app.
46. I would find the app gives me control over my healthcare information.
47. I would find the app will help me navigate my healthcare journey more efficiently.
48. I would use the app when visiting different healthcare providers.
49. I would find the app is simple and easy to use.
50. I learned to use the app quickly.

Participants responded to each question using a seven-point Likert scale indicating their level of agreement (from strongly disagree to strongly agree). A Likert scale provided a quantifiable metric to evaluate a participant's attitude regarding the usability of the application. Usability was related to navigating through the main functions of schedule, arrival, history and update. Because the use cases were associated with each of the four functions to address the six common themes revealed in the first study, conclusions could be made regarding the success of the application relative to identified pain points. Upon completion of the ten tasks, patient participants were required to complete an additional 14 questions related to the overall usability and functionality components of the application. While healthcare providers did participate in the tasks designed for the participant experience, they were asked seven questions that specifically related to a health care provider's needs. These questions helped determine if the application responded to pain points encountered within the current healthcare system from a healthcare provider perspective.

Analysis.

Trends. All six patient participant questionnaire responses were combined for analysis. Heatmaps were used to visualize the Likert-scale data to uncover trends. Transcripts of each session were analyzed to uncover trends based on the six themes (communication, care, repetition, information, control and privacy) from the first study and the six usability goals (efficiency, effectiveness, safety, utility, learnability and memorability).

Results.

Data collected from the twelve questionnaires revealed very positive user satisfaction to the application. Heat maps show patient participants responded with ratings from 5 to 7 for each question. The results of the questionnaire are reported in relation to the usability goals and supported by user comments and recommendations.

Use Cases with Ratings of 6 and 7. Participants responded positively to the following use cases, reflected in ratings of 6 or 7.

- Use Case 1.0: Schedule an appointment at a walk-in clinic (Figure 38);
- Use Case 3.0: Sign in at hospital emergency room (Figure 39);
- Use Case 4.0: Schedule an appointment with family physician (Figure 40);
- Use Case 7.0: Share x-ray results taken at hospital with specialist (Figure 41); and,
- Use Case 8.0: Sign in electronically at family medical clinic (Figure 42).

Figure 38

Patient Questionnaire Responses for Use Case 1.0: Schedule an Appointment at a Walk-in Clinic

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 1.0	The login process made me feel my personal information is safe and secure.	-	-	-	-	-	2	4
Use Case 1.0	I find this functionality will minimize the time I have to wait at walk-in clinics.	-	-	-	-	-	-	6
Use Case 1.0	I feel confident I would be added successfully to the walk-in clinic's patient queue by checking in through the app.	-	-	-	-	-	4	2
Use Case 1.0	I feel comfortable that my health card information will be shared appropriately with the walk-in clinic.	-	-	-	-	-	1	4
Use Case 1.0	I find this functionality is an efficient method to schedule an appointment at a walk-in clinic.	-	-	-	-	-	-	6

Figure 39

Patient Questionnaire Responses for Use Case 3.0: Sign In at Hospital Emergency Room

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 3.0	I am happy I did not have to wait in line to sign in at reception because I signed in through the app.	-	-	-	-	-	2	4
Use Case 3.0	I feel comfortable completing the preliminary assessment questions through the app	-	-	-	-	-	1	4
Use Case 3.0	I am satisfied with the speed of the sign in process through the app.	-	-	-	-	-	1	5
Use Case 3.0	I find the app makes it easy to check the 'wait time remaining'.	-	-	-	-	-	-	6
Use Case 3.0	I am happy I can check the wait time remaining anything through the app.	-	-	-	-	-	-	6

Figure 40

Patient Questionnaire Responses for Use Case 4.0: Schedule an Appointment with Family Physician

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 4.0	I find this functionality will save me time when I schedule an appointment with my family physician.	-	-	-	-	-	-	6
Use Case 4.0	I was satisfied with the instructions the app provided me for completing the task.	-	-	-	-	-	-	6
Use Case 4.0	I find this functionality is an efficient method to schedule healthcare appointments with my family physician.	-	-	-	-	-	-	6

Figure 41

Patient Questionnaire Responses for Use Case 7.0: Share X-Ray Results with Specialist

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 7.0	I found this functionality integrated my health records obtained through different health care providers efficiently.	-	-	-	-	-	2	4
Use Case 7.0	I am satisfied with the amount of time it took to complete the tasks in this scenario.	-	-	-	-	-	1	5
Use Case 7.0	I find the functionality to show and send my diagnostic results a useful tool to help manage my health care journey more efficiently.	-	-	-	-	-	-	6
Use Case 7.0	I found the 'send diagnostic' test result process left me feeling my personal information is safe and secure.	-	-	-	-	-	-	6

Figure 42

Patient Questionnaire Responses for Use Case 8.0: Sign In at Family Medical Clinic

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 8.0	I am happy I did not have to present my health card upon arrival because the family medical clinic already had my information when I signed in through the app.	-	-	-	-	-	-	6
Use Case 8.0	I am happy I did not have to wait in line to sign in at reception because I signed in through the app.	-	-	-	-	-	-	6
Use Case 8.0	I am satisfied with the speed of the sign in process through the app.	-	-	-	-	-	-	6

Efficiency. Patients were highly satisfied with the arrival functionality of the application. Ratings of 6 and 7 appear for all questions of use cases 3.0 and 8.0 (Figures 39 & 42). Use cases 1.0 and 4.0 (Figures 38 & 40) revealed participants strongly agreed that the application provided an efficient method to schedule appointments at family medical and walk-in clinics. As noted by two patients,

> *'I love the smart functionality of the app. No matter you just take two seconds or not, it's just one less thing I have to do. I love it'*
> (Family Medical Clinic Patient (PC6), participant).

> *'The very first thing [I want to say is], it doesn't take a long time'*
> (Walk-in Clinic Patient (PC2), participant).

Effectiveness. Participants were also comfortable with the management and transfer of patient information to healthcare providers. One patient noted,

> *'I'm happy I didn't have to present my health card because the family medical clinic already had my information when I send them through the app'*
> (Hospital Emergency Room Patient (PC4), participant).

Safety. Use case 7.0 responses revealed participants were highly satisfied with the ability to share diagnostic results with healthcare providers efficiently and securely through the application. As noted by a patient,

> *'It left me feeling my personal information is safe and secure because you have to verify it multiple times'*
> (Hospital Emergency Room Patient (PC4), participant).

> *'I love this point. You have to ask for permission all the time because even if people are logged in, it's all about security.'*
> (Walk-in Clinic Patient (PC1), participant).

Memorability. In order to test the usability goal of 'memorability', participants were asked to repeat the tasks for use case 7.0: Share x-ray results taken at hospital with specialist at follow-up visit. All participants gave a 6 or 7 rating to the question, 'I found the app process of accessing my medical history to be familiar and easy to navigate the second time I used it' (Figure 43). Users were able to easily navigate through the application interface and efficiently manage their medical record. One patient commented,

> *'I know how to do that. I did do it, sending to the hospital, it would be the same thing, just different locations'*
> (Hospital Emergency Room Patient (PC4), participant).

Figure 43
Patient Questionnaire Responses for Use Case 11.0: Repeat Use Case 7.0 (Share X-Ray Results)

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 11.0	I found the app process of accessing my medical history to be familiar and easy to navigate the second time I used it.	-	-	-	-	-	1	5

Use Cases Including Ratings of 5. As mentioned, while responses were all high, some questions yielded at least one rating of 5. These are:

- Use Case 2.0: Share blood test results with new family physician (Figure 44);
- Use Case 5.0: Update medical record from family physician consultation (Figure 45);
- Use Case 6.0: Schedule an appointment with a diagnostic laboratory (Figure 46);
- Use Case 9.0: Update history with x-ray results (Figure 47); and,
- Use Case 10.0: Update multiple user profiles simultaneously (Figure 48).

Figure 44

Patient Questionnaire Responses for Use Case 2.0: Share Blood Test Results with New Family Physician

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 2.0	I found my health records were easy to access through the app.	-	-	-	-	-	1	5
Use Case 2.0	I would use this functionality when faced with this scenario because it is efficient.	-	-	-	-	-	1	5
Use Case 2.0	I found this functionality helped me communicate more effectively with my healthcare provider.	-	-	-	-	1	2	3
Use Case 2.0	The app makes me feel confident that my medical records are genuine.	-	-	-	-	-	2	4

Figure 45

Patient Questionnaire Responses for Use Case 5.0: Update Medical Record from Family Physician Consultation

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 5.0	I found the process of verifying my medical records left me feeling my personal information is safe and secure.	-	-	-	-	-	1	5
Use Case 5.0	I found it easy and convenient to update my history through this app.	-	-	-	-	1	-	5
Use Case 5.0	I find this functionality will help me keep my medical history organized.	-	-	-	-	-	1	5

Figure 46

Patient Questionnaire Responses for Use Case 6.0: Schedule an Appointment with Diagnostic Laboratory

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 6.0	I am satisfied with the ease and amount of time to complete the tasks in this scenario.	-	-	-	-	1	-	5
Use Case 6.0	I feel comfortable that the steps to complete this task are easy to remember and repeat in the future.	-	-	-	-	-	2	4
Use Case 6.0	I feel confident my requisition forms and health information will be sent securely electronically to the diagnostic lab through the app.	-	-	-	-	-	1	5
Use Case 6.0	I find the scan and upload of requisition forms process through this app made me feel my personal information is safe and secure.	-	-	-	-	-	1	5

Figure 47

Patient Questionnaire Responses for Use Case 9.0: Update History with X-Ray Results

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 9.0	I found the process of verifying my diagnostic test results left me feeling my personal information is safe and secure.	-	-	-	-	-	-	6
Use Case 9.0	I found this functionality integrated my health records obtained through different health care providers efficiently.	-	-	-	-	1	-	5
Use Case 9.0	I found it easy and convenient to update my history through this app.	-	-	-	-	1	1	4

Figure 48

Patient Questionnaire Responses for Use Case 10.0: Update Multiple User Profiles Simultaneously

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
Use Case 10.0	I found it easy and convenient to update multiple profiles simultaneously.	-	-	-	-	-	-	6
Use Case 10.0	I feel this functionality will help me keep my family's medical history organized and up-to-date.	-	-	-	-	1	-	5
Use Case 10.0	I found the process of adding a medical record left me feeling my personal information is safe and secure.	-	-	-	-	1	1	4

Utility. Patients gave at least one rating of 5 in the three use cases (5.0, 9.0 and 10.0) which dealt with testing the update functionality (Figures 45, 47 & 48). One patient commented on confusion between the 'history' and 'update' terminology,

> *'I automatically would have gone to history then clicked on the file that says pending and press it to update. I would think there should be some kind of notification beside update'*
> (Family Medical Clinic Patient (PC3), participant).

Another patient experienced the same confusion,

> *'I think maybe a little clarity here because when I'm looking at this, I can look at least three different things or I could choose hospital records, diagnostic results or view all history'*
> (Family Medical Clinic Patient (PC6), participant).

Safety, Learnability and Efficiency. All participants were satisfied patient information such as requisition forms and results were securely transferred between healthcare providers through the application, as revealed by use case 6.0 responses (Figure 46). As noted by one patient,

> *'Taking pictures, the app saves everything, it is better than when you have physical papers'*
> (Walk-in Clinic Patient (PC2), participant).

Participants also found the efficiency to transfer medical information through the application using minimal steps satisfactory. A patient expressed,

> *'The steps are easy to remember and repeat in the future. The more I use the app, the easier it is.*
> (Hospital Emergency Patient (PC4), participant).

However, one patient gave a rating of 5 to the following question: 'I am satisfied with the ease and amount of time to complete the tasks in this scenario'. One patient recommended,

> *'One thing that would be really good to have on the home screen, let's say a little portlet for reminders saying these are the things that are pending your action'*
> (Family Medical Clinic Patient (PC3), participant).

The family medical clinic patient recommended adding a portlet to the home screen to show the number of records pending user verification. Currently on the application, the user will need to select 'update' before the number of records pending verification will populate. The participant's desire for further efficiency could attribute to the 5 rating mentioned above.

A participant gave a 5 rating to the following question in use case 2.0: Share blood test results with new family physician (Figure 44): 'I found this functionality helped me communicate more efficiently with my healthcare provider'. However, the patient expressed a desire for this information to be sent ahead of their appointment.

> *'Is there any way that when the appointment is scheduled, I can already send this information to them so they can have a quick look before I get in so they already know and it makes my visit with them more efficient. It may be a good thing if as soon as my appointment is booked, they have all that history already'*
> (Family Medical Clinic Patient (PC6), participant).

The 5 rating could be attributed to the participant expressing a desire for efficiency. The participant suggested adding the function for users to send their medical history records prior to their scheduled appointment to improve efficiency.

Post-session Questions. Upon completion of the ten use cases, participants were asked to respond to an additional 14 questions pertaining to the overall usability of the application. Participants gave ratings of 6 and 7 for most questions, thus, showing overall user satisfaction with the application's functions (Figure 49). In response to the ability to update multiple profiles simultaneously, one patient noted,

> *'I love this feature because the doctor already has at their fingertips and they don't have to ask me every time I get I there. It doesn't force me to have to remember all the medical history of my family'*
> (Family Medical Clinic Patient (PC6), participant).

Another patient expressed their satisfaction with the application noting,

> *'I wish we have this app for government papers, not just healthcare'*
> (Walk-in Clinic Patient (PC2), participant).

Exceptions included: questions pertaining to the comfort of accessing healthcare information through the application and the use of easy-to-understand language and clarity-of-navigation information through the interface. Three patients gave a 5 rating to these questions. Two patients noted:

> *'I'm just a little confused of what I need to do. I see an X on the top and then I see it looks like a back arrow for me to go back.'*
> (Family Medical Clinic Patient (PC6), participant).

> *'I don't know if it was a language barrier, but it was kind of hard for me'*
> (Walk-in Clinic Patient (PC2), participant).

Figure 49

Use Case 10.0: Patient Questionnaire Responses

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Patient - Number of Responses						
End of User Testing	The app requires a reasonable number of steps to accomplish what I want to do.	-	-	-	-	-	1	5
End of User Testing	The app saves me time because it keeps my healthcare information organized.	-	-	-	-	-	1	5
End of User Testing	I would find the app useful in keeping track of my healthcare information.	-	-	-	-	-	-	6
End of User Testing	I would find the app helps in communicating with different healthcare providers.	-	-	-	-	-	1	5
End of User Testing	I would find the app securely stores my healthcare information.	-	-	-	-	-	1	5
End of User Testing	I trust the app shares healthcare information securely with healthcare providers.	-	-	-	-	-	2	4
End of User Testing	I am comfortable with accessing my healthcare information through the app.	-	-	-	-	1	-	5
End of User Testing	I would find the app gives me control over my healthcare information.	-	-	-	-	-	-	6
End of User Testing	I would find the app will help me navigate my healthcare journey more efficiently.	-	-	-	-	-	-	6
End of User Testing	I would use the app when visiting different healthcare providers.	-	-	-	-	-	-	6
End of User Testing	I would find the app is simple and easy to use.	-	-	-	-	-	-	6
End of User Testing	I learned to use the app quickly.	-	-	-	-	-	1	5
End of User Testing	The app uses language that is easy to understand.	-	-	-	-	1	-	5
End of User Testing	The app interface provides useful information on where I am in the process and navigation.	-	-	-	-	1	-	5

Healthcare Provider Questions. Healthcare providers were asked to complete seven questions at the end of the session concerning the application's ability to improve their job experience and interactions with patients. Participant responses were high with ratings of five to seven (Figure 50). A healthcare provider participant noted:

> *'It reduces a lot of the wait times. I think it's great. I think it makes it so much easier'*
> (Rehabilitation Unit Nurse (HP5), participant).

The following questions were given ratings of five by one healthcare participant: 'I feel the app would improve wait times at my place of work and I feel the app would improve communication with patients'. One healthcare provider participant noted,

> *'Sometimes [patients] don't know which area to go to in the hospital. If you had the option to tell [patients] which area and which way to go once [they] have [their] confirmation [that] would be helpful'*
> (Family Medical Clinic Administrator (HP2), participant).

Figure 50
Post Session Questions for Healthcare Providers

		1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
Section	Question	Healthcare Provider - Number of Responses						
Healthcare Providers	I feel the app would be beneficial for patients.	-	-	-	-	-	2	3
Healthcare Providers	I feel the app would make my job easier.	-	-	-	-	-	1	4
Healthcare Providers	I feel the app would improve wait times at my place of work.	-	-	-	-	1	-	4
Healthcare Providers	I feel the app would minimize inadequate or lack of patient information.	-	-	-	-	-	-	5
Healthcare Providers	I feel the app would improve communication with patients.	-	-	-	-	1	-	4
Healthcare Providers	I would be comfortable with the authenticity of the patient health records on the app.	-	-	-	-	-	1	4
Healthcare Providers	I feel the app would reduce repetitive administrative processes.	-	-	-	-	-	-	5

User Recommendations.

As discussed in the reflection phase, the design of the application centered on four main factors: technological requirements, usability, language and aesthetics. The combined results from the transcribed user-testing sessions and questionnaire responses were aggregated to reveal patient suggestions for future refinements of the application based on the aforementioned four factors.

Technological Recommendations. The blockchain platform offers the benefits of immutability, transparency, data verifiability, security, control, convenience and efficiency to manage patient medical records. Participants were very satisfied with the data verifiability and security features of the application. However, the majority of participants revealed unease with public and private key user identity verification process of blockchain technology. Users are required to remember a long alphanumeric sequence to verify their identity. While this verification process enables security, having a user remember these sequences is a pain point. As noted by multiple patients,

> *'My only issue is if I accidentally lose these codes, all the information that's saved on there is gone and that's going to be an issue'*
> (Family Physician Clinic Patient (PC6), participant).

> *'How do you expect people to memorize it?'*
> (Family Medical Clinic Patient (PC5), participant).

> *'I have to type this thing out?'*
> (Family Medical Clinic Patient (PC3), participant).

A family medical clinic patient suggested the exploration of biometrics using facial recognition could be a solution for verification.

> *'It recognizes your face ID, then it recognizes your alphanumeric sequences to verify your ID'*
> (Family Medical Clinic Patient (PC6), participant).

Additionally, the use of a two-step verification process using text message codes was recommended,

> *'A two-stage authentication process where once you try to sign in, it sends a code to your phone and you have to type it in before it actually accepts your sign in'*
> (Family Medical Clinic Patient (PC6), participant).

A patient suggested the addition of an explanation of blockchain benefits to help users better understand the application's security features,

> *'I guess part of it would be convincing people that it's completely safe. Maybe a [description] on the blockchain concept for its functionality'*
> (Hospital Emergency Patient (PC4), participant).

Usability Recommendations. Refinement recommendations related to the usability of the prototype for each of the main functions of the application were collected from participants. In general, usability recommendations focused on three of the six usability goals: efficiency, effectiveness and utility. These included:

1. The addition of a portlet on the home screen to show the pending updates for verification will improve the user experience. It will immediately show the actions required by the user upon login, thereby improving the effectiveness and efficiency of the application;
2. Adding the functionality for users to receive alerts of pending verifications and schedule changes without having to be logged into the application;
3. The option for a user to choose different languages (e.g. English, French, etc.); and
4. The option to be added to a healthcare provider's waitlist if the patient's preferred appointment time and date is unavailable. If there is a cancellation, a patient will be notified through the application and the user can edit their existing appointment.

Language Recommendations. The use of clear and concise language proved to help users navigate effortlessly through the application. As noted by a walk-in clinic patient,

> *'The app uses language that's easy… the app interface provides you with information on where I am in the process'*
> (Walk-in Clinic Patient (PC2), participant).

However, multiple participants experienced confusion choosing which record to access on the history screen while navigating through tasks. Users are presented with the options: family physician medical records, hospital medical records, diagnostic results, specialist records, walk-in clinic records and view all records. The terminology used for the menu items appeared to be the source of confusion, as noted by one participant,

> *'I don't know if it was a language barrier, but [the medical terms] was kind of hard for me [to understand]'*
> (Walk-in Clinic Patient (PC1), participant).

> 'I think maybe a little clarity here because when I'm looking at this, I can look at least three different things or I could choose hospital records, diagnostic results or view all history'
> (Family Medical Clinic Patient (PC6), participant).

Aesthetic Recommendations. Overall participants were very satisfied with the aesthetic and visual design of the application reflected in their ease of use through the completion of use case tasks. A patient commented,

> *'This [logo representing] the identity, when you use this design with these [clear] steps, the visual is easy to understand more. Good design with the steps make it easier for you to choose'*
> (Walk-in Clinic Patient, (PC2), participant).

The same participant also noted,

> *'The font you use [is] big and bold and it's really minimal… the app interface provides you some information on where I am in the process'*
> (Walk-in Clinic Patient, (PC2), participant).

There are two ways for users to navigate back to the home screen including the logo on the top of every screen and the home button on the bottom secondary navigation bar. Most participants experienced some confusion navigating back to the home screen initially. One patient noted after completing the tasks for use case 1.0,

> *'I'm just a little confused of what I need to do. I see an X on the top and then I see it looks like a back arrow for me to go back'*
> (Family Medical Clinic Patient (PC6), participant).

Discussion.

The following section discusses the results in relation to the six themes from the first study. Pain points from the first study were categorized into six themes: communication, care, control, privacy, information and repetition. The talk aloud method encouraged participants to verbalize their experience with the application. Positive insights demonstrated the application's success improving the patient experience. Participants also brought forth valuable recommendations to refine the prototype for further study beyond the scope of this thesis.

Communication. When navigating through the current decentralized and complex healthcare system, participants revealed a variety of communication issues: inefficiencies, lack of communication, miscommunication, multiple platforms, out-dated technology and multiple uncoordinated channels of communication. Currently, a patient lacks access to a consolidated medical record. For instance, in use case 7.0, participants were asked to share x-ray results taken at the hospital with a specialist at a follow-up visit. The convenience of accessing medical records on a mobile device improves patient experience in this scenario. Using the application, the participant can

access the x-ray image and send it instantaneously to the specialist. Currently, the specialist office would need to contact the hospital to send the x-rays. The patient would be required to book another consultation appointment for a later date, thus resulting in an inefficient healthcare experience. A participant recently visited the hospital emergency room for a similar experience noted the benefits of the application in providing a positive service experience,

> *'I keep saying seamless just because this is really seamless'*
> (Hospital Emergency Room Patient (PC4), participant).

A walk-in clinic patient commented on the efficiency of the application,

> *'Taking pictures, the app saves everything, it is better than when you have physical papers'*
> (Walk-in Clinic Patient (PC2), participant).

Healthcare providers currently use a variety of independent systems to manage their records. A disconnected system often leads to miscommunication between patients and healthcare providers. The application provides a consolidated secure repository for patient records to facilitate efficient and convenient communication with healthcare providers. By giving patients access to their medical record, a patient will have control over sharing their information with healthcare providers. Patients will no longer rely on intermediaries to transfer their medical information, thus improving their experience in interactions within healthcare.

Care. Long wait times for healthcare services was the second most important subtheme revealed through the first study. All participants voiced frustration with the long wait times to access care, resulting in a negative patient experience. The application's scheduling function was designed to minimize time spent waiting at healthcare facilities for consultations. Use cases 1.0, 4.0 and 6.0 demonstrated the ease and convenience of the scheduling functionality and received the highest average scores from participants. A family medical clinic patient was satisfied with how the application promotes efficient use of time.

> *'I'm assuming I still need to see the triage nurse, but as soon as I go there, she's got all the information. She knows exactly who I am. Rather than taking half an hour to go through all my symptoms of why I'm there, she could have taken five minutes to look at it before I got there. I love that'*
> (Family Medical Clinic Patient (PC6), participant).

identiCHAIN updates wait times in real time, reducing the amount of time spent at health care facilities. Patients can conveniently check the wait-time on their mobile device. Minimizing time

spent in a health care facility has the added benefit of reducing possible exposure to communicable diseases.

Control. Currently, a patient does not have access to all the components of their medical record resulting in a lack of control over their health information. For instance, patients are not usually given access to diagnostic results. Rather, diagnostic laboratories send results directly to a family physician or specialist. When a patient is given access to their diagnostic results, it is through out-dated technology such as compact discs or paper copies. This application conveniently enables the digital transfer of a patient's records from multiple healthcare providers. It uses blockchain technology's secure two-step verification feature. A patient must verify each record sent by healthcare providers before it can be added to their medical history. A patient was very satisfied with having secure control over their own medical records through the application, noting:

> *'It left me feeling my personal information is safe and secure because you have to verify it multiple times'*
> (Hospital Emergency Room Patient (PC4), participant).

A medical clinic patient noted,

> *'The app makes me feel confident that my medical records are genuine. Absolutely'*
> (Family Medical Clinic Patient (PC6), participant).

Currently, healthcare providers use differing systems to manage records, resulting in a patient's medical record being dispersed among multiple healthcare locations. identiCHAIN provides healthcare providers and patients a platform to transfer patient information securely and conveniently. Giving a patient secure control of their own medical record is one of the unique features this application. Blockchain technology requires a patient verify the authenticity of the record before it will be added to their medical history. A patient therefore has control of their medical record and the confidence that each record in their medical history is genuine. And once a record has been added to patient's medical history, the patient has the authority to share the record at their discretion.

Privacy. A risk of exposure of patient medical information due to the reliance of out-dated technology was a pain point revealed in the first study. Multiple participants revealed that fax machines are the main method of communication between healthcare providers. Patient information is often sent insecurely through a fax by intermediaries without a patient's knowledge. This application provides a secure and seamless way for patients and healthcare providers to digitally

share patient medical information. For instance, the application contains the user's health card information and releases it only when the user grants permission. Two patients indicated this feature provided comfort knowing their information was secure:

> *'I feel comfortable my health card information will be shared appropriately with the walk-in clinic… because it showed my actual health card'*
> (Hospital Emergency Room Patient (PC4), participant).

> *'I love this point. [The application] asks for permission [to release my information] all the time even if people are logged in. It's all about security.'*
> (Walk-in Clinic Patient (PC1), participant).

The application can only be accessed by healthcare providers and patients and removes intermediary involvement in the managing of a patient's health information. A patient will have access to their medical record and retain control over the possibility of sending information to third parties.

Information. A loss or lack of information hinders a patient's healthcare experience. In use case 2.0, a patient arrives at a new family physician for a consultation. However, the patient's previous physician has not transferred their medical records. Therefore, the new physician cannot access the patient's health record because they do not have their medical history. This scenario is a common issue revealed by multiple participants. Currently, the new physician's office must submit a request for the patient's medical record. Normally, this is sent via fax and delays the consultation. Enabling users to access and share their medical record digitally through their mobile device, this application alleviates inefficiencies within the current healthcare system. Additionally, patients will have the ability to send their medical record to the physician through the application. This function earned high satisfaction ratings from participants, as noted by a family medical clinic patient:

> *'I love this because since everything's all integrated, not only does it save me time and convenience, it does the same for the doctor. It makes the whole system a lot more efficient'*
> (Family Medical Clinic Patient (PC6), participant).

Currently, a patient compiles fragmented pieces of their medical record through paper photocopies or out-dated technologies such as files on compact discs. As a result, a patient does not have an accurate and organized record of their medical history. This application enables patients to collect and manage medical records easily. identiCHAIN provides convenience and a secure platform to access medical records that have been verified to ensure authenticity.

Repetition. Repetitive delivery of information defines current patient experience. A critical care nurse explained patients are often frustrated with having to repeat information multiple times to different healthcare providers:

> *'A terrible amount of time is spent by nurses collecting history of allergies which was already done by so many people along the way. If that could be communicated to me, that saves time. This will be very useful'*
> (Critical Care Nurse (HP1), participant).

The application provides an efficient platform for patients to manage their healthcare interactions and records. As a result, the need to verbally convey information repeatedly across different health channels is minimized. A participant was very satisfied with not having to repeatedly relay information to their family physician, noting:

> *'I love this feature because the doctor already has at their fingertips and they don't have to ask me every time I get I there'*
> (Family Medical Clinic Patient (PC6), participant).

A patient noted their satisfaction with not having to present their health card repeatedly,

> *'I'm happy I didn't have to present my health card because the family and medical clinic already had my information when I send them through the app'*
> (Hospital Emergency Patient (PC4), participant).

The application improves the patient experience by removing the need to repeat information throughout one's healthcare journey as a patient's information is digitally accessible through the application. As noted by a rehabilitation nurse,

> *'It eliminates a lot of the redundant processes in which you have to wait for specific things'*
> (Rehabilitation Unit Nurse (HP5), participant).

A patient commented on the efficiency of the application,

> *'This is absolutely awesome to make things a little more efficient'*
> (Family Medical Clinic Patient (PC6), participant).

Main Insights from the Second Study. Overall, patients were highly satisfied with the usability of the application, reflective in the high ratings on the questionnaires based on the seven-point Likert scale. The results of specific questions on the questionnaire tailored to the six usability goals defined by Sharp, et al., (2015) revealed high results ranging from 6.33–6.89 for patients and 6.40–7.00 for healthcare providers. The main insights from the second study include:

1. Users were satisfied with the ease of use of the application in communicating and transferring their information to healthcare providers;
2. Users trusted the application to securely store and transfer their medical records; and,

3. Users were satisfied that the application reduced repetitive processes in their interactions within the healthcare system .

Additionally, the second study demonstrated the value of using a service design framework in improving patient experience. The testing of the developed prototype with the same participants from the first study enabled the researcher to gauge the success of the prototype in responding directly to pain points revealed in the first study. Furthermore, following the iterative nature of the service design framework will enable the researcher to continue to reflect and refine the design solution.

Limitations. Because participant responses were so high, there is a possibility that these were biased. As the same 12 participants from the first study took part in this user-testing session, the researcher had already established a comfortable relationship with each participant. Thus, participant responses could be skewed due to the presence of the researcher. However, transcripts from the sessions yielded 37 positive participant insights, supporting the high participant ratings from the questionnaire responses. Additionally, the small sample size of 12 participants is a potential limitation. Increasing the participant pool is recommended for future study.

Recommendations

Prototype Refinements

The design of the identiCHAIN application focused on technological requirements, usability, language and aesthetics. In response to the results section, the researcher outlines recommendations for future iterations of the digital application.

Technological Requirements

Blockchain is an emerging technology, thus continual developments are being investigated and implemented. As recommended by PC6, the use of biometrics such as facial recognition to replace the issue of having to remember long alphanumeric sequences to verify a user's identity should be further explored in future studies.

Usability

Following the recommendation of participants, additional features of the application that should be implemented in the next prototype include:

1. Adding the functionality to immediately show the actions required by the user upon login, such as the pending updates for verification;
2. Incorporating the functionality for users to receive alerts from the system without having to be logged into the application; and,
3. Providing the user with the option to choose their preferred language upon login.

Further investigations may be needed to integrate a 'waitlist' function, allowing patient's to be notified of cancellations to adjust their appointments accordingly. As noted by a healthcare provider participant, allowing the system to automatically notify a patient of an opportunity to change their appointment was revealed as a pain point for the healthcare provider.

Language

The history functionality of the application contains medical records that have already been verified by users and the update functionality contains the records pending user verification. Multiple participants experienced confusion differentiating between these two functionalities, thus further explorations for alternative terms should be explored and tested with users.

Aesthetics

Multiple participants experienced confusion navigating back to the home screen. In the application, the logo on the top of the page and the home button on the bottom secondary navigation bar link to the home screen. Visual explorations to highlight the home button on each screen will need to be further investigated.

Service Design Framework

The researcher recommends continuing the study following the iterative nature of the service design framework. The researcher suggests refining the current iteration of the application based on the feedback from the user testing session, followed by another user testing session to test the refined prototype. Furthermore, increasing the participant pool to include a larger sample and a more diverse set of healthcare providers and patients would allow for more perspectives that could be used to further inform the development of the application.

Future Research

This thesis confirmed that patients experience numerous challenges navigating through the current healthcare system. Issues related to communication, care, control, privacy, information and repetition result in a negative patient experience. Adopting a service design framework to understand user's needs at the onset of the design process led to the design of a digital patient identity mobile application. The application was tested with users and proved successful in responding to patient pain points within the current healthcare system. Patients were satisfied with the features and healthcare providers thought the application would improve their work experience and interaction with patients.

This thesis focused specifically on improving the patient experience. Future research could focus on the development of a corresponding interface designed specifically for healthcare clinics. This would reveal insights from the healthcare provider perspective and meet the needs of healthcare providers. A greater understanding of healthcare providers needs and their administrative ecosystem (such as patient record keeping and billing systems) and how the application can support healthcare requirements will further improve the patient experience with an eye towards integration across the entire system.

The potential to further this study beyond the scope of this thesis presents numerous research opportunities to contribute to the fields of service design, healthcare and blockchain technology. Future collaborations with blockchain technologists can transform the prototype from a stage of conceptualization to realization. Multi-disciplinary collaborations enable the combination of diverse skillsets to develop more effective solutions. The success of the application relies on the integration of the current health system. Future research should include government stakeholders to gain perspectives for real-world implementation.

Conclusion

This study contributes to service design discourse by demonstrating the value of adopting a service design framework embracing emerging technology to improve the patient experience through an applied case study. Using the combined methods of in-depth interviews, co-design and user-testing sessions proved successful in revealing rich participant insights to inform design solutions. The incorporation of emerging technology, specifically blockchain, enabled the design of an innovative solution that gives patients full control over accessing and sharing their healthcare record. Furthermore, a blockchain-based solution will allow for the instantaneous transfer of medical data, where every member of the distributed network of the healthcare blockchain would have the same data for the patient. This results in a reduced risk or errors and better patient care. A service design methodology provided the framework to test the viability of the solution directly with users. This study illustrates the importance of placing service design at the centre of user-centered solutions. The service designer plays an essential role in leading the development of service innovations. While emerging technology can accelerate success, the work of service designers is core to achieving optimal user experiences. Stickdorn and Schneider suggest,

> Designers possess more than simply an ability to style products; they are practitioners of an applied process of creative skills: identifying problems, researching, analysing, evaluating, synthesising and then conceptualising, testing and communicating solutions. Design, whatever the discipline, is not only about an end product, but rather a systematic process of identifying problems, then researching, creating, testing and implementing solutions (Stickdorn & Schneider, 2011, p.87).

The key to a successful service design project is the iterative process of researching, creating, testing and refining. This study made use of three of the four phases of the service design framework: exploration, creation and reflection. A digital patient identity application was designed and tested by engaging users throughout the design process. While the results showed a high user satisfaction rate, it is expected that further refinements and testing of the application are necessary for practical implementation of the solution. It is important to acknowledge that multiple actors contribute to the patient experience in a complex healthcare system. identiCHAIN represents a small contribution towards improving the experience.

Bibliography

Apple Developer. (2020). Human interface guidelines. Retrieved March 1, 2020, from https://developer.apple.com/design/human-interface-guidelines/

Braun, V., & Clarke, V. (2006). Qualitative research in psychology using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. Retrieved from http://www.tandfonline.com/action/journalInformation?journalCode=uqrp20%5Cnhttp://www.tandfonline.com/action/journalInformation?journalCode=uqrp20

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, *8*(2), 5–21. https://doi.org/10.2307/1511637

Caruso, L. (2018). Digital innovation and the fourth industrial revolution: epochal social changes? *AI and Society*, *33*(3), 379–392. https://doi.org/10.1007/s00146-017-0736-1

Chang, F., & Gupta, N. (2015). Progress in electronic medical record adoption in Canada. *Canadian Family Physician*, *61*(12), 1076–1084.

Cipolla, C., & Manzini, E. (2009). Relational services. *Knowledge, Technology & Policy*, *22*(1), 45–50. https://doi.org/10.1007/s12130-009-9066-z

Consumers Health Forum of Australia. (n.d.). The real people real data toolkit. Retrieved October 1, 2019, from www.chf.org.au

Cooper, R., Dunn, N., Coulton, P., Walker, S., Rodgers, P., Cruikshank, L., Tsekleves, E., Hands, D., Whitham, R., Boyko, C., Richards, D., Aryana, B., Pollastri, S., L., Escalante, M., Knowles, B., Lopez-Galviz, C., Cureton, P., Coulton, C. (2018). ImaginationLancaster: Open-Ended, Anti-Disciplinary, Diverse. *She Ji*, Vol. 4, pp. 307–341. https://doi.org/10.1016/j.sheji.2018.11.001

Crosby, M., Nachiappan, Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). BlockChain technology: Beyond bitcoin. *Applied Innovation Review*, (2).

De Filippi, P. (2017). *What blockchain means for the sharing economy*. Retrieved from https://hbr.org/2017/03/what-blockchain-means-for-the-sharing-economy

Degryse, C. (2016). Digitalisation of the economy and its impact on labour markets. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2730550

Dorst, K. (2019). Design beyond design. *She Ji*, *5*(2), 117–127. https://doi.org/10.1016/j.sheji.2019.05.001

Greenbaum, J., & Kyng, M. (Eds.). (1991). *Design at work: Cooperative design of computer systems*. Hillsdale, NJ: LEA Publishers.

Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., & Taylor, R. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Affairs*, *24*(5), 1103–1117. https://doi.org/10.1377/hlthaff.24.5.1103

Holmlid, S. (2007). *Interaction design and service design: Expanding a comparison of design disciplines*. In Proceedings Nordes Conference 'Design Inquiries'. Stockholm, Sweden.

Jaspers, M. W. M., Steen, T., Bos, C. Van Den, & Geenen, M. (2004). The think aloud method: A guide to user interface design. *International Journal of Medical Informatics*, *73*(11–12), 781–795. https://doi.org/10.1016/j.ijmedinf.2004.08.003

Jodi, A. (1994). A pragmatic view of thematic analysis. *The Qualitative Report*, *2*(1), 4–5. Retrieved from https://nsuworks.nova.edu/tqr/vol2/iss1/3

Jones, P. (2017, September 1). The systemic turn: Leverage for world changing. *She Ji*, Vol. 3, pp. 157–163. https://doi.org/10.1016/j.sheji.2017.11.001

Junginger, S. (2015). Organizational design legacies and service design. *Design Journal*, *18*(2), 209–226. https://doi.org/10.2752/175630615X14212498964277

Junginger, S. (2017). Design research and practice for the public good: A reflection. *She Ji*, *3*(4), 290–302. https://doi.org/10.1016/j.sheji.2018.02.005

Kimbell, L. (2009). The turn to service design. In G. Julier & L. Moor (Eds.), *Design and creativity: Policy, Management and practice* (pp. 157–173). https://doi.org/10.5040/9781474293693.ch-009

Krippendorff, K. (2006). *The semantic turn: A new foundation for design*. Boca Raton, FL: Taylor & Francis Group.

Kruchten, P. (2004). *The rational unified process an introduction*. Boston, MA: Pearson Education, Inc.

LifeLabs. (2020a). An open letter to LifeLabs customers. Retrieved March 8, 2020, from https://www.lifelabs.com/lifelabs-releases-open-letter-to-customers-following-cyber-attack/

LifeLabs. (2020b). my results. Retrieved March 8, 2020, from https://myresults.lifelabs.com/#/

Malmberg, L., Rodriguez, V., Lannerstrom, L., Wetter-Edman, K., Vink, J., & Holmlid, S. (2019). Service design as a transformational driver toward person-centered care in healthcare. In M. A. Phannstiel & C. Rasche (Eds.), *Service Design and Service Thinking in Healthcare and Hospital Management* (pp. 1–18). https://doi.org/10.1007/978-3-030-00749-2

Malmberg, L., & Wetter-Edman, K. (2016). *Design in public sector: Exploring antecedents of sustained design capability.* The 20th DMI: Acedemic Design Management Conference.

Mead, N., & Bower, P. (2000). Patient-centredness: A conceptual framework and review of the empirical literature. *Social Science and Medicine*, *51*(7), 1087–1110. https://doi.org/10.1016/S0277-9536(00)00098-8

Meroni, A., & Sangiorgi, D. (2011). *Design for service*s. Surrey: Gower Publishing Limited.

Morelli, N. (2002). Designing product/service systems: A methodological exploration. *Design Issue*s, *18*(3), 3–17. https://doi.org/10.1162/074793602320223253

Ontario Ministry of Health and Long-Term Care. (2016). *2016–17 Published Plans and 2015–2016 Annual Reports.* Retrieved from http://www.health.gov.on.ca/en/common/ministry/publications/plans/ppar16/

Ontario Ministry of Health and Long-Term Care. (2019). Hallway health care: A system under strain – first interim report from the premier's council on improving healthcare and ending hallway medicine. Retrieved from http://www.health.gov.on.ca/en/public/publications/premiers_council/report.aspx

Penin, L. (2018). *Designing the invisible*. London, UK: Bloomsbury Publishing Plc.

Persaud, N. (2019, January 14). A national electronic health record for primary care. *CMAJ*, Vol. 191, pp. E28–E29. https://doi.org/10.1503/cmaj.181647

Pinhanez, C. (2009). Services as customer-intensive systems. *Design Issues*, *25*(2), 3–13. https://doi.org/10.1162/desi.2009.25.2.3

Portal, P. (2002). What you need to know about your dental plan. *The Journal of the Michigan Dental Association*, *84*(8), 11.

Price, M., Singer, A., & Kim, J. (2013). Adopting electronic medical records: Are they just electronic paper records? *Canadian Family Physician*, *59*(7).

Quest Diagnostics. (2020). myQuest. Retrieved March 8, 2020, from https://myquest.questdiagnostics.com/web/home

Root, R. W., & Draper, S. (1983). Questionnaires as a software evaluation tool. *Conference on Human Factors in Computing Systems – Proceedings*, (December), 83–87. https://doi.org/10.1145/800045.801586

Sangiorgi, D. (2009). Building up a framework for Service Design research. *8th European Academy of Design Conference, Aberdeen, Scotland*, (April), 415–420.

Sangiorgi, D. (2011). Transformative services and transformation design. *International Journal of Design*, *5*(2), 29–40.

Sangiorgi, D., & Junginger, S. (2015). Emerging issues in service design. *Design Journal*, *18*(2), 165–170. https://doi.org/10.2752/175630615X14212498964150

Sangiorgi, D., & Prendiville, A. (Eds.). (2017). *Designing for service: Key issues and new directions*.

London, UK: Bloomsbury Publishing.

Schuler, D., & Namioka, A. (Eds.). (1993). *Participatory design: Principles and practices*. Hillsdale, NJ: LEA Publishers.

Secomandi, F., & Snelders, D. (2011). The object of service design. *Design Issues*, *27*(3), 20–34. https://doi.org/10.1162/DESI_a_00088

Sharp, H., Rogers, Y., & Preece, J. (2015). Chapter 1: What is interaction design? *Interaction Design: Beyond Human-Computer Interaction*, 1–35.

Stanley, J. (2018). *Blockchain explained: How it works, who cares and what its future may hold.* Retrieved from https://www.techspot.com/article/1567-blockchain-explained/#blockchain-infographic

Steen, M. (2013). Co-design as a process of joint inquiry and imagination. *Design Issues*, *29*(2), 16–28. https://doi.org/10.1162/DESI_a_00207

Stickdorn, M., Lawrence, A., Hormess, M., & Schneider, J. (2018a). *This is service design doing: Applying service design thinking in the real world*. Sebastopol, CA.

Stickdorn, M., Lawrence, A., Hormess, M., & Schneider, J. (2018b). *This is service design methods: Expanded service design thinking methods for real projects*. Sebastopol, CA.

Stickdorn, M., & Schneider, J. (2011). *This is service design thinking*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Tapscott, D., & Tapscott, A. (2011). *Blockchain revolution: how the technology behind bitcoin is changing money*. Toronto, Ontario: Penguin Random House Canada Limited.

Trischler, J., Pervan, S. J., Kelly, S. J., & Scott, D. R. (2018). The value of codesign: The effect of customer involvement in service design teams. *Journal of Service Research*, *21*(1), 75–100. https://doi.org/10.1177/1094670517714060

Tsilidou, A. L., & Foroglou, G. (2015). *Further applications of the blockchain*. Retrieved from https://www.researchgate.net/publication/276304843

Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice*, *6*(5). https://doi.org/10.5430/jnep.v6n5p100

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing and Health Sciences*, Vol. 15, pp. 398–405. https://doi.org/10.1111/nhs.12048

Webster, P. C. hristophe. (2015). E-health progress still poor $2 billion and 14 years later. *CMAJ : Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne*, *187*(10), E309–E310. https://doi.org/10.1503/cmaj.109-5088

Wetter-Edman, K., Sangiorgi, D., Edvardsson, B., Holmlid, B., Gronroos, C., & Mattelmaki, T. (2014). Design for value co-creation: Exploring synergies between design for service and service logic. *Service Science*, *6*(2), 106–121.

Yu, E., & Sangiorgi, D. (2018). Exploring the transformative impacts of service design: The role of designer–client relationships in the service development process. *Design Studies*, *55*, 79–111. https://doi.org/10.1016/j.destud.2017.09.001

Appendix A

First Study Framework and Protocol

INTERVIEW/CO-DESIGN SESSION
Checklist of Materials

	MATERIALS	QUANTITY	NOTES
◯	Blank Consent Forms	2	Make sure participant signs forms before beginning session
◯	Journey Map Template	2	Blank – 24 x 18" - Corresponding to care of interest
◯	Journey Map Example	1	End User Patient Example – for review prior to beginning co-design
◯	Framework binder	1	Contains framework for sessions
◯	Icons container	1	Make sure there are enough of all icons printed for use
◯	Stationary case	1	Make sure all stationary is working and check quantity
	◯ Sharpies	10	Variety of colours
	◯ Highlighters	1	5 colour options
	◯ Gluesticks	2	
	◯ Double-Sided Tape	1	For use in case gluesticks dry out
	◯ Post-its	6	Variety of colours
	◯ Labels (white)	1	
	◯ Labels (multi-colour)	1	Package of labels for pulling out important information
	◯ Labels (multi-colour dots)	1	Package of multicolour dots for classifying information
	◯ Scissors	1	
◯	iPad		For taking notes during session
◯	iPhone		For audio recording of sessions (VoiceMemo App)
◯	Pen	2	For taking notes during session
◯	Notebook	1	For taking notes during session

INTERVIEW/CO-DESIGN SESSION
Protocol

INTRODUCTION

1. Personal intro
2. Discuss research study | purpose of session
3. Consent Form | review and sign
    a. Audio recording session
    b. Photography

PRELIMINARY QUESTIONS (FOR HEALTHCARE PROFESSIONALS)

1. What areas of healthcare have you worked in?
2. How long have you worked in healthcare?
3. Who do you interact with most on a day-to-day basis (patients, doctors)?

PRELIMINARY QUESTIONS (FOR PATIENTS)

1. How was your experience with (specific healthcare process)?
2. Could you tell me a bit more about your experience?
3. What are your overall thoughts with the convenience and efficiency of the current Ontario healthcare process?
4. When comparing the healthcare system with other services you use that you would rate highly, how would you compare both?

JOURNEY MAP CO-DESIGN ACTIVITY

1. Explain journey map process
2. Review materials: icons, stationary
3. Review patient journey map template example – prefilled information
4. Review blank journey map template
    a. HORIZONTAL AXIS: Phases
    b. VERTICAL AXIS: Categories of interest
        i. Information required
        ii. Communication
        iii. Service experience
        iv. Positives
        v. Pain points
        vi. Recommendations
5. Begin journey map session
6. Refer to prompt questions to garner specific insights on:
    a. Coordination of care
    b. Continuity of care
    c. Informed consent
    d. Access to health services
    e. Respectful care and treatment
    f. Overall experience of care

CONCLUSION

1. Additional thoughts/Concluding insights
2. Follow-up: User testing session in January/February participation
3. Thank you

FRAMEWORK

Gathering & Analyzing Patient Experience

Stage in the Patient Life Journey	A Change in Health	Seeking Assistance	Diagnosis	Treatment	Life with a Health Issue	Applying the Framework
Definition (Each stage includes various interactions with the healthcare system)	• Symptoms of an illness or chronic condition appear • An existing condition worsens • An episode of an existing condition • Suspecting something is wrong • An accident • An emergency • A change in life	• Visiting a health professional for assistance with a health issue PRIMARY CARE - Family Doctor SECONDARY CARE - Walk-in Clinic ACUTE CARE - Hospital Emergency	• Medical procedures involved in diagnosis PRIMARY CARE - Family Doctor SECONDARY CARE - Walk-in Clinic - Specialist - Scheduled Procedures/Surgeries - Diagnostic Services (blood work, x-rays) ACUTE CARE - Hospital Emergency	• Hospitalization • Medicines • Devices • Allied health treatments (group of care providers)	• Self-management of a condition • Ongoing treatment or other medical or health interventions • Staying well • Secondary prevention	• Assess the patient's main touchpoints with the healthcare system related to a specific condition • Holistic view of a patient's journey through common stages
POSITIVE OUTCOMES FOR PATIENTS and their carers at each stage of the journey (END-USERS)	At each stage, patients: • Can access safe, quality, timeline, appropriate health services • Patients are provided with all the relevant information they need about their care and have access to all information efficiently and timely so they have the ability to make an informed decision about their care • Experience coordinated care and smooth transitions between different services • Feel a sense of control over their life and their health - Many people find that being involved in self-management of their health helps them to feel stronger and more in control of their health - This can involve having the knowledge, skills and confidence to manage their own health, having a choice of healthcare provider and having a degree of personal independence • Are able to share their experiences to inform service delivery and policy - Patients have avenues for complaints and feedback, and opportunities to contribute to policy making at every level through meaningful and supported engagement					• Refer to prompt questions designed to extract insights from participants to help determine the information that is relevant to a patient
Desired HEALTH SERVICE & SYSTEM OUTCOMES (STAKEHOLDERS)	• There is a consistently high standard of patient-centred care across all parts of the health system • Population and individual health outcomes are measured and recorded • Health system is cost-effective and efficient • Resources are appropriately distributed across the system to achieve improved health outcomes					• Refer to prompt questions designed to extract insights from participants to help determine the information that is relevant to stakeholders
Outcomes are mediated by:	• Patient's expectation of their health status and health services • Patients' and carers' confidence and ability to undertake self-advocacy and take part in system advocacy • Health policy and funding context • Organizational and management factors in different health settings • Health workforce issues					• Wider system issues mediate good patient experience outcomes
Patient Experience can provide evidence about:	• The extent to which desired individual and system outcomes are met • Patient and carer experiences of health, illness and care including: - The experience of a change in health, diagnosis, treatment and management (and how well health services/systems respond to these - Reasons for waiting or seeking health assistance - When, why, how, to whom services are accessible or inaccessible - Quality of relationships with health professionals (communication, trust, respect) - What patients expect of their own health and of health services					• Patient experience can provide an essential base for responding to healthcare challenges

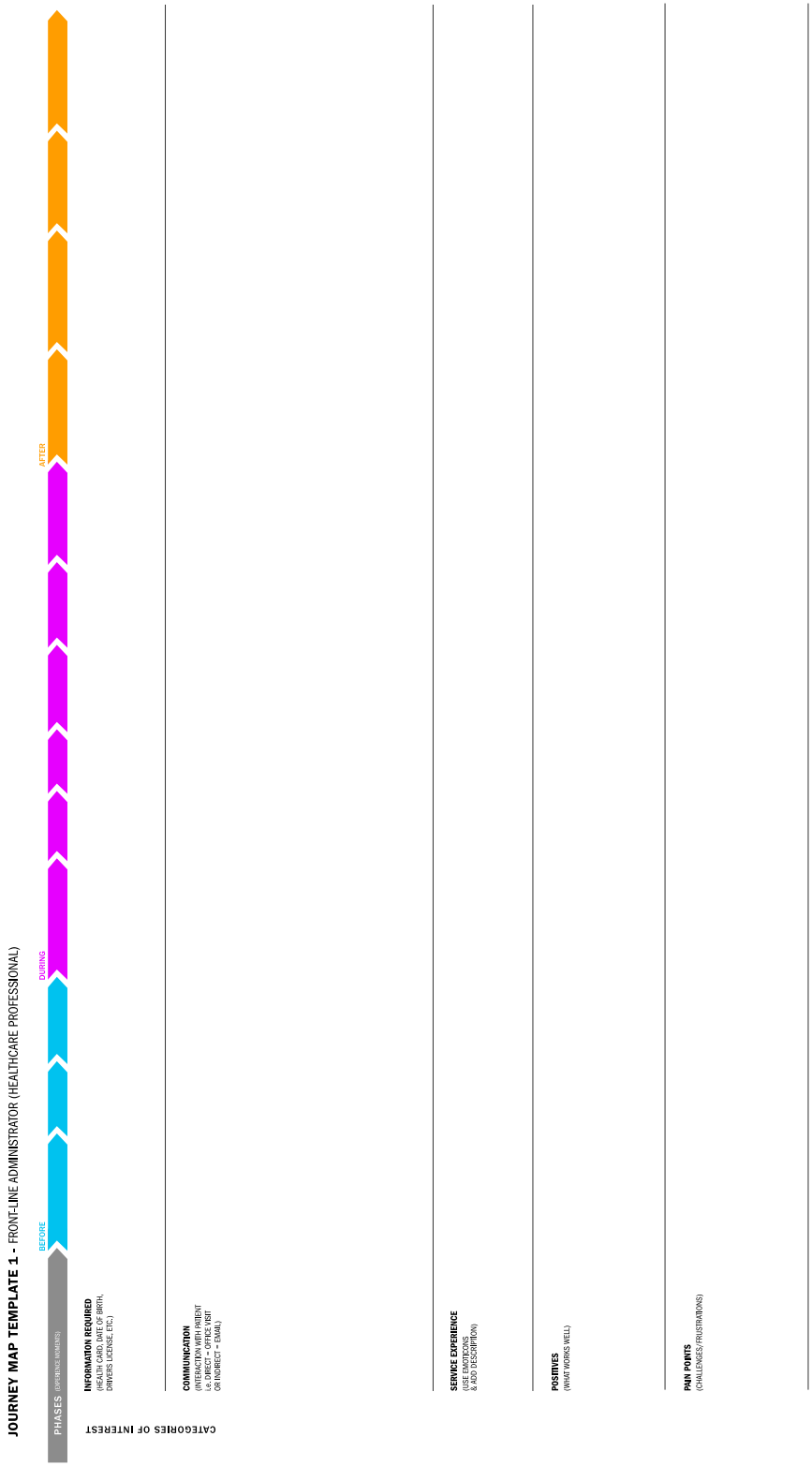
FRAMEWORK

Gathering & Analyzing Patient Experience
PROMPT QUESTIONS

Stage in the Patient Life Journey	A Change in Health	Seeking Assistance	Diagnosis	Treatment	Life with a Health Issue	Applying the Framework
Prompt questions to ask about patient experience at each stage during session	COORDINATION OF CARE 1. Thinking about all the medical and health professionals that you have dealt with how would you describe your relationship with those people? 2. How would you describe the care you have received? 3. Thinking about your experience of health care, what would you say has been the most difficult or challenging part of this experience? 4. If you were talking to a friend who had recently been diagnosed with the same condition as you, what would you tell them to expect? 5. If you could change anything about the experience of health care you received, what would that be? 6. What sort of health services do you use? 7. When did you first seek help from a healthcare professional? 8. If you could change one thing about your care, what would that be? 9. In your opinion, can you tell me how much technology you think should be incorporated in the delivery of healthcare services (i.e. AI diagnostics, mobile check-in, electronic medical records)? 10. From your experience interacting with patients, what do you see are common frustrations they experience when coming to your medical facility? 11. When did you first seek medical advice and from whom? 12. Were you referred to specialists? How did that process work? How long did it take? CONTINUITY OF CARE 1. What happened after you left the hospital? Who looked after your health? 2. Did the hospital of other services follow up once you were back home? INFORMED CONSENT 1. Did you know what to expect before you had the treatment/procedure? Were there any surprises? 2. Do you do anything to manage your condition now (after treatment)? ACCESS TO HEALTH SERVICES 1. Have you always been able to access the service when you needed to? 2. What sort of health services do you use? 3. Did you ever have difficulties accessing care or healthcare services that you needed? What did you do then? RESPECTFUL CARE & TREATMENT 1. Thinking about all the medical and health professionals that you have dealt with, how would you describe your relationship with those people? OVERALL EXPERIENCE OF CARE 1. Is there anything that's worked especially well in the care you've received? 2. Is there anything that hasn't worked well in the care you've received? 3. In your opinion, are there any changes that could assist you to stay as healthy as you can be, into the future? 4. If you could change one thing about your care, what would that be?					• SEMI-STRUCTURED CO-DESIGN SESIONS allow patients to tell stories that can identify service design intervention points and shape better decisions

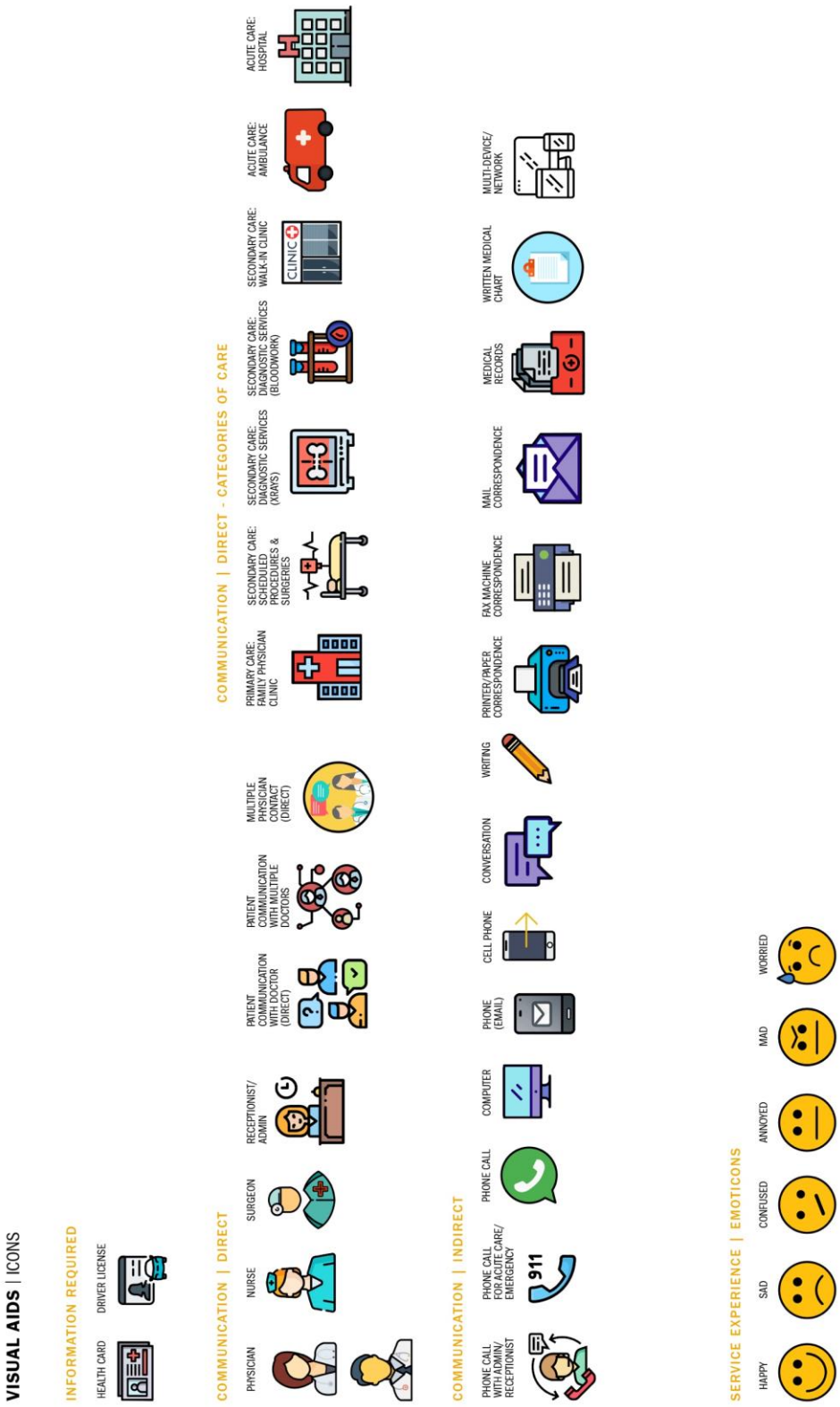
Appendix B

First Study Journey Map Template



Appendix C

First Study Icons and Emoticons



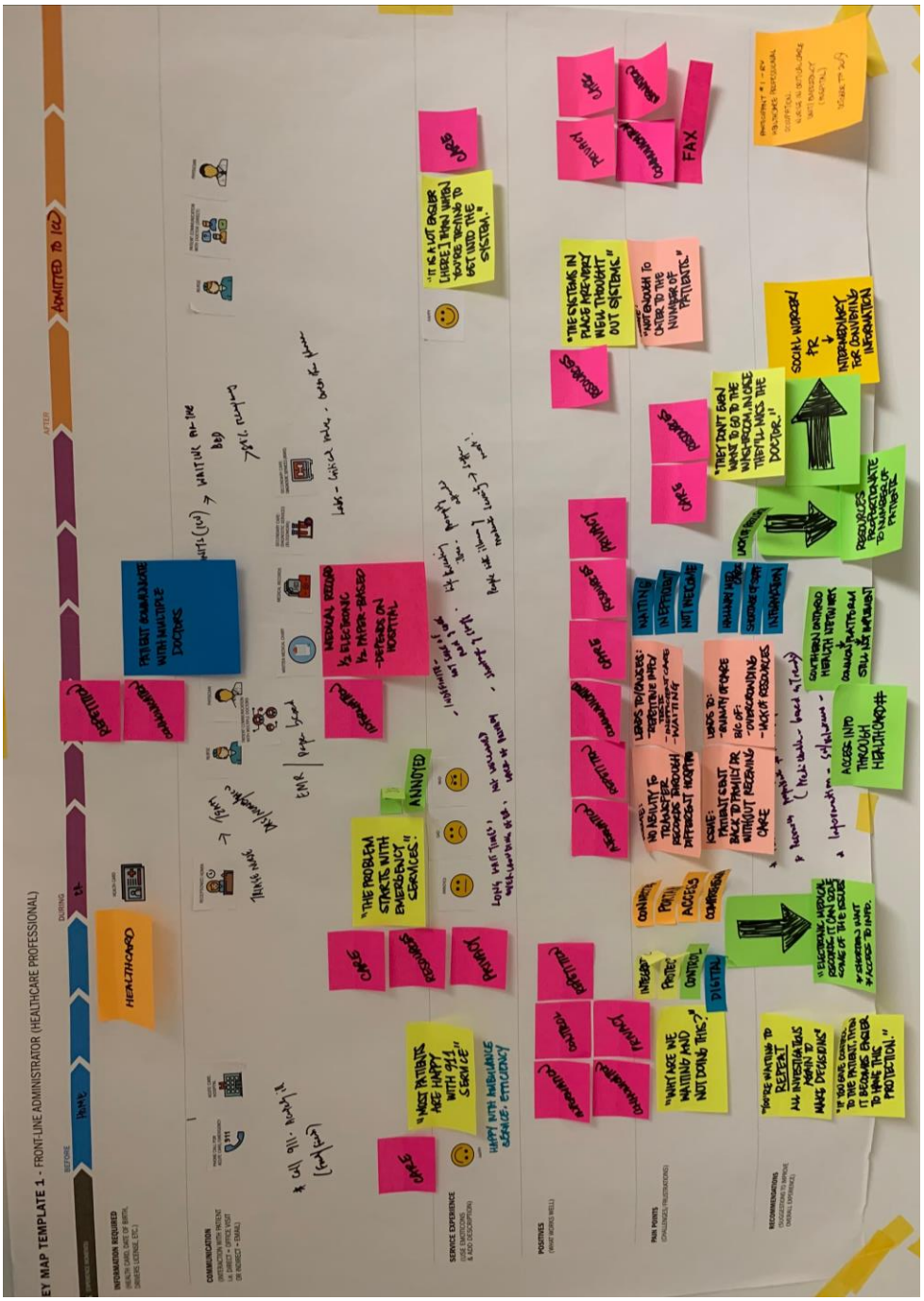
Appendix D

First Study Journey Map Thematic Analysis

ACUTE CARE

Healthcare Provider | Participant HP1

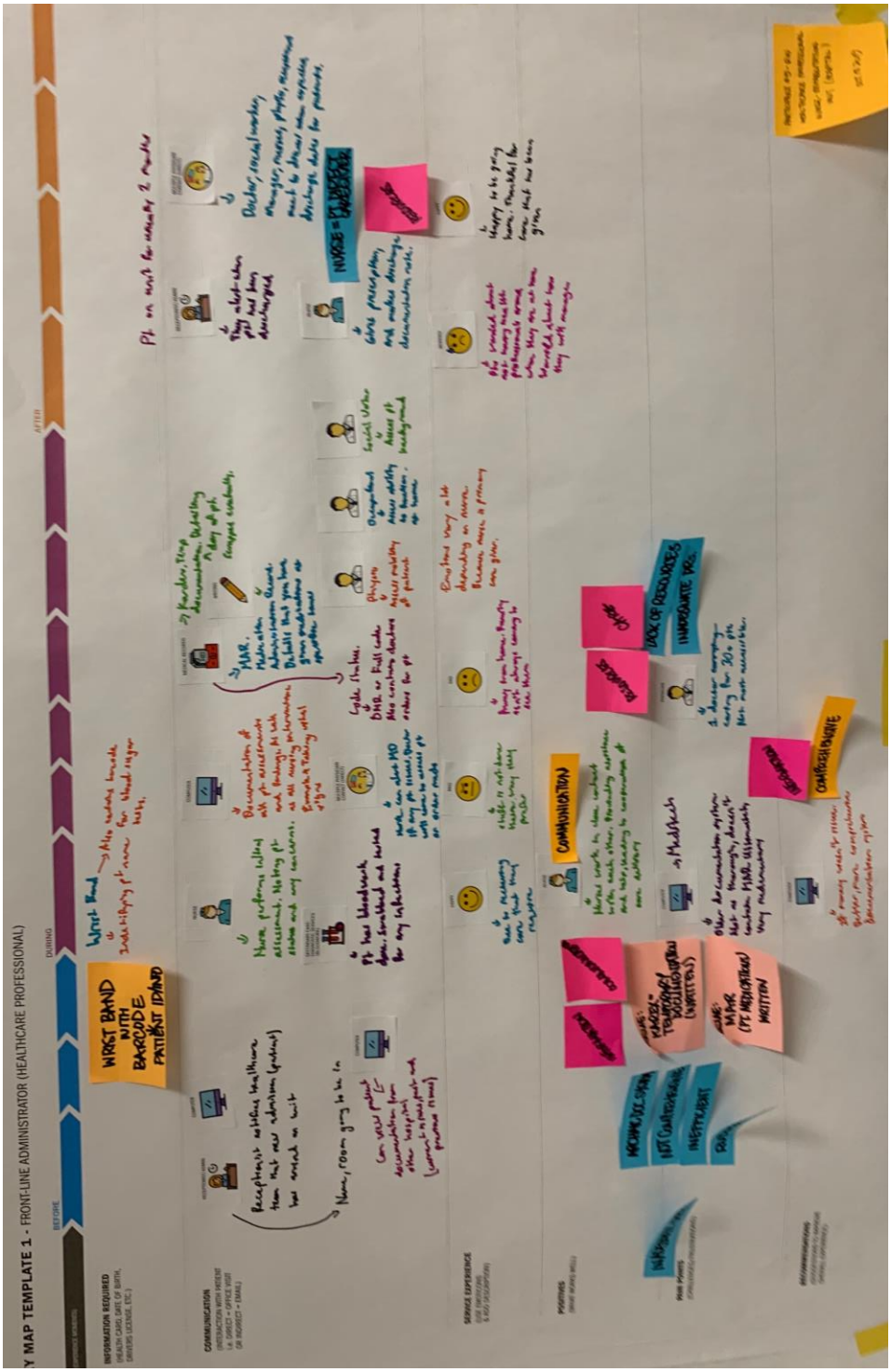
Critical Care Nurse at Hospital Journey



ACUTE CARE

Healthcare Provider | Participant HP5

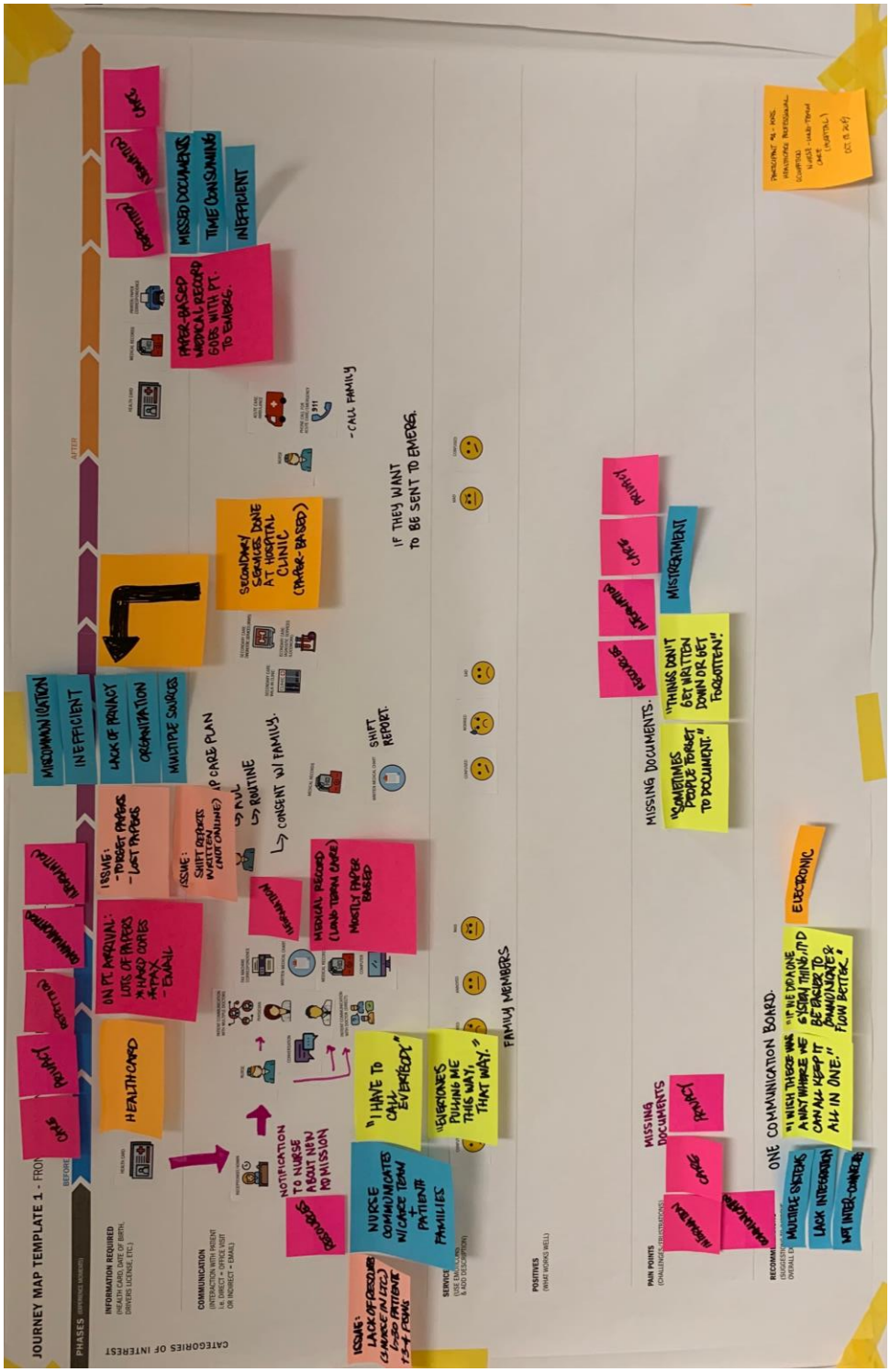
Rehabilitation Nurse at Hospital Journey



ACUTE CARE

Healthcare Provider | Participant HP4

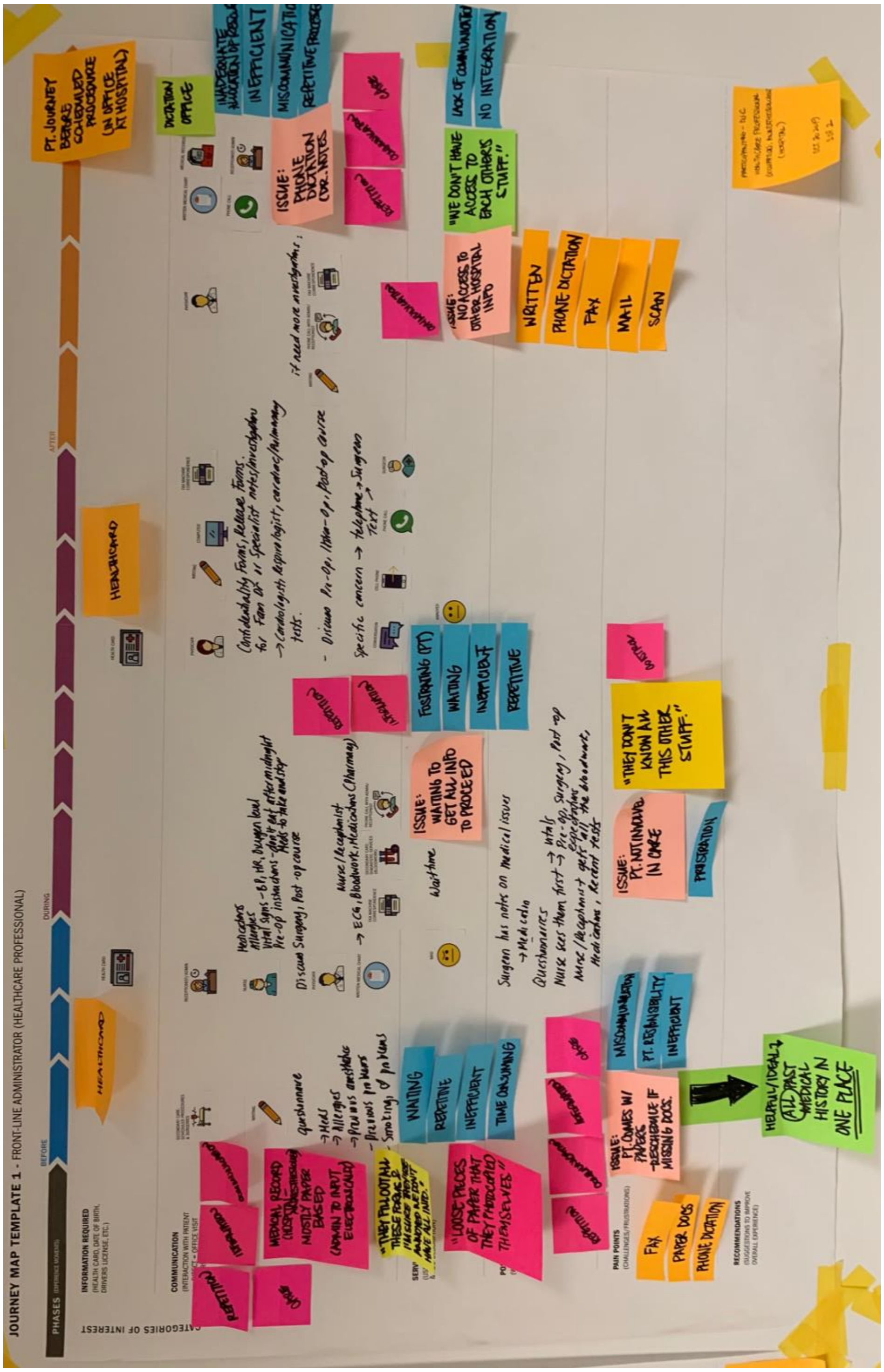
Long-Term Care Nurse at Hospital Journey



ACUTE CARE

Healthcare Provider | Participant HP6

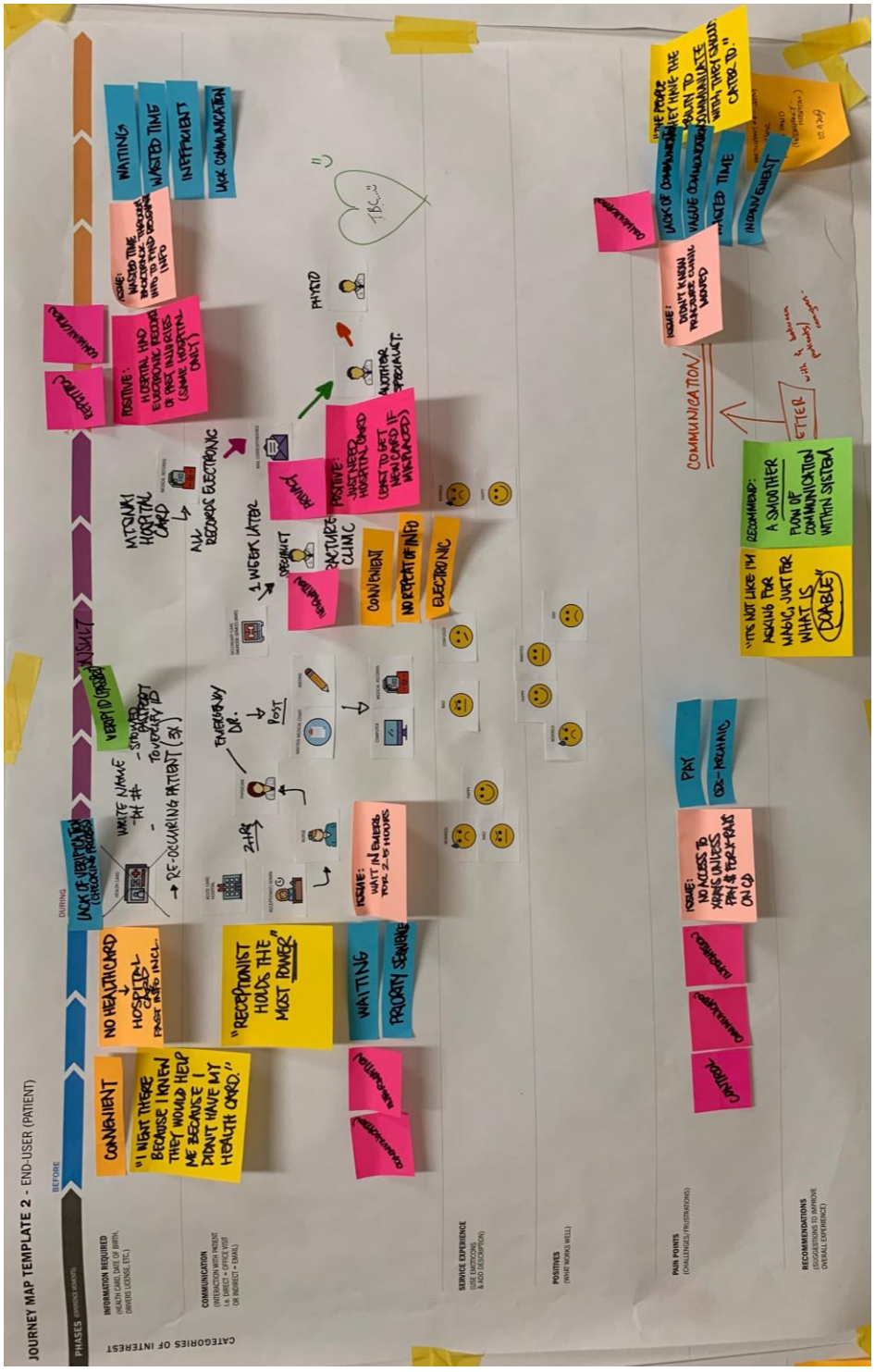
Anesthesiologist Journey



ACUTE CARE

Patient of Care | Participant PC4

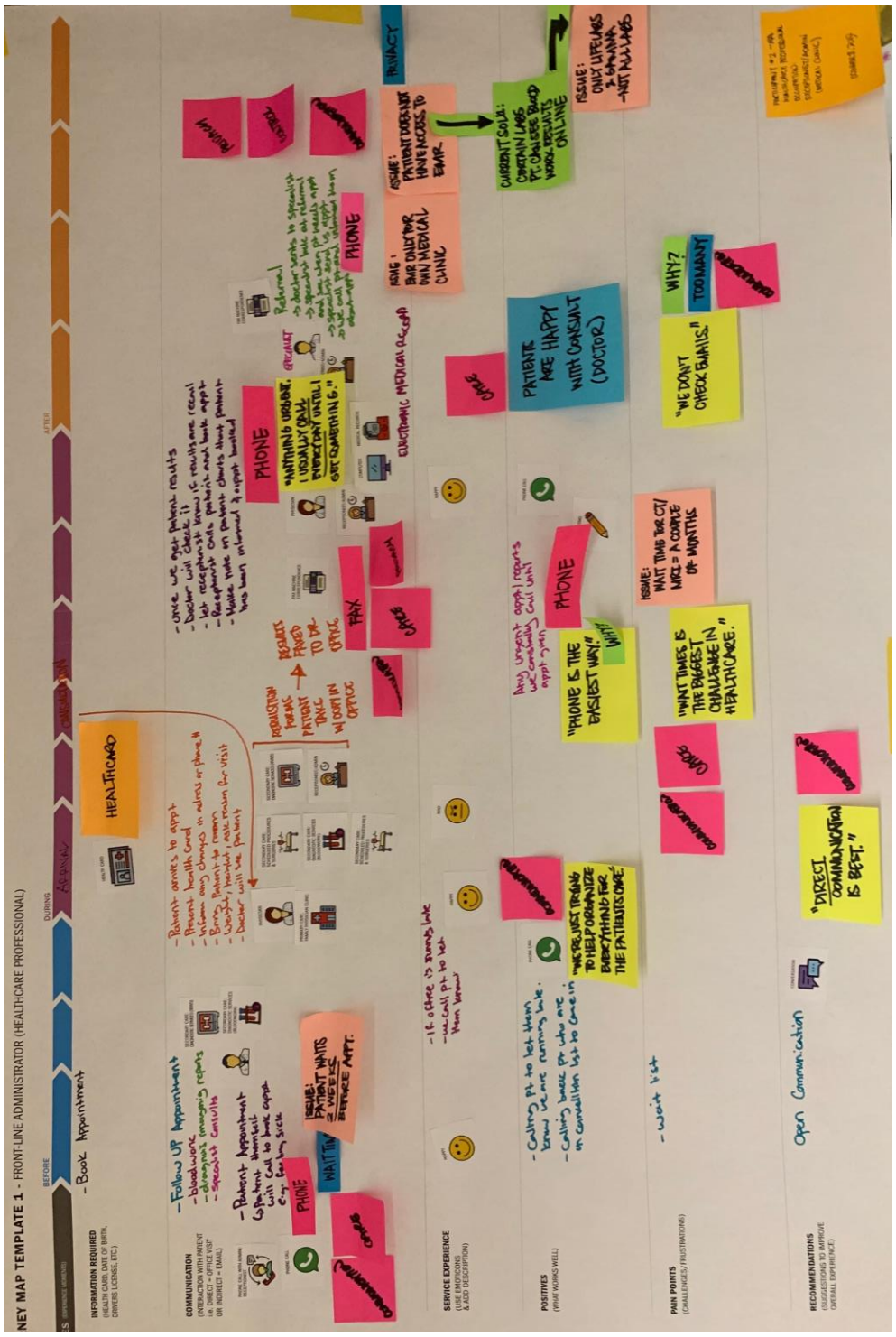
Hospital Emergency Room Journey



PRIMARY CARE

Healthcare Provider | Participant HP3

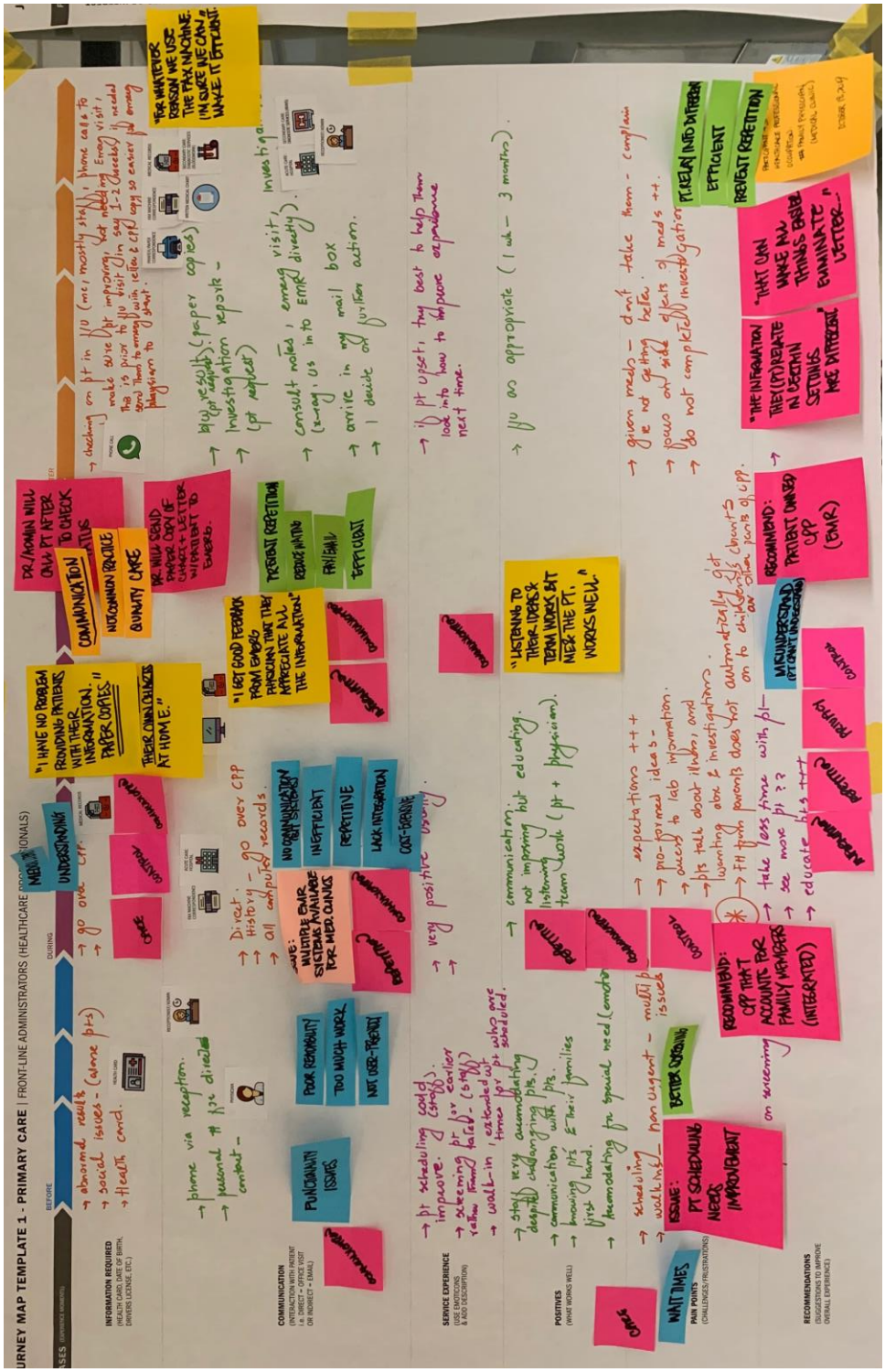
Family Medical Clinic Administrator Journey



PRIMARY CARE

Healthcare Provider | Participant HP3

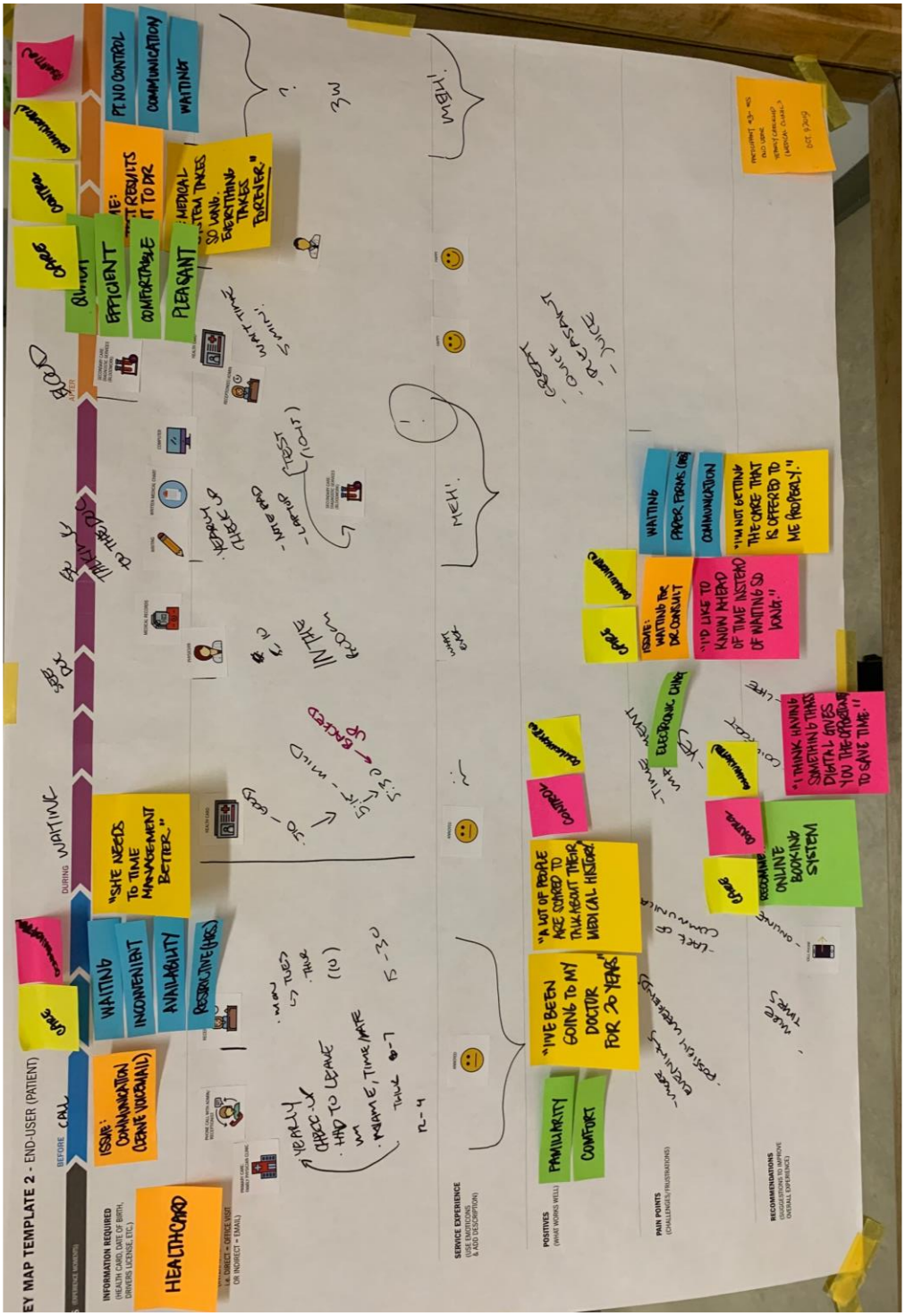
Family Physician



PRIMARY CARE

Patient of Care | Participant PC3

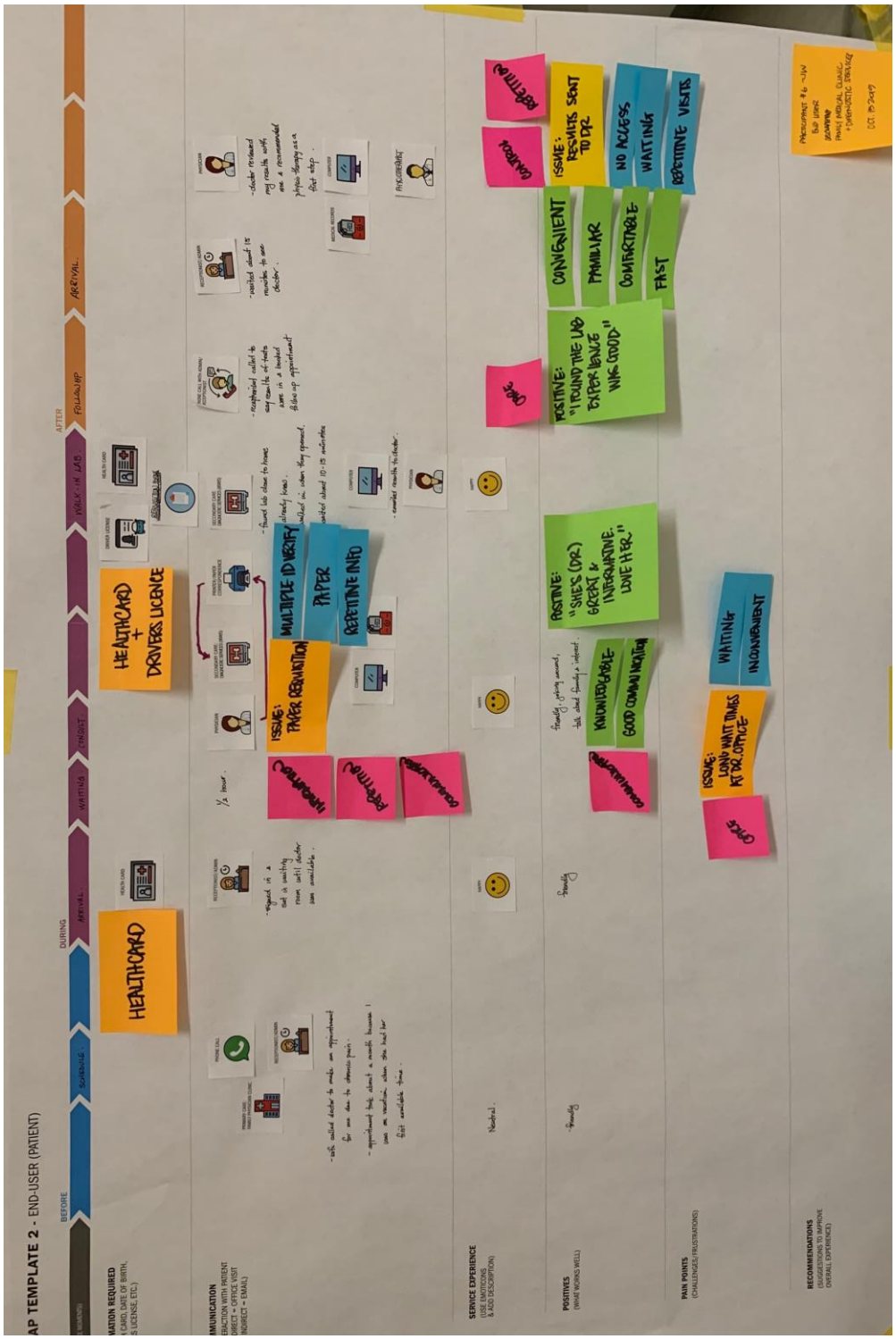
Family Medical Clinic Journey



PRIMARY CARE

Patient of Care | Participant PC6

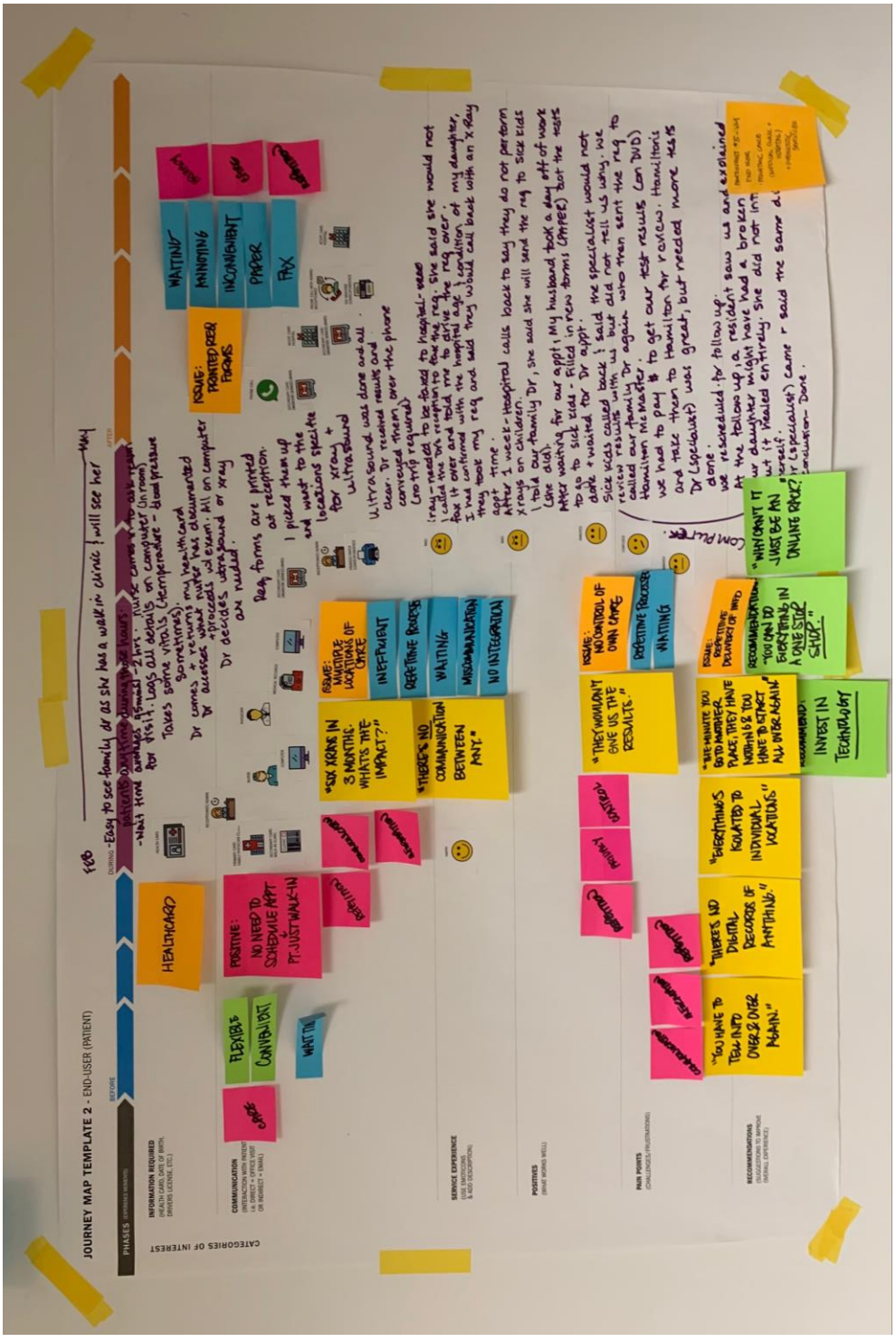
Family Medical Clinic Journey



PRIMARY CARE

Patient of Care | Participant PC5

Family Medical Clinic + Diagnostic Lab Journey



SECONDARY CARE

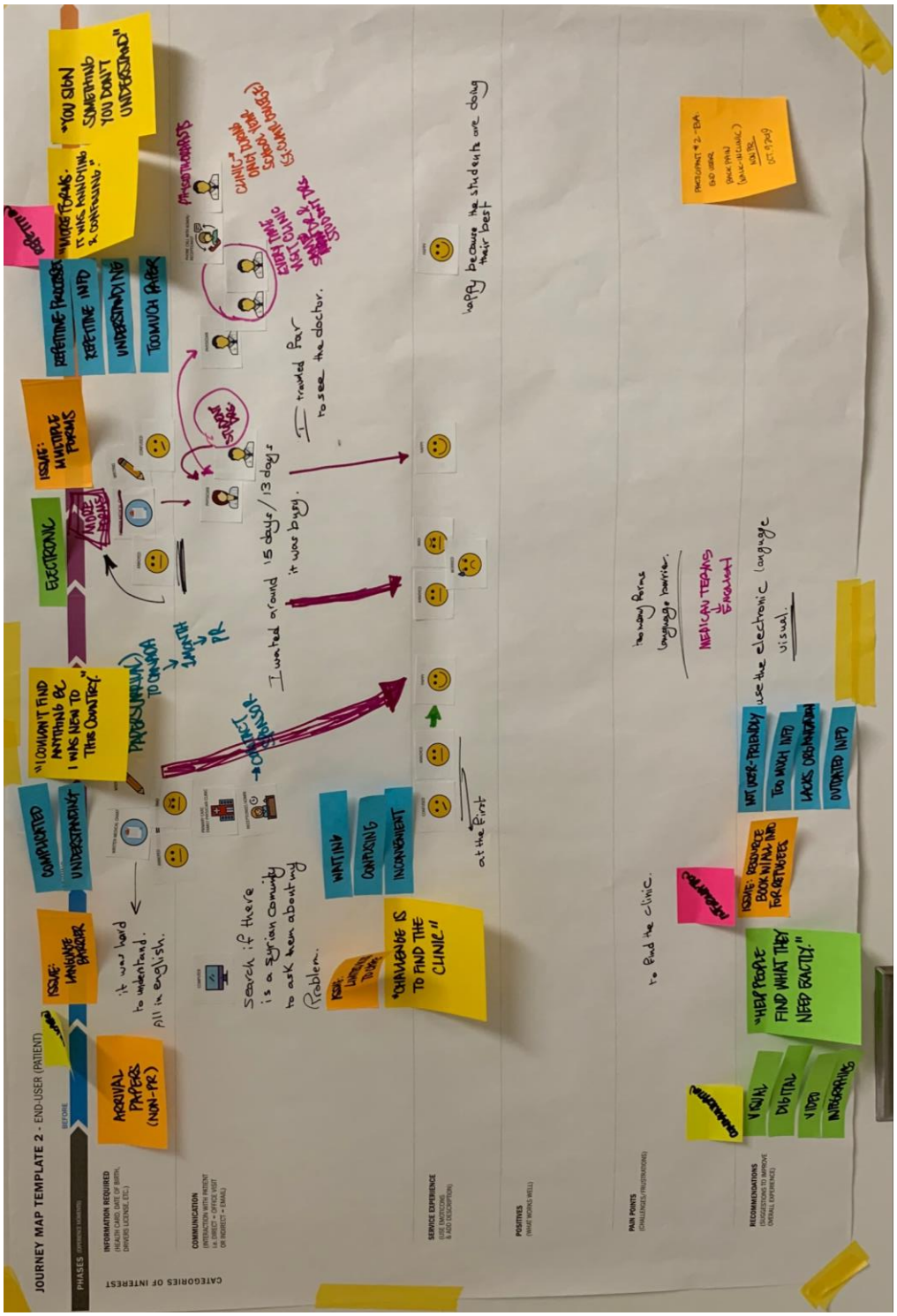
Patient of Care | Participant PC1

Walk-in Clinic Journey

SECONDARY CARE

Patient of Care | Participant PC2

Walk-in Clinic Journey



JOURNEY MAP + INTERVIEW ANALYSIS

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience										
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
CARE	INADEQUATE CARE	Mostly Paper Based Medical Record/Chart	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Acute Care	KC(HP4)	"If a patient doesn't have all their papers and everything, then they have to come back or they'd have to fax it."
CARE	INADEQUATE CARE	One of the main challenges is when DR does not have all the information required to proceed with care - PT has to come back	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"One of the main challenges, that you don't have it all…you can't do a correct diagnosis without all this stuff."
CARE	INADEQUATE CARE	DR has to coordinate with multiple members of care team to gain comprehensive PT info	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"If you don't have that information then you're waiting…while trying to get the information, calling the family doc or cardiologist saying, I have this patient right no, I need this information now, fax it now."
CARE	INADEQUATE CARE	PT EMR does not connect with other family members EMR	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update,"
CARE	INADEQUATE CARE	Mostly Paper Based documentation	Pain Point	Yes	Yes	Yes									Primary Care	AMG(PC1)	"At the walk-in clinic they would have lots of paper files…everything was by hand. Nobody saved anything on their computer."
CARE	INADEQUATE CARE	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	BK(PC2)	"Did they have a chart for you that they had from before, your last visit? No…they didn't keep record…they didn't write, I wrote everything in the forms."
CARE	INADEQUATE CARE	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
CARE	INADEQUATE CARE	EMR system that contains each family members EMR and updates each automatically with relevant information and changes	Solution	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update,"
CARE	OLD TECHNOLOGY	Reliant on FAX to relay vital patient information	Pain Point	Yes	Yes	Yes	Yes								Acute Care	RVP(HP1)	"Currently, unless she sends a copy or she faxes a copy to this particular specialist, he won't have access to that, It's still through fax."
CARE	OLD TECHNOLOGY	PT arrives to longterm care unit with papers of medical history/info or info is faxed to nurse in unit	Pain Point	Yes	Yes	Yes	Yes								Acute Care	KC(HP4)	"When they arrive, everything is given to me already…I have most of the papers depending. Sometimes still, the place where they're coming from, they send it through fax or through email or a
CARE	OLD TECHNOLOGY	Receptionist will have to get all PT information faxed from different sources	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Usually the receptionist will get that all fixed form wherever they got it,"
CARE	OLD TECHNOLOGY	Communication between medical clinics and diagnostic labs through fax	Pain Point	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"They send it usually through fax."
CARE	OLD TECHNOLOGY	Receptionist send PT medical chart to specialist for consultation and care	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"We send over all the blood work and ECG and any heart tests through fax."
CARE	OLD TECHNOLOGY	Maximize on technology available	Solution	Yes	Yes	Yes	Yes								Acute Care	RVP(HP1)	"Currently, unless she sends a copy or she faxes a copy to this particular specialist, he won't have access to that, It's still through fax."
CARE	OLD TECHNOLOGY	Diagnostic services are called up to nurses from lab if there are critical values, otherwise uploaded to computer	Pain Point	Yes		Yes									Acute Care	RVP(HP1)	"And if there are critical values, they will call up and tell us on the phone."
CARE	OLD TECHNOLOGY	If lab finds critical values in diagnostic tests, will phone up to tell nurses about abnormal/critical results	Pain Point	Yes		Yes									Acute Care	RVP(HP1)	"And if there are critical values, they will call up and tell us on the phone,"
CARE	OLD TECHNOLOGY	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
CARE	OVERCROWDING	PT waits on average 2 weeks before getting appointment with walk-in clinic	Pain Point	Yes	Yes						Yes	Yes	Yes		Primary Care	BK(PC2)	"The appointment was late because there's a lot of people there…15 days, Two weeks, It was really busy,"
CARE	OVERCROWDING	Would be ideal to have everything else connected to it.	Solution	Yes	Yes	Yes	Yes				Yes				Acute Care	RVP(HP1)	"There's no comprehensive kind of access to what both the physicians do."
CARE	QUALITY OF CARE	Because PT history is not known on arrival, processes are repeated because hospital has no record of previous care (i.e,	Pain Point	Yes	Yes	Yes									Acute Care	RVP(HP1)	"Electronic medical records, it can solve some of the issues because you know, the patient have had investigations two days prior to coming to the emergency room and if you don't have a copy of
CARE	QUALITY OF CARE	DR has receptionist call PT 2-4 days in severe illness situations post consult - NOT COMMON PRACTICE FOR MOST FAMILY	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"In addition to making a follow-up visit, I asked the girls to call them two days later or four days later just to make sure that they're actually progressing in the direction that I want."
CARE	QUALITY OF CARE	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened…So they don't have to wait for eight hours. It just improves the wait time for them."
CARE	QUALITY OF CARE	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Positive	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that, That program hasn't started as yet, but once it starts it will make it easier…I hope that happens because
CARE	QUALITY OF CARE	Giving PT access to their own EMR	Positive	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again."
CARE	QUALITY OF CARE	PT relay information depending on setting	Pain Point	Yes		Yes									Primary Care	DSA(HP3)	"Patients also, the information that they relate in certain settings is different."
CARE	QUALITY OF CARE	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart."
CARE	QUALITY OF CARE	Communication is good between medical clinic and PT	Positive	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think our communication is very good, I think we know everybody by first name actually,"
CARE	QUALITY OF CARE	PT sometimes don't do all their tests and DR has to do investigations repeatedly - especially preventative diagnostic tests	Pain Point	Yes			Yes				Yes				Primary Care	DSA(HP3)	"But they don't complete theirs, especially the preventative measures, mammograms, bone density test or their colon cancer screening for example, they do not complete them. And so sometimes I
CARE	QUALITY OF CARE	PT EMR does not connect with other family members EMR	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update,"
CARE	QUALITY OF CARE	PT is happy with efficiency, care and speed of diagnostic labs	Positive	Yes	Yes			Yes							Primary Care	ES(PC3)	"I'm happy, bloodwork takes around 5 minutes."
CARE	QUALITY OF CARE	Receptionist does not update PT in waiting room about wait time	Pain Point	Yes	Yes						Yes				Primary Care	Est(PC3)	"And then I wait. And there's no update…I think that's what gets annoying…as a patient or as someone coming in to get checked up, I'm not getting the care that is offered to me properly."
CARE	QUALITY OF CARE	PT relay information depending on setting	Pain Point	Yes		Yes									Primary Care	ES(PC3)	"A lot of people are scared to talk about their medical history or what's wrong with them and they avoid seeing the doctor…comfort."
CARE	QUALITY OF CARE	PT can't understand investigations	Pain Point	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	AMG(PC1)	"Because of the language barrier…doctor terms or hospital terms…they're like terms that I don't know."
CARE	QUALITY OF CARE	Without the school form, PT has no access to care	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"If they don't have the form it doesn't matter if I have the insurance or not…the clinic is not going to take me because I don't have a health card."
CARE	QUALITY OF CARE	PT doesn't have access to their medical record	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	AMG(PC1)	"I need a copy to make my own file but they wouldn't give me a copy."
CARE	QUALITY OF CARE	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
CARE	QUALITY OF CARE	Electronic Medical Record System would shorten wait times because you have access to previous processes completed so PT	Solution	Yes	Yes	Yes									Acute Care	RVP(HP1)	"Electronic medical records, it can solve some of the issues because you know, the patient have had investigations two days prior to coming to the emergency room and if you don't have a copy of
CARE	QUALITY OF CARE	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea, I think it reduces the number of times the same questions are asked over and over again."
CARE	QUALITY OF CARE	PT have access to their own EMR	Solution	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	DSA(HP3)	"Patient's cannot read their investigations."
CARE	QUALITY OF CARE	EMR system that contains each family members EMR and updates each automatically with relevant information and changes	Solution	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update,"
CARE	QUALITY OF CARE	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up…you
CARE	WAITING	Long wait time upon arrival to emerg	Pain Point	Yes	Yes										Acute Care	RVP(HP1)	"The problem starts with emergency services, It's because of the long wait,"
CARE	WAITING	PT with moderate illness are the ones who suffer most because critical PT are seen first even through these PT are in pain (Order	Pain Point	Yes											Acute Care	RVP(HP1)	"Illnesses of moderate severity is the ones who suffer most."
CARE	WAITING	PT has to consult with multiple doctors	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"They sometimes see another doctor before or after me. Sometimes they see multiple doctors at the same time,"
CARE	WAITING	Receptionist will have to get all PT information faxed from different sources	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Sometimes they have to call the pharmacy to try and get all the medications if they don't bring their medications,"
CARE	WAITING	If PT does not have all information or test results, will have to get referral form and perform tests again before scheduled procedure	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Then you go home or they see another doctor and then they come back another day for all the stuff that I want them to get."
CARE	WAITING	DR has to coordinate with multiple members of care team to gain comprehensive PT info	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"If you don't have that information then you're waiting…while trying to get the information, calling the family doc or cardiologist saying, I have this patient right no, I need this information now, fax it now."
CARE	WAITING	Long wait time upon arrival to emerg	Pain Point	Yes	Yes					Yes	Yes	Yes	Yes		Acute Care	JSM(PC4)	"I waited a solid two and a half hours."

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience										
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
CARE	WAITING	PT has to wait a week before diagnostic test results came back and has to schedule follow-up appointment for results	Pain Point	Yes			Yes						Yes		Acute Care	JSM(PC4)	"That's when I got follow-up appointment that had to see a specialist just to determine the gravity of the situations…a week later,"
CARE	WAITING	PT showed only hospital card as ID which had all medical history from the hospital	Positive	Yes	Yes	Yes	Yes	Yes							Acute Care	JSM(PC4)	"I had to being my Mount Sinai hospital card,"
CARE	WAITING	PT waits on average 2 weeks before getting appointment with family physician	Pain Point	Yes	Yes										Primary Care	RH(HP2)	"At our clinic about two weeks or so."
CARE	WAITING	Receptionist send referral form to specialist and waits to confirm appointment for patient through fax	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I would wait until they send me back an appointment."
CARE	WAITING	PT happy when receptionist calls to inform them of impending wait times and keep them updated so they don't have to wait in	Positive	Yes	Yes			Yes							Primary Care	RH(HP2)	"If we are running late, let's say 30 minutes, I would call in advance…it helps so much and then you get a lot more happy patients."
CARE	WAITING	Wait times for diagnostic services - Lo. couple of months CT and MRI	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I think that's pretty much the biggest challenge in healthcare for Canada. It's just the wait time because especially if you want to get an appointment for a CT or MRI, you have to wait a couple of
CARE	WAITING	Long wait times for diagnostic services and scheduled procedures and specialist appointments	Pain Point	Yes			Yes				Yes	Yes			Primary Care	RH(HP2)	"It depends on the type of specialists. Sometimes like with knee surgery that could be booking until next year."
CARE	WAITING	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened…So they don't have to wait for eight hours. It just improves the wait time for them."
CARE	WAITING	Family physician medical clinic fax diagnostic service requisition forms to hospital or labs	Pain Point	Yes			Yes								Primary Care	DSA(HP3)	"The requirement is for us to fax that requisition."
CARE	WAITING	Extended wait times for PT	Pain Point	Yes		Yes					Yes	Yes			Primary Care	DSA(HP3)	"Patient scheduling could improve on my side."
CARE	WAITING	PT had to leave message with receptionist and wait for call back to book appt for yearly checkup with family physician	Pain Point	Yes	Yes						Yes				Primary Care	ES(PC3)	"Called the reception, left a voicemail saying I needed to book my appointment for my yearly checkup…during their office hours…the receptionist usually calls back the next day,"
CARE	WAITING	PT is annoyed with booking process and having to wait up to 10 days for appointment with family physician	Pain Point	Yes	Yes						Yes				Primary Care	ES(PC3)	"I get annoyed with booking…I have to wait 10 days usually…she should either have more times that are available for evenings…she has very restrictive hours and one evening."
CARE	WAITING	PT waits for up to 20 minutes for family physician consult	Pain Point	Yes	Yes						Yes				Primary Care	ES(PC3)	"I'm annoyed at this stage…the longest I've ever waited was 20 minutes…I'm usually either annoyed…on the cusp because I get agitated."
CARE	WAITING	PT has to wait before diagnostic test results came back to doctor (2-3 weeks)	Pain Point	Yes			Yes						Yes	Yes	Primary Care	ES(PC3)	"They don't tell me, After this is all done, they'll be like, your results will be passed along to your doctor and she'll give you a call if anything happens…they don't really say when."
CARE	WAITING	PT had to wait 6 months to get diagnostic test appt - mammogram	Pain Point	Yes			Yes				Yes	Yes			Primary Care	ES(PC3)	"My mom had to wait six months to know about their referral to get a mammogram done."
CARE	WAITING	PT had to wait 1 month for appt to see family physician	Pain Point	Yes	Yes										Primary Care	JW(PC6)	"I think it was about a month when she had their first appointment available."
CARE	WAITING	PT had to wait in waiting room half hour before consult with family physician	Pain Point	Yes	Yes						Yes				Primary Care	JW(PC6)	"Any kind of annoyance, just the wait time."
CARE	WAITING	All test results are electronically sent to DR from diagnostic lab	Positive	Yes			Yes	Yes							Primary Care	JW(PC6)	"Whenever you take x-rays or ultrasounds, the technician takes the results and puts it in the computer and then it gets sent to my doctor."
CARE	WAITING	PT had to go through multiple channels to have access to care	Pain Point	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Primary Care	AMG(PC1)	"First you have to go and make an appointment with your insurance people, then they'll contact the doctor and then tell you which walk-in clinic and what time you're going to go…and that's every time
CARE	WAITING	PT had to contact insurance numerous times to get access to care	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"It was super, super, super, super frustrating because I had to call them at least seven times."
CARE	WAITING	PT had long wait time at walk-in clinic - two hours	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"A walk-in clinic, you have to wait a long time. They give you a number and you have to be there really early, early morning…I was annoyed…I waited two hours…I wait two hours just so they can
CARE	WAITING	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"I went through all over again…back to the same clinic and same paper work…because they didn't have any records like the school forms and insurance…so I had to do all the process from stage
CARE	WAITING	Specific walk-in clinic had sign in machine that reduced wait time and increased efficiency	Positive	Yes	Yes			Yes							Primary Care	AMG(PC1)	"The machine asks for your student ID and insurance, And the machine has a Spanish version and multiple languages, you just choose…depending on the doctor it tells you how long you have to
CARE	WAITING	PT waits on average 2 weeks before getting appointment with walk-in clinic	Pain Point	Yes	Yes						Yes	Yes	Yes		Primary Care	BK(PC2)	"The appointment was late because there's a lot of people there…15 days, Two weeks, It was really busy."
CARE	WAITING	PT of the family physician can walk in for appt at any time	Positive	Yes	Yes			Yes							Primary Care	VH(PC5)	"If you're a patient of hers, you can actually walk in during any time and see the family doctor."
CARE	WAITING	PT waits on average 2 hours in waiting room to see family physician	Pain Point	Yes	Yes						Yes				Primary Care	VH(PC5)	"The longest time so far has been two hours."
CARE	WAITING	PT not given access to their results, have to send back to doctor	Pain Point	Yes			Yes					Yes			Primary Care	VH(PC5)	"They wouldn't give us the results…"We don't have a doctor who will do that"…send it back to our doctor."
CARE	WAITING	No connection between multiple systems leads to a lot of waiting at multiple healthcare providers	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	VH(PC5)	"So the doctor has everything digital. But the minute you go to another place, they have nothing and they have to start all over again. They ask you the same questions…there's no communication, no
CARE	WAITING	PT had to make multiple phone calls to multiple healthcare institutions leading to extended waiting	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
CARE	WAITING	Screening PT for earlier rather than later appointment	Solution	Yes		Yes					Yes	Yes			Primary Care	DSA(HP3)	"Patient scheduling could improve on my side."
CARE	WAITING	More flexible appointment times and dates	Solution	Yes	Yes						Yes				Primary Care	ES(PC3)	"I get annoyed with booking…I have to wait 10 days usually…she should either have more times that are available for evenings…she has very restrictive hours and one evening."
CARE	WAITING	Maximize on technology available - online booking system	Solution	Yes				Yes							Primary Care	ES(PC3)	"I think having something that's digital gives you the opportunity to save time…Reserve, get my email, add it into my calendar and then go on."
CARE	WAITING	Maximize on technology available	Solution	Yes	Yes			Yes							Primary Care	AMG(PC1)	"The machine asks for your student ID and insurance, And the machine has a Spanish version and multiple languages, you just choose…depending on the doctor it tells you how long you have to
CARE	WAITING	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up…you
COMMUNICATION	EFFICIENCY	Because PT history is not known on arrival, processes are repeated because hospital has no record of previous care (i.e,	Pain Point	Yes	Yes	Yes									Acute Care	RVP(HP1)	"Electronic medical records, it can solve some of the issues because you know, the patient have had investigations two days prior to coming to the emergency room and if you don't have a copy of
COMMUNICATION	EFFICIENCY	Wristbands have barcode than can be scanned for immediate PT info including blood sugar test results	Positive	Yes		Yes		Yes							Acute Care	RW(HP5)	"Wristband is the piece of information that they pretty much always have to have on them."
COMMUNICATION	EFFICIENCY	PT admitted to Emerg without a health card because he was already in system with prior visits	Positive	Yes	Yes			Yes							Acute Care	JSM(PC4)	"Because I have a valid health card, which is why I was able to bypass me not having a health card."
COMMUNICATION	EFFICIENCY	Hospital Emerg had records of PT previous visits and history to same location	Positive	Yes	Yes										Acute Care	JSM(PC4)	"Did they have records of your previous injuries? They did,"
COMMUNICATION	EFFICIENCY	PT showed only hospital card as ID which had all medical history from the hospital	Positive	Yes	Yes	Yes	Yes	Yes							Acute Care	JSM(PC4)	"I had to being my Mount Sinai hospital card."
COMMUNICATION	EFFICIENCY	Replacing hospital card was efficient process in hospital admin office	Positive	Yes	Yes			Yes							Acute Care	JSM(PC4)	"They just gave me a new one within minutes and I just went back upstairs and I had my appointment."
COMMUNICATION	EFFICIENCY	PT EMR is electronic at specific family physician medical clinic	Positive	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"All electronic, that way w have a trail."
COMMUNICATION	Efficiency	Some diagnostic services results like bloodwork through Lifelabs and Gamma can be viewed online	Positive	Yes			Yes	Yes							Primary Care	RH(HP2)	"If they are with Lifelabs or Gamma, they can look online to see the results."
COMMUNICATION	EFFICIENCY	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened…So they don't have to wait for eight hours. It just improves the wait time for them."
COMMUNICATION	EFFICIENCY	Giving PT access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea, I think it reduces the number of times the same questions are asked over and over again."
COMMUNICATION	EFFICIENCY	Most EMR systems for medical clinics are not user friendly or intuitive	Pain Point	Yes		Yes					Yes				Primary Care	DSA(HP3)	"Very, very user unfriendly actually. Too much work into going between windows and there was connectivity between one window and the other…in terms of readability, it is not as great…it's very
COMMUNICATION	EFFICIENCY	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart,"
COMMUNICATION	EFFICIENCY	PT EMR does not connect with other family members EMR	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update."
COMMUNICATION	EFFICIENCY	PT is happy with efficiency, care and speed of diagnostic labs	Positive	Yes	Yes	Yes		Yes							Primary Care	ES(PC3)	"I'm happy, bloodwork takes around 5 minutes,"
COMMUNICATION	EFFICIENCY	PT has to wait before diagnostic test results came back to doctor (2-3 weeks)	Pain Point	Yes			Yes						Yes	Yes	Primary Care	ES(PC3)	"They don't tell me, After this is all done, they'll be like, your results will be passed along to your doctor and she'll give you a call if anything happens…they don't really say when."
COMMUNICATION	EFFICIENCY	PT very happy with diagnostic lab efficiency	Positive	Yes		Yes		Yes							Primary Care	JW(PC6)	"I found the lab experience was good. No problem at all. I'm familiar with the technicians there."

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience										
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
COMMUNICATION	EFFICIENCY	All test results are electronically sent to DR from diagnostic lab	Positive	Yes			Yes	Yes							Primary Care	JW(PC6)	"Whenever you take x-rays or ultrasounds, the technician takes the results and puts it in the computer and then it gets sent to my doctor,"
COMMUNICATION	EFFICIENCY	PT had to go through multiple channels to have access to care	Pain Point	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Primary Care	AMG(PC1)	"First you have to go and make an appointment with your insurance people, then they'll contact the doctor and then tell you which walk-in clinic and what time you're going to go...and that's every time
COMMUNICATION	EFFICIENCY	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"I went through all over again...back to the same clinic and same paper work...because they didn't have any records like the school forms and insurance...so I had to do all the process from stage
COMMUNICATION	EFFICIENCY	Specific walk-in clinic had sign in machine that reduced wait time and increased efficiency	Positive	Yes	Yes			Yes							Primary Care	AMG(PC1)	"The machine asks for your student ID and insurance, And the machine has a Spanish version and multiple languages, you just choose...depending on the doctor it tells you how long you have to
COMMUNICATION	EFFICIENCY	Family Medical clinic has EMR	Positive	Yes	Yes	Yes	Yes	Yes							Primary Care	VH(PC5)	"At your medical records are electronic then? Based on what I can tell, yes, it's electronic."
COMMUNICATION	EFFICIENCY	PT not given access to their results, have to send back to doctor	Pain Point	Yes			Yes					Yes			Primary Care	VH(PC5)	"They wouldn't give us the results..."We don't have a doctor who will do that"...send it back to our doctor,"
COMMUNICATION	EFFICIENCY	No connection between multiple systems	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	VH(PC5)	"So the doctor has everything digital. But the minute you go to another place, they have nothing and they have to start all over again. They ask you the same questions...there's no communication, no
COMMUNICATION	EFFICIENCY	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
COMMUNICATION	EFFICIENCY	Electronic Medical Record System would shorten wait times because you have access to previous processes completed so PT	Solution	Yes	Yes	Yes									Acute Care	RVP(HP1)	"Electronic medical records, it can solve some of the issues because you know, the patient have had investigations two days prior to coming to the emergency room and if you don't have a copy of
COMMUNICATION	EFFICIENCY	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
COMMUNICATION	EFFICIENCY	Maximize on technology available so not reliant on fax for correspondence	Solution	Yes											Primary Care	DSA(HP3)	"For whatever reason we use the fax machine. I'm sure we can make it efficient. And that's one of the possibilities,"
COMMUNICATION	EFFICIENCY	EMR system that contains each family members EMR and updates each automatically with relevant information and changes	Solution	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children...we have to add variances, histories separate...it doesn't automatically update,"
COMMUNICATION	EFFICIENCY	Maximize on technology available - online booking system	Solution	Yes				Yes							Primary Care	ES(PC3)	"I think having something that's digital gives you the opportunity to save time...Reserve, get my email, add it into my calendar and then go on,"
COMMUNICATION	EFFICIENCY	Maximize on technology available	Solution	Yes	Yes			Yes							Primary Care	AMG(PC1)	"The machine asks for your student ID and insurance, And the machine has a Spanish version and multiple languages, you just choose...depending on the doctor it tells you how long you have to
COMMUNICATION	EFFICIENCY	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up...you
COMMUNICATION	LACK OF COMMUNICATION	Lack of communication between care givers (nurses) and PT	Pain Point	Yes	Yes	Yes			Yes		Yes	Yes		Yes	Acute Care	RVP(HP1)	"They don't even want to go to the washroom in case the doctor comes in, they'll miss the doctor."
COMMUNICATION	LACK OF COMMUNICATION	Lack of communication between care givers (nurses) and PT	Pain Point	Yes	Yes	Yes			Yes		Yes	Yes		Yes	Acute Care	RVP(HP1)	"It's the fear of the unknown that causes them a lot of anxiety,"
COMMUNICATION	LACK OF COMMUNICATION	In ICU, because of high acuity of the illness, full medical history is crucial	Pain Point	Yes		Yes									Acute Care	RVP(HP1)	"information is key and resources second...fear of unknown is what causes them a lot of anxiety."
COMMUNICATION	LACK OF COMMUNICATION	Hospital did not communicate change of location	Pain Point	Yes	Yes					Yes	Yes	Yes			Acute Care	JSM(PC4)	"I feel they're always moving things around. I actually missed my first follow-up appointment and I tried everything. I emailed, I called...it was all gor not because they had changed their location of the
COMMUNICATION	LACK OF COMMUNICATION	Family Medical clinics do not share PT EMR with each other	Pain Point	Yes											Primary Care	RH(HP2)	"So everything would be electronic, but it's only within your own office? Yes. EMR."
COMMUNICATION	LACK OF COMMUNICATION	Receptionist continuously calls PT to update the wait times so they don't have to wait in waiting room the whole time or to	Positive	Yes	Yes			Yes							Primary Care	RH(HP2)	"The key thing is just communication"
COMMUNICATION	LACK OF COMMUNICATION	Receptionist does not update PT in waiting room about wait time	Pain Point	Yes	Yes						Yes				Primary Care	ES(PC3)	"And then I wait. And there's no update...I think that's what gets annoying...as a patient or as someone coming in to get checked up, I'm not getting the care that is offered to me properly,"
COMMUNICATION	LACK OF COMMUNICATION	Receptionist does not update PT in waiting room about wait time	Pain Point	Yes		Yes									Primary Care	ES(PC3)	"A lot of people are scared to talk about their medical history or what's wrong with them and they avoid seeing the doctor...comfort."
COMMUNICATION	LACK OF COMMUNICATION	PT had to contact insurance numerous times to get access to care	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"It was super, super, super, super frustrating because I had to call them at least seven times."
COMMUNICATION	LACK OF COMMUNICATION	No connection between multiple systems	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	VH(PC5)	"So the doctor has everything digital. But the minute you go to another place, they have nothing and they have to start all over again. They ask you the same questions...there's no communication, no
COMMUNICATION	LACK OF COMMUNICATION	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
COMMUNICATION	LACK OF COMMUNICATION	PT had to convey diagnostic test results to family doctor on follow up visit because no connection between DR and LAB	Pain Point	Yes			Yes								Primary Care	VH(PC5)	"The next time we visited the family doctor. We conveyed the information to their because we weren't sure if she received it from them. ..Did she have that information?...She did not. She did not
COMMUNICATION	LACK OF COMMUNICATION	Need Social Worker/PR intermediary to convey info from nurse to PT or PT family	Pain Point	Yes	Yes	Yes			Yes		Yes	Yes		Yes	Acute Care	RVP(HP1)	"They don't even want to go to the washroom in case the doctor comes in, they'll miss the doctor."
COMMUNICATION	LACK OF COMMUNICATION	Need Social Worker/PR intermediary to convey info from nurse to PT or PT family	Pain Point	Yes	Yes	Yes			Yes		Yes	Yes		Yes	Acute Care	RVP(HP1)	"It's the fear of the unknown that causes them a lot of anxiety."
COMMUNICATION	LACK OF COMMUNICATION	Have PT full medical history on hand	Solution	Yes		Yes									Acute Care	RVP(HP1)	"information is key and resources second...fear of unknown is what causes them a lot of anxiety."
COMMUNICATION	LACK OF COMMUNICATION	Suggest for their system is to just have better communication. A smoother flow of communication.	Solution	Yes	Yes					Yes	Yes	Yes			Acute Care	JSM(PC4)	"I feel they're always moving things around. I actually missed my first follow-up appointment and I tried everything. I emailed, I called...it was all gor not because they had changed their location of the
COMMUNICATION	MISCOMMUNICATION	In Long-Term Care unit, secondary services are done in hospital clinic but sometimes tests are done but nurses aren't notified	Pain Point	Yes		Yes									Acute Care	KC(HP4)	"The thing about that is sometimes the person would do the bloodwork and you would never know because they don't tell you that they did it."
COMMUNICATION	MISCOMMUNICATION	PT relay information depending on setting	Pain Point	Yes		Yes									Primary Care	DSA(HP3)	"Patients also, the information that they relate in certain settings is different,"
COMMUNICATION	MISCOMMUNICATION	PT can't understand investigations	Pain Point	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	DSA(HP3)	"Patient's cannot read their investigations."
COMMUNICATION	MISCOMMUNICATION	PT can't understand investigations	Pain Point	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	AMG(PC1)	"Because of the language barrier...doctor terms or hospital terms...they're like terms that I don't know,"
COMMUNICATION	MISCOMMUNICATION	PT can't understand investigations	Pain Point	Yes	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Primary Care	BK(PC2)	"It's about the medical and the medicine terms...it's not everyday English."
COMMUNICATION	MISCOMMUNICATION	One cohesive communication board	Solution	Yes		Yes									Acute Care	KC(HP4)	"The thing about that is sometimes the person would do the bloodwork and you would never know because they don't tell you that they did it."
COMMUNICATION	MISCOMMUNICATION	PT have access to their own EMR	Solution	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	DSA(HP3)	"Patient's cannot read their investigations."
COMMUNICATION	MULTIPLE CHANNELS	Nurse has to contact all care team	Pain Point	Yes	Yes	Yes	Yes								Acute Care	KC(HP4)	"I have to call everybody."
COMMUNICATION	MULTIPLE CHANNELS	If PT does not have all information or test results, will have to get referral form and perform tests again before scheduled procedure	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Then you go home or they see another doctor and then they come back another day for all the stuff that I want them to get,"
COMMUNICATION	MULTIPLE CHANNELS	Receptionist will send via mail or fax paper copy of PT scheduled surgery notes from surgeon to family dr to add to medical record	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"After the surgery, surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor,"
COMMUNICATION	MULTIPLE CHANNELS	DR has to coordinate with multiple members of care team to gain comprehensive PT info	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"If you don't have that information then you're waiting...while trying to get the information, calling the family doc or cardiologist saying, I have this patient right no, I need this information now, fax it now,"
COMMUNICATION	MULTIPLE CHANNELS	PT is accessed by triage nurse post receptionist before seeing DR	Pain Point	Yes	Yes	Yes		Yes	Yes		Yes		Yes		Acute Care	JSM(PC4)	"Post receptionist, they put you up with a nurse, The triage nurse...And then they place you in an urgency order."
COMMUNICATION	MULTIPLE CHANNELS	PT showed only hospital card as ID which had all medical history from the hospital	Positive	Yes	Yes	Yes	Yes	Yes							Acute Care	JSM(PC4)	"I had to being my Mount Sinai hospital card."
COMMUNICATION	MULTIPLE CHANNELS	Hospital did not communicate change of location	Pain Point	Yes	Yes					Yes	Yes	Yes			Acute Care	JSM(PC4)	"I feel they're always moving things around. I actually missed my first follow-up appointment and I tried everything. I emailed, I called...it was all gor not because they had changed their location of the
COMMUNICATION	MULTIPLE CHANNELS	PT had to reiterate previous diagnosis because physician change	Pain Point	Yes	Yes	Yes					Yes				Acute Care	JSM(PC4)	"When I went to my follow-up, they had to backtrack a little bit because it was under a different physician's name...and find my original x-rays,"
COMMUNICATION	MULTIPLE CHANNELS	Receptionist send referral form to specialist and waits to confirm appointment for patient through fax	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I would wait until they send me back an appointment."
COMMUNICATION	MULTIPLE CHANNELS	Receptionist send PT medical chart to specialist for consultation and care	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"We send over all the blood work and ECG and any heart tests through fax."
COMMUNICATION	MULTIPLE CHANNELS	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"It helps them triage better...I got good feedback from the emerg physician that they appreciate all the information."
COMMUNICATION	MULTIPLE CHANNELS	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Positive	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that. That program hasn't started as yet, but once it starts it will make it easier...I hope that happens because

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience									
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
COMMUNICATION	MULTIPLE CHANNELS	Giving PT access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
COMMUNICATION	MULTIPLE CHANNELS	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart."
COMMUNICATION	MULTIPLE CHANNELS	Communication is good between medical clinic and PT	Positive	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think our communication is very good, I think we know everybody by first name actually."
COMMUNICATION	MULTIPLE CHANNELS	PT has to wait before diagnostic test results came back to doctor (2-3 weeks)	Pain Point	Yes			Yes						Yes	Yes	Primary Care	ES(PC3)	"They don't tell me. After this is all done, they'll be like, your results will be passed along to your doctor and she'll give you a call if anything happens...they don't really say when,"
COMMUNICATION	MULTIPLE CHANNELS	All test results are electronically sent to DR from diagnostic lab	Positive	Yes			Yes	Yes							Primary Care	JW(PC6)	"Whenever you take x-rays or ultrasounds, the technician takes the results and puts it in the computer and then it gets sent to my doctor,"
COMMUNICATION	MULTIPLE CHANNELS	PT had to go through multiple channels to have access to care	Pain Point	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Primary Care	AMG(PC1)	"First you have to go and make an appointment with your insurance people, then they'll contact the doctor and then tell you which walk-in clinic and what time you're going to go...and that's every time
COMMUNICATION	MULTIPLE CHANNELS	PT had to contact insurance numerous times to get access to care	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"It was super, super, super, super frustrating because I had to call them at least seven times."
COMMUNICATION	MULTIPLE CHANNELS	PT gives information repeatedly and information is not saved for future uses	Pain Point	Yes							Yes	Yes			Primary Care	AMG(PC1)	"Everything is lengthy...if everyone has my information already, it would be better if I have to show up instead of all the hours times that I had to go back to the same clinic and fill out forms...maybe
COMMUNICATION	MULTIPLE CHANNELS	PT not given access to their results, have to send back to doctor	Pain Point	Yes			Yes					Yes			Primary Care	VH(PC5)	"They wouldn't give us the results..." We don't have a doctor who will do that"...send it back to our doctor,"
COMMUNICATION	MULTIPLE CHANNELS	No connection between multiple systems	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	VH(PC5)	"So the doctor has everything digital. But the minute you go to another place, they have nothing and they have to start all over again, They ask you the same questions...there's no communication, no
COMMUNICATION	MULTIPLE CHANNELS	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
COMMUNICATION	MULTIPLE CHANNELS	PT had to convey diagnostic test results to family doctor on follow up visit because no connection between DR and LAB	Pain Point	Yes			Yes								Primary Care	VH(PC5)	"The next time we visited the family doctor. We conveyed the information to their because we weren't sure if she received it from them. ...Did she have that information?...She did not. She did not
COMMUNICATION	MULTIPLE CHANNELS	Suggest for their system is to just have better communication. A smoother flow of communication.	Solution	Yes	Yes					Yes	Yes	Yes			Acute Care	JSM(PC4)	"I feel they're always moving things around, I actually missed my first follow-up appointment and I tried everything, I emailed, I called...it was all gor not because they had changed their location of the
COMMUNICATION	MULTIPLE CHANNELS	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again."
COMMUNICATION	MULTIPLE CHANNELS	Maximize on technology available - online booking system	Solution	Yes				Yes							Primary Care	ES(PC3)	"I think having something that's digital gives you the opportunity to save time...Reserve, get my email, add it into my calendar and then go on,"
COMMUNICATION	MULTIPLE CHANNELS	Maximize on technology	Solution	Yes							Yes	Yes			Primary Care	AMG(PC1)	"Everything is lengthy...if everyone has my information already, it would be better if I have to show up instead of all the hours times that I had to go back to the same clinic and fill out forms...maybe
COMMUNICATION	MULTIPLE CHANNELS	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up...you
COMMUNICATION	MULTIPLE CHANNELS	PT has to consult with multiple doctors	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"They sometimes see another doctor before or after me, Sometimes they see multiple doctors at the same time."
COMMUNICATION	MULTIPLE CHANNELS	Receptionist will have to get all PT information faxed from different sources	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Usually the receptionist will get that all faxed form wherever they got it."
COMMUNICATION	MULTIPLE CHANNELS	Receptionist will have to get all PT information faxed from different sources	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Sometimes they have to call the pharmacy to try and get all the medications if they don't bring their medications,"
COMMUNICATION	MULTIPLE CHANNELS	PT has to wait a week before diagnostic test results came back and has to schedule follow-up appointment for results	Pain Point	Yes			Yes						Yes		Acute Care	JSM(PC4)	"That's when I got follow-up appointment that had to see a specialist just to determine the gravity of the situations...a week later,"
COMMUNICATION	NETWORK	Hospital records are not integrated with family physician	Pain Point	Yes	Yes	Yes	Yes				Yes				Acute Care	RVP(HP1)	"There's no comprehensive kind of access to what both the physicians do,"
COMMUNICATION	NETWORK	No connection between multiple systems	Pain Point	Yes											Acute Care	RVP(HP1)	"It would be ideal to have everything else also connected to it."
COMMUNICATION	NETWORK	In Long-term care unit, nurse and PSW systems are not connected	Pain Point	Yes		Yes									Acute Care	KC(HP4)	"I think it's be better if we all had the same system in a way so we can all talk to each other,"
COMMUNICATION	NETWORK	Hospitals do not share their records with each other	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"We don't have access to each other's stuff...even if it's doctors that are affiliated with the hospital, nothing crosses, That's why we have to fax all our requests,"
COMMUNICATION	NETWORK	Family Medical clinics do not share PT EMR with each other	Pain Point	Yes											Primary Care	RH(HP2)	"So everything would be electronic, but it's only within your own office? Yes, EMR,"
COMMUNICATION	NETWORK	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Solution	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that, That program hasn't started as yet, but once it starts it will make it easier...I hope that happens because
COMMUNICATION	NETWORK	Giving PT access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
COMMUNICATION	NETWORK	Different EMR systems used by different medical clinics and each one doesn't connect with the other - all independent	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"There are so many out there that are available."
COMMUNICATION	NETWORK	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart,"
COMMUNICATION	NETWORK	PT EMR does not connect with other family members EMR	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children...we have to add variances, histories separate...it doesn't automatically update."
COMMUNICATION	NETWORK	PT had to go through multiple channels to have access to care	Pain Point	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Primary Care	AMG(PC1)	"First you have to go and make an appointment with your insurance people, then they'll contact the doctor and then tell you which walk-in clinic and what time you're going to go...and that's every time
COMMUNICATION	NETWORK	Different process to access care for international students dependent on institution	Pain Point	Yes	Yes						Yes				Primary Care	AMG(PC1)	"It is a difference process for every school."
COMMUNICATION	NETWORK	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"I went through all over again...back to the same clinic and same paper work...because they didn't have any records like the school forms and insurance...so I had to do all the process from stage
COMMUNICATION	NETWORK	PT gives information repeatedly and information is not saved for future uses	Pain Point	Yes							Yes	Yes			Primary Care	AMG(PC1)	"Everything is lengthy...if everyone has my information already, it would be better if I have to show up instead of all the hours times that I had to go back to the same clinic and fill out forms...maybe
COMMUNICATION	NETWORK	No connection between multiple systems	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	VH(PC5)	"So the doctor has everything digital. But the minute you go to another place, they have nothing and they have to start all over again, They ask you the same questions...there's no communication, no
COMMUNICATION	NETWORK	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
COMMUNICATION	NETWORK	PT had to convey diagnostic test results to family doctor on follow up visit because no connection between DR and LAB	Pain Point	Yes			Yes								Primary Care	VH(PC5)	"The next time we visited the family doctor. We conveyed the information to their because we weren't sure if she received it from them. ...Did she have that information?...She did not. She did not
COMMUNICATION	NETWORK	Would be ideal to have everything else connected to it.	Solution	Yes	Yes	Yes	Yes				Yes				Acute Care	RVP(HP1)	"There's no comprehensive kind of access to what both the physicians do."
COMMUNICATION	NETWORK	One cohesive communication board	Solution	Yes		Yes									Acute Care	KC(HP4)	"I think it's be better if we all had the same system in a way so we can all talk to each other."
COMMUNICATION	NETWORK	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
COMMUNICATION	NETWORK	EMR system that contains each family members EMR and updates each automatically with relevant information and changes	Solution	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children...we have to add variances, histories separate...it doesn't automatically update."
COMMUNICATION	NETWORK	Maximize on technology	Solution	Yes							Yes	Yes			Primary Care	AMG(PC1)	"Everything is lengthy...if everyone has my information already, it would be better if I have to show up instead of all the hours times that I had to go back to the same clinic and fill out forms...maybe
COMMUNICATION	NETWORK	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up...you
COMMUNICATION	OLD TECHNOLOGY	DR has to coordinate with multiple members of care team to gain comprehensive PT info	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"If you don't have that information then you're waiting...while trying to get the information, calling the family doc or cardiologist saying, I have this patient right no, I need this information now, fax it now,"
COMMUNICATION	OLD TECHNOLOGY	Hospitals do not share their records with each other	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"We don't have access to each other's stuff...even if it's doctors that are affiliated with the hospital, nothing crosses, That's why we have to fax all our requests,"
COMMUNICATION	OLD TECHNOLOGY	Communication between medical clinics and diagnostic labs through fax	Pain Point	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"They send it usually through fax,"
COMMUNICATION	OLD TECHNOLOGY	Receptionist send referral form to specialist and waits to confirm appointment for patient through fax	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I would wait until they send me back an appointment."
COMMUNICATION	OLD TECHNOLOGY	Receptionist send PT medical chart to specialist for consultation and care	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"We send over all the blood work and ECG and any heart tests through fax."
COMMUNICATION	OLD TECHNOLOGY	Family physician medical clinic fax diagnostic service requisition forms to hospital or labs	Pain Point	Yes											Primary Care	RH(HP2)	"Because we're the requesting physician, they would fax it to us and then the doctor will look at it and she'll let us know if the patient is a we call or not."

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience									
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based Medical Record/Chart	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Acute Care	KC(HP4)	"If a patient doesn't have all their papers and everything, then they have to come back or they'd have to fax it,"
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes		Yes					Yes				Acute Care	RW(HP5)	"Some hospitals are just still paper, which is absolutely horrible."
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes	Yes						Yes				Acute Care	DJC(HP6)	"It is written,"
COMMUNICATION	OLD TECHNOLOGY	DR will chart PT chart on paper which are scanned into hospital computer to keep record	Pain Point	Yes			Yes				Yes				Acute Care	DJC(HP6)	"So all paperwork, I will chart their whole entire visit on paper...all of our paper copies are then scanned...that will be added into our computer."
COMMUNICATION	OLD TECHNOLOGY	PT presents paper based documentation	Pain Point	Yes	Yes						Yes				Acute Care	DJC(HP6)	"They will come with at least some medical chart.
COMMUNICATION	OLD TECHNOLOGY	Receptionist will send via mail or fax paper copy of PT scheduled surgery notes from surgeon to family dr to add to medical record	Pain Point	Yes			Yes				Yes				Acute Care	DJC(HP6)	"After the surgery, surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor,"
COMMUNICATION	OLD TECHNOLOGY	DR will write requisition form for client to bring for diagnostic tests	Pain Point	Yes			Yes				Yes				Primary Care	RH(HP2)	"She will write that form and we will give it to you by the end of the visit and I'll explain what to do with the form."
COMMUNICATION	OLD TECHNOLOGY	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Solution	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened...So they don't have to wait for eight hours. It just improves the wait time for them."
COMMUNICATION	OLD TECHNOLOGY	PT gets form to bring for diagnostic services	Pain Point	Yes			Yes								Primary Care	ES(PC3)	"And I leave with the form."
COMMUNICATION	OLD TECHNOLOGY	Some PT will keep their own paper records to compile their own medical chart	Pain Point	Yes			Yes								Primary Care	DSA(HP3)	"Sometimes patients, what they do it they make their own charts at home and they track their sugar or their cholesterol and see what they want to do to improve...sometimes people just like to keep
COMMUNICATION	OLD TECHNOLOGY	DR will write requisition form for client to bring for diagnostic tests	Pain Point	Yes			Yes								Primary Care	JW(PC6)	"She printed a form on the computer...take that form to get the tests done."
COMMUNICATION	OLD TECHNOLOGY	PT had to fill out lots of paper based forms	Pain Point	Yes	Yes					Yes	Yes	Yes			Primary Care	AMG(PC1)	"It was a lot of paper and stuff,"
COMMUNICATION	OLD TECHNOLOGY	PT lost paper-based communications from DR	Pain Point	Yes			Yes				Yes	Yes			Primary Care	AMG(PC1)	"I lost those papers. Like who is going to keep papers?"
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes	Yes	Yes									Primary Care	AMG(PC1)	"At the walk-in clinic they would have lots of paper files...everything was by hand. Nobody saved anything on their computer."
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes	Yes					Yes	Yes				Primary Care	BK(PC2)	"You have to show them all the papers you have."
COMMUNICATION	OLD TECHNOLOGY	PT had to fill out lots of paper based forms	Pain Point	Yes	Yes					Yes	Yes				Primary Care	BK(PC2)	"You have pages you have to fill out all the paper forms....and the forms were really hard for me because I'm new to this country,"
COMMUNICATION	OLD TECHNOLOGY	PT gets form to bring for diagnostic services	Pain Point	Yes			Yes								Primary Care	VH(PC5)	"Req forms are printed at reception area...I picked them up and went to the locations specified for x-ray and Ultrasound."
COMMUNICATION	OLD TECHNOLOGY	PT has to contact multiple sources to retrieve information on their own care to bring to medical appointments	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"It's helpful when some patients get copies of all their information, then it saves you all that time. If they come with it, amazing...loose pieces of paper that they photocopied themselves or somehow
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based Medical Record/Chart	Pain Point	Yes	Yes	Yes	Yes								Acute Care	RVP(HP1)	"Mostly in an emergency unit, it's paper-based."
COMMUNICATION	OLD TECHNOLOGY	Mostly Paper Based Medical Record/Chart	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Acute Care	KC(HP4)	"If a patient doesn't have all their papers and everything, then they have to come back or they'd have to fax it,"
COMMUNICATION	OLD TECHNOLOGY	Nurse shift reports are paper-based	Pain Point	Yes		Yes					Yes				Acute Care	KC(HP4)	"Shift reports are done through paper."
COMMUNICATION	OLD TECHNOLOGY	In Long-Term care unit, diagnostic test results are sent to unit from hospital clinic by paper	Pain Point	Yes		Yes			Yes	Yes			Yes		Acute Care	KC(HP4)	"Sometimes people forget to document,"
COMMUNICATION	OLD TECHNOLOGY	Maximize on technology available	Solution	Yes		Yes					Yes				Acute Care	KC(HP4)	"Shift reports are done through paper."
COMMUNICATION	OLD TECHNOLOGY	One cohesive communication board	Solution	Yes		Yes			Yes	Yes			Yes		Acute Care	KC(HP4)	"Sometimes people forget to document."
COMMUNICATION	OLD TECHNOLOGY	DR has to dictate notes into phone system to be transcribed by receptionist/admin and added to PT medical chart	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"I dictate my notes, I'll use the phone and we go into the hospital dictation system...a receptionist listens to our things and then writes it all down. And then that report with all my notes, everything will
COMMUNICATION	OLD TECHNOLOGY	Receptionist will repeatedly call to get PT appointment for diagnostic services or specialist appointments	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I usually just keep calling them and calling them until I get an appointment."
COMMUNICATION	OLD TECHNOLOGY	Receptionist relies on phone for communication with other medical facilities and patients	Pain Point	Yes	Yes		Yes								Primary Care	RH(HP2)	"Pretty much the phone is the easiest way. And faxing."
COMMUNICATION	OLD TECHNOLOGY	DR does not use email - relies on phone	Pain Point	Yes			Yes								Primary Care	DSA(HP3)	"I don't email, I'm not an email person to begin with,"
COMMUNICATION	OLD TECHNOLOGY	Receptionist relies on phone for communication with other medical facilities and patients	Pain Point	Yes	Yes		Yes								Primary Care	RH(HP2)	"Pretty much the phone is the easiest way. And faxing."
COMMUNICATION	OLD TECHNOLOGY	PT had to leave message with receptionist and wait for call back to book appt for yearly checkup with family physician	Pain Point	Yes	Yes						Yes				Primary Care	ES(PC3)	"Called the reception, left a voicemail saying I needed to book my appointment for my yearly checkup...during their office hours...the receptionist usually calls back the next day."
COMMUNICATION	OLD TECHNOLOGY	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
COMMUNICATION	QUALITY OF STAFF	Multiple healthcare providers do not communicate with each other	Pain Point	Yes	Yes	Yes	Yes				Yes				Acute Care	RVP(HP1)	"There's no comprehensive kind of access to what both the physicians do."
COMMUNICATION	QUALITY OF STAFF	Would be ideal to have everything else connected to it	Solution	Yes	Yes	Yes	Yes				Yes				Acute Care	RVP(HP1)	"There's no comprehensive kind of access to what both the physicians do,"
CONTROL	ACCESSIBILITY	PT has to wait a week before diagnostic test results came back and has to schedule follow-up appointment for results	Pain Point	Yes			Yes								Acute Care	JSM(PC4)	"That's when I got follow-up appointment that had to see a specialist just to determine the gravity of the situations...a week later,"
CONTROL	ACCESSIBILITY	PT has to pay for test results on CD	Pain Point	Yes			Yes								Acute Care	JSM(PC4)	"I know that if someone developed an app where you can just say we moved for today...and then you can enhance it by adding copies of your x-rays because I wanted them and I had to take photos
CONTROL	ACCESSIBILITY	PT has no access to their own EMR from family physician	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"Does a patient have access to their EMR? No they don't. They can have access to their bloodwork. If they are with LifeLabs or Gamma, they can look online to see the results,"
CONTROL	ACCESSIBILITY	Some diagnostic services results like bloodwork through Lifelabs and Gamma can be viewed online	Positive	Yes			Yes	Yes							Primary Care	RH(HP2)	"If they are with Lifelabs or Gamma, they can look online to see the results."
CONTROL	ACCESSIBILITY	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Solution	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that, That program hasn't started as yet, but once it starts it will make it easier...I hope that happens because
CONTROL	ACCESSIBILITY	Giving PT access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea, I think it reduces the number of times the same questions are asked over and over again."
CONTROL	ACCESSIBILITY	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"I went through all over again...back to the same clinic and same paper work...because they didn't have any records like the school forms and insurance...so I had to do all the process from stage
CONTROL	ACCESSIBILITY	PT not given access to their x-rays electronically, purchase CD	Pain Point	Yes			Yes				Yes	Yes			Primary Care	AMG(PC1)	"I asked for an email copy, they wouldn't give me a copy, Finally after keep asking they gave me a CD."
CONTROL	ACCESSIBILITY	PT doesn't have access to their medical record	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	AMG(PC1)	"I need a copy to make my own file but they wouldn't give me a copy,"
CONTROL	ACCESSIBILITY	Maximize on technology available and develop an app to notify of location changes, access to x-rays and medical info all together	Solution	Yes			Yes								Acute Care	JSM(PC4)	"I know that if someone developed an app where you can just say we moved for today...and then you can enhance it by adding copies of your x-rays because I wanted them and I had to take photos
CONTROL	ACCESSIBILITY	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea, I think it reduces the number of times the same questions are asked over and over again."
CONTROL	ACCESSIBILITY	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up...you
CONTROL	ACCESSIBILITY	Maximize on technology - digital access to information	Solution	Yes											Primary Care	VH(PC5)	"If you just had digital access to any information we had and if somehow a doctor could go in the system and say, Oh, you need an MRI on your HIP and you're eight, it automatically pops up...you
CONTROL	RELIANT ON INTERMEDIARIES	Protection of PT health information	Pain Point	Yes											Acute Care	RVP(HP1)	"If you give control to the patient, then it becomes easier to have this protection,"
CONTROL	RELIANT ON INTERMEDIARIES	Hospital records are not integrated with family physician	Pain Point	Yes	Yes	Yes	Yes								Acute Care	RVP(HP1)	"We have moved so much digital, why are we waiting and not doing this?"
CONTROL	RELIANT ON INTERMEDIARIES	PT presents paper based documentation	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"They will come with at least some medical chart.
CONTROL	RELIANT ON INTERMEDIARIES	Receptionist will send via mail or fax paper copy of PT scheduled surgery notes from surgeon to family dr to add to medical record	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"After the surgery, surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor,"

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience									
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
CONTROL	RELIANT ON INTERMEDIARIES	DR has to coordinate with multiple members of care team to gain comprehensive PT info	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"If you don't have that information then you're waiting…while trying to get the information, calling the family doc or cardiologist saying, I have this patient right no, I need this information now, fax it now,"
CONTROL	RELIANT ON INTERMEDIARIES	PT has to contact multiple sources to retrieve information on their own care to bring to medical appointments	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"It's helpful when some patients get copies of all their information, then it saves you all that time. If they come with it, amazing…loose pieces of paper that they photocopied themselves or somehow
CONTROL	RELIANT ON INTERMEDIARIES	PT had to reiterate previous diagnosis because physician change	Pain Point	Yes	Yes	Yes					Yes				Acute Care	JSM(PC4)	"When I went to my follow-up, they had to backtrack a little bit because it was under a different physician's name…and find my original x-rays."
CONTROL	RELIANT ON INTERMEDIARIES	Communication between medical clinics and diagnostic labs through fax	Pain Point	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"They send it usually through fax."
CONTROL	RELIANT ON INTERMEDIARIES	Family Medical clinics do not share PT EMR with each other	Pain Point	Yes											Primary Care	RH(HP2)	"So everything would be electronic, but it's only within your own office? Yes, EMR."
CONTROL	RELIANT ON INTERMEDIARIES	Receptionist send referral form to specialist and waits to confirm appointment for patient through fax	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I would wait until they send me back an appointment."
CONTROL	RELIANT ON INTERMEDIARIES	Receptionist send PT medical chart to specialist for consultation and care	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"We send over all the blood work and ECG and any heart tests through fax."
CONTROL	RELIANT ON INTERMEDIARIES	Receptionist will repeatedly call to get PT appointment for diagnostic services or specialist appointments	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"I usually just keep calling them and calling them until I get an appointment."
CONTROL	RELIANT ON INTERMEDIARIES	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Pain Point	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened…So they don't have to wait for eight hours. It just improves the wait time for them."
CONTROL	RELIANT ON INTERMEDIARIES	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Solution	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that. That program hasn't started as yet, but once it starts it will make it easier…I hope that happens because
CONTROL	RELIANT ON INTERMEDIARIES	Giving PT access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
CONTROL	RELIANT ON INTERMEDIARIES	DR will give PT paper copy of their bloodwork if requested	Pain Point	Yes		Yes		Yes							Primary Care	DSA(HP3)	"Sometimes people will ask about their bloodwork results and we will give them a paper copy."
CONTROL	RELIANT ON INTERMEDIARIES	Some PT will keep their own paper records to compile their own medical chart	Pain Point	Yes			Yes								Primary Care	DSA(HP3)	"Sometimes patients, what they do it they make their own charts at home and they track their sugar or their cholesterol and see what they want to do to improve…sometimes people just like to keep
CONTROL	RELIANT ON INTERMEDIARIES	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Pain Point	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart."
CONTROL	RELIANT ON INTERMEDIARIES	PT can't understand investigations	Pain Point	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	DSA(HP3)	"Patient's cannot read their investigations."
CONTROL	RELIANT ON INTERMEDIARIES	PT EMR does not connect with other family members EMR	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update."
CONTROL	RELIANT ON INTERMEDIARIES	PT has to wait before diagnostic test results came back to doctor (2-3 weeks)	Pain Point	Yes			Yes						Yes	Yes	Primary Care	ES(PC3)	"They don't tell me. After this is all done, they'll be like, your results will be passed along to your doctor and she'll give you a call if anything happens…they don't really say when."
CONTROL	RELIANT ON INTERMEDIARIES	All test results are electronically sent to DR from diagnostic lab	Pain Point	Yes			Yes	Yes							Primary Care	JW(PC6)	"Whenever you take x-rays or ultrasounds, the technician takes the results and puts it in the computer and then it gets sent to my doctor."
CONTROL	RELIANT ON INTERMEDIARIES	PT had to go through multiple channels to have access to care	Pain Point	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Primary Care	AMG(PC1)	"First you have to go and make an appointment with your insurance people, then they'll contact the doctor and then tell you which walk-in clinic and what time you're going to go…and that's every time
CONTROL	RELIANT ON INTERMEDIARIES	PT not given access to their x-rays electronically, purchase CD	Pain Point	Yes			Yes				Yes	Yes			Primary Care	AMG(PC1)	"I asked for an email copy, they wouldn't give me a copy. Finally after keep asking they gave me a CD,"
CONTROL	RELIANT ON INTERMEDIARIES	PT doesn't have access to their medical record	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	AMG(PC1)	"I need a copy to make my own file but they wouldn't give me a copy."
CONTROL	RELIANT ON INTERMEDIARIES	PT not given access to their results, have to send back to doctor	Pain Point	Yes			Yes					Yes			Primary Care	VH(PC5)	"They wouldn't give us the results…"We don't have a doctor who will do that"…send it back to our doctor."
CONTROL	RELIANT ON INTERMEDIARIES	Give control of medical information to patient - PT gives access to their medical information according to their discretion	Solution	Yes											Acute Care	RVP(HP1)	"If you give control to the patient, then it becomes easier to have this protection."
CONTROL	RELIANT ON INTERMEDIARIES	Maximize on technology available	Solution	Yes	Yes	Yes	Yes								Acute Care	RVP(HP1)	"We have moved so much digital, why are we waiting and not doing this?"
CONTROL	RELIANT ON INTERMEDIARIES	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again."
CONTROL	RELIANT ON INTERMEDIARIES	PT have access to their own EMR	Solution	Yes		Yes	Yes			Yes			Yes	Yes	Primary Care	DSA(HP3)	"Patient's cannot read their investigations."
CONTROL	RELIANT ON INTERMEDIARIES	EMR system that contains each family members EMR and updates each automatically with relevant information and changes	Solution	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update."
CONTROL	RELIANT ON INTERMEDIARIES	Maximize on technology available - online booking system	Solution	Yes				Yes							Primary Care	ES(PC3)	"I think having something that's digital gives you the opportunity to save time…Reserve, get my email, add it into my calendar and then go on. I can schedule my time, type in my health card. And
INFORMATION	LACK OF INFORMATION	Because PT history is not known on arrival, processes are repeated because hospital has no record of previous care (i.e.	Pain Point	Yes	Yes	Yes									Acute Care	RVP(HP1)	"Electronic medical records, it can solve some of the issues because you know, the patient have had investigations two days prior to coming to the emergency room and if you don't have a copy of
INFORMATION	LACK OF INFORMATION	DR has to coordinate with multiple members of care team to gain comprehensive PT info	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"If you don't have that information then you're waiting…while trying to get the information, calling the family doc or cardiologist saying, I have this patient right no, I need this information now, fax it now."
INFORMATION	LACK OF INFORMATION	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Solution	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that. That program hasn't started as yet, but once it starts it will make it easier…I hope that happens because
INFORMATION	LACK OF INFORMATION	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes						Yes	Yes			Primary Care	AMG(PC1)	"I went through all over again…back to the same clinic and same paper work…because they didn't have any records like the school forms and insurance…so I had to do all the process from stage
INFORMATION	LACK OF INFORMATION	PT doesn't have access to their medical record	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	AMG(PC1)	"I need a copy to make my own file but they wouldn't give me a copy."
INFORMATION	LACK OF INFORMATION	Walk-in clinic did not keep copy of PT previous visits	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Primary Care	BK(PC2)	"Did they have a chart for you that they had from before, your last visit? No…they didn't keep record…they didn't write, I wrote everything in the forms."
INFORMATION	LACK OF INFORMATION	PT had to make multiple phone calls to multiple healthcare institutions	Pain Point	Yes	Yes						Yes	Yes			Primary Care	VH(PC5)	"There are a lot of phone calls because I did do a lot of phone calls to confirm will you do this? Do you need this? Just so we were always prepared at every juncture, but yet it still didn't prepare
INFORMATION	LACK OF INFORMATION	Electronic Medical Record System would shorten wait times because you have access to previous processes completed so PT	Solution	Yes	Yes	Yes									Acute Care	RVP(HP1)	"Electronic medical records, it can solve some of the issues because you know, the patient have had investigations two days prior to coming to the emergency room and if you don't have a copy of
INFORMATION	LOSING INFORMATION	Mostly Paper Based Medical Record/Chart	Pain Point	Yes											Acute Care	KC(HP4)	"A written medical chart,"
INFORMATION	LOSING INFORMATION	Nurse shift reports are paper-based	Pain Point	Yes		Yes					Yes				Acute Care	KC(HP4)	"Shift reports are done through paper."
INFORMATION	LOSING INFORMATION	Because everything is predominantly paper-based, there have been times that papers have been missing	Pain Point	Yes						Yes	Yes		Yes		Acute Care	KC(HP4)	"I have a lot of physical paperwork."
INFORMATION	LOSING INFORMATION	Because everything is predominantly paper-based, there have been times that papers have been missing	Pain Point	Yes											Acute Care	KC(HP4)	"It is common for things to go missing because my nursing station is open and people can just come in,"
INFORMATION	LOSING INFORMATION	In Long-Term care unit, diagnostic test results are sent to unit from hospital clinic by paper	Pain Point	Yes		Yes									Acute Care	KC(HP4)	"Sometimes people forget to document."
INFORMATION	LOSING INFORMATION	Receptionist will have to get all PT information faxed from different sources	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Sometimes they have to call the pharmacy to try and get all the medications if they don't bring their medications."
INFORMATION	LOSING INFORMATION	Receptionist will send via mail or fax paper copy of PT scheduled surgery notes from surgeon to family dr to add to medical record	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"After the surgery, surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor."
INFORMATION	LOSING INFORMATION	If PT does not have all information or test results, will have to get referral form and perform tests again before scheduled procedure	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"Then you go home or they see another doctor and then they come back another day for all the stuff that I want them to get."
INFORMATION	LOSING INFORMATION	DR will give PT paper copy of their bloodwork if requested	Pain Point	Yes		Yes		Yes							Primary Care	DSA(HP3)	"Sometimes people will ask about their bloodwork results and we will give them a paper copy."
INFORMATION	LOSING INFORMATION	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Positive	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that. That program hasn't started as yet, but once it starts it will make it easier…I hope that happens because
INFORMATION	LOSING INFORMATION	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart."
INFORMATION	LOSING INFORMATION	PT EMR does not connect with other family members EMR	Pain Point	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transferred onto the children…we have to add variances, histories separate…it doesn't automatically update."
INFORMATION	LOSING INFORMATION	PT gets form to bring for diagnostic services	Pain Point	Yes			Yes								Primary Care	ES(PC3)	"And I leave with the form."
INFORMATION	LOSING INFORMATION	DR will write requisition form for client to bring for diagnostic tests	Pain Point	Yes			Yes								Primary Care	JW(PC6)	"She printed a form on the computer…take that form to get the tests done."

Required	Required	Required	Required	Required	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Required	Required	Optional
		Observation		Research Scope	Timing			Service Experience									
THEMES	KEY WORDS	Description	Type	In Scope	PRE	DURING	POST	HAPPY	SAD	CONFUSED	ANNOYED	MAD	WORRIED	ANXIETY	CARE	PARTICIPANT	QUOTES
INFORMATION	LOSING INFORMATION	All test results are electronically sent to DR from diagnostic lab	Positive	Yes			Yes	Yes							Primary Care	JW(PC6)	"Whenever you take x-rays or ultrasounds, the technician takes the results and puts it in the computer and then it gets sent to my doctor,"
INFORMATION	LOSING INFORMATION	PT lost paper-based communications from DR	Pain Point	Yes			Yes				Yes	Yes			Primary Care	AMG(PC1)	"I lost those papers. Like who is going to keep papers?"
INFORMATION	LOSING INFORMATION	Mostly Paper Based documentation	Pain Point	Yes	Yes	Yes									Primary Care	AMG(PC1)	"At the walk-in clinic they would have lots of paper files…everything was by hand. Nobody saved anything on their computer."
INFORMATION	LOSING INFORMATION	PT gets form to bring for diagnostic services	Pain Point	Yes			Yes								Primary Care	VH(PC5)	"Req forms are printed at reception area…I picked them up and went to the locations specified for x-ray and ultrasound."
INFORMATION	LOSING INFORMATION	Maximize on technology available	Solution	Yes		Yes					Yes				Acute Care	KC(HP4)	"Shift reports are done through paper."
INFORMATION	LOSING INFORMATION	One cohesive communication board	Solution	Yes		Yes									Acute Care	KC(HP4)	"Sometimes people forget to document."
INFORMATION	LOSING INFORMATION	EMR system that contains each family members EMR and updates each automatically with relevant information and changes	Solution	Yes	Yes	Yes	Yes				Yes				Primary Care	DSA(HP3)	"The family history on your side doesn't get transfered onto the children…we have to add variances, histories separate…it doesn't automatically update,"
INFORMATION	OLD TECHNOLOGY	Lack of functionality in existing documentation system	Pain Point	Yes											Acute Care	RW(HP5)	"It doesn't really look at the most comprehensive view of the patient. It's not the most ordered. It's not as well organized."
INFORMATION	OLD TECHNOLOGY	Lack of functionality in existing documentation system	Pain Point	Yes											Acute Care	RW(HP5)	"It doesn't really look at the most comprehensive view of the patient. It's not the most ordered. It's not as well organized."
INFORMATION	OLD TECHNOLOGY	More comprehensive documentation system that provides most comprehensive view of the PT	Solution	Yes											Acute Care	RW(HP5)	"It doesn't really look at the most comprehensive view of the patient. It's not the most ordered. It's not as well organized,"
INFORMATION	OLD TECHNOLOGY	More comprehensive documentation system that provides most comprehensive view of the PT	Solution	Yes											Acute Care	RW(HP5)	"It doesn't really look at the most comprehensive view of the patient. It's not the most ordered. It's not as well organized,"
INFORMATION	OLD TECHNOLOGY	Receptionist will send via mail or fax paper copy of PT scheduled surgery notes from surgeon to family dr to add to medical record	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"After the surgery, surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor."
INFORMATION	OLD TECHNOLOGY	Communication between medical clinics and diagnostic labs through fax	Pain Point	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"They send it usually through fax."
INFORMATION	OLD TECHNOLOGY	Receptionist send PT medical chart to specialist for consultation and care	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"We send over all the blood work and ECG and any heart tests through fax."
INFORMATION	OLD TECHNOLOGY	PT has to wait before diagnostic test results came back to doctor (2-3 weeks)	Pain Point	Yes			Yes						Yes	Yes	Primary Care	ES(PC3)	"They don't tell me. After this is all done, they'll be like, your results will be passed along to your doctor and she'll give you a call if anything happens…they don't really say when,"
INFORMATION	OLD TECHNOLOGY	PT has to fill out numerous forms upon arrival	Pain Point	Yes	Yes						Yes	Yes			Acute Care	DJC(HP6)	"They fill all these forms and I'm sure they're annoyed that we don't have all this information."
INFORMATION	OLD TECHNOLOGY	PT paper-based records stores in hospital in health records area	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"Will just be a paper copy that's probably stored down in the health records area,"
INFORMATION	OLD TECHNOLOGY	PT has to contact multiple sources to retrieve information on their own care to bring to medical appointments	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"It's helpful when some patients get copies of all their information, then it saves you all that time. If they come with it, amazing…loose pieces of paper that they photocopied themselves or somehow
INFORMATION	OLD TECHNOLOGY	DR will write requisition form for client to bring for diagnostic tests	Pain Point	Yes			Yes								Primary Care	RH(HP2)	"She will write that form and we will give it to you by the end of the visit and I'll explain what to do with the form."
INFORMATION	OLD TECHNOLOGY	Receptionist writes all notes on paper	Pain Point	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"I usually keep a list…and make notes."
INFORMATION	OLD TECHNOLOGY	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Pain Point	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened…So they don't have to wait for eight hours. It just improves the wait time for them,"
INFORMATION	OLD TECHNOLOGY	PT will sometimes bring their own reports to family physician consults	Pain Point	Yes		Yes									Primary Care	DSA(HP3)	"Sometimes people will bring in their own previous reports."
INFORMATION	OLD TECHNOLOGY	DR will give PT paper copy of their bloodwork if requested	Pain Point	Yes		Yes		Yes							Primary Care	DSA(HP3)	"Sometimes people will ask about their bloodwork results and we will give them a paper copy."
INFORMATION	OLD TECHNOLOGY	Some PT will keep their own paper records to compile their own medical chart	Pain Point	Yes			Yes								Primary Care	DSA(HP3)	"Sometimes patients, what they do it they make their own charts at home and they track their sugar or their cholesterol and see what they want to do to improve…sometimes people just like to keep
INFORMATION	OLD TECHNOLOGY	PT had to fill out lots of paper based forms	Pain Point	Yes	Yes					Yes	Yes	Yes			Primary Care	AMG(PC1)	"It was a lot of paper and stuff."
INFORMATION	OLD TECHNOLOGY	PT lost paper-based communications from DR	Pain Point	Yes			Yes				Yes	Yes			Primary Care	AMG(PC1)	"I lost those papers. Like who is going to keep papers?"
INFORMATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes	Yes	Yes									Primary Care	AMG(PC1)	"At the walk-in clinic they would have lots of paper files…everything was by hand. Nobody saved anything on their computer."
INFORMATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes	Yes					Yes	Yes				Primary Care	BK(PC2)	"You have to show them all the papers you have,"
INFORMATION	OLD TECHNOLOGY	PT had to fill out lots of paper based forms	Pain Point	Yes	Yes					Yes	Yes				Primary Care	BK(PC2)	"You have pages you have to fill out all the paper forms…and the forms were really hard for me because I'm new to this country."
INFORMATION	OLD TECHNOLOGY	Mostly Paper Based documentation	Pain Point	Yes		Yes									Acute Care	RW(HP5)	"Some hospitals are just still paper, which is absolutely horrible."
INFORMATION	OLD TECHNOLOGY	DR has to dictate notes into phone system to be transcribed by receptionist/admin and added to PT medical chart	Pain Point	Yes	Yes	Yes	Yes								Acute Care	DJC(HP6)	"I dictate my notes. I'll use the phone and we go into the hospital dictation system…a receptionist listens to our things and then writes it all down. And then that report with all my notes, everything will
INFORMATION	OLD TECHNOLOGY	PT had to fill out lots of paper based forms	Pain Point	Yes	Yes					Yes	Yes	Yes			Primary Care	AMG(PC1)	"It was a lot of paper and stuff."
PRIVACY	EXPOSURE OF PERSONAL INFO	Receptionist will send via mail or fax paper copy of PT scheduled surgery notes from surgeon to family dr to add to medical record	Pain Point	Yes			Yes								Acute Care	DJC(HP6)	"After the surgery, surgeon will again dictate to the phone system and then the receptionist will transcribe that and then send that letter to the family doctor."
PRIVACY	EXPOSURE OF PERSONAL INFO	Communication between medical clinics and diagnostic labs through fax	Pain Point	Yes	Yes	Yes	Yes								Primary Care	RH(HP2)	"They send it usually through fax."
PRIVACY	EXPOSURE OF PERSONAL INFO	Giving PT access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
PRIVACY	EXPOSURE OF PERSONAL INFO	PT have access to their own EMR	Solution	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again,"
PRIVACY	EXPOSURE OF PERSONAL INFO	Maximize on technology - Digital access to information	Solution	Yes											Primary Care	VH(PC5)	"I think the challenge is we don't invest enough in technology as you get by with these homegrown systems that are prone to breach. But if you developed a really secure system, you put the money
REPETITION	RELAYING INFORMATION REPETITIVELY	Mostly Paper Based Medical Record/Chart	Pain Point	Yes	Yes	Yes	Yes				Yes	Yes			Acute Care	KC(HP4)	"If a patient doesn't have all their papers and everything, then they have to come back or they'd have to fax it."
REPETITION	RELAYING INFORMATION REPETITIVELY	In rehabilitation unit, all PT wear WRISTBANDS with identifying information and bar code for blood sugar test monitoring	Positive	Yes	Yes	Yes									Acute Care	RW(HP5)	"They always have to have on them their wristband…so that we can identify them, The wristband along with identifying patient name also contains a barcode…for blood sugar test,"
REPETITION	RELAYING INFORMATION REPETITIVELY	PT has to repeatedly give healthcard	Pain Point	Yes	Yes	Yes									Acute Care	DJC(HP6)	"You have health cards all the time…or at least check."
REPETITION	RELAYING INFORMATION REPETITIVELY	PT has to consult with multiple doctors	Pain Point	Yes	Yes										Acute Care	DJC(HP6)	"They sometimes see another doctor before or after me. Sometimes they see multiple doctors at the same time."
REPETITION	RELAYING INFORMATION REPETITIVELY	PT has to fill out numerous forms upon arrival	Pain Point	Yes	Yes						Yes				Acute Care	DJC(HP6)	"They fill all these forms and I'm sure they're annoyed that we don't have all this information."
REPETITION	RELAYING INFORMATION REPETITIVELY	PT admitted to Emerg without a health card because he was already in system with prior visits	Positive	Yes	Yes			Yes							Acute Care	JSM(PC4)	"Because I have a valid health card, which is why I was able to bypass me not having a health card,"
REPETITION	RELAYING INFORMATION REPETITIVELY	PT had to reiterate previous diagnosis because physician change	Pain Point	Yes	Yes	Yes					Yes				Acute Care	JSM(PC4)	"When I went to my follow-up, they had to backtrack a little bit because it was under a different physician's name…and find my original x-rays,"
REPETITION	RELAYING INFORMATION REPETITIVELY	PT has to present health card at every visit	Pain Point	Yes	Yes										Primary Care	RH(HP2)	"Just the health card every time, no driver's license."
REPETITION	RELAYING INFORMATION REPETITIVELY	DR will send PT with a letter with PT medical chart in paper form documenting consult to EMERG to lessen their wait time at	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"I'll send them with a letter saying this is what happened…So they don't have to wait for eight hours. It just improves the wait time for them,"
REPETITION	RELAYING INFORMATION REPETITIVELY	Repeatedly giving health card at every visit to family physician medical clinic	Pain Point	Yes	Yes						Yes				Primary Care	DSA(HP3)	"OHIP wants us to check on the health card every single visit. That's what they wanted. They'd run it through a scanner and basically captures the time and the date that the person arrives at the
REPETITION	RELAYING INFORMATION REPETITIVELY	MYHOSPITAL at Mackenzie hospital is currently working on pilot project centralizing their hospital records with associated family	Positive	Yes	Yes	Yes	Yes								Primary Care	DSA(HP3)	"myhospital at Mackenzie, they can even access my records and I'm registered for that, That program hasn't started as yet, but once it starts it will make it easier…I hope that happens because
REPETITION	RELAYING INFORMATION REPETITIVELY	Giving PT access to their own EMR	Positive	Yes	Yes	Yes	Yes	Yes							Primary Care	DSA(HP3)	"I think it's a great idea. I think it reduces the number of times the same questions are asked over and over again."
REPETITION	RELAYING INFORMATION REPETITIVELY	Some hospital emergency rooms will send electronic copy of PT visit to family doctor	Positive	Yes			Yes	Yes							Primary Care	DSA(HP3)	"They don't do is as a paper copy anymore. It comes electronically into our EMR and then my staff, they basically kind of go through it and they add it to their patient's chart,"

Appendix F

Application System Requirements

Touchpoint	Requirement [actions]	Content [objects]	Function [functions]
	1.0 The system needs to display all profiles associated with the patient's file	• Names • Avatar • Profiles include: a. Patient b. Spouse c. Children d. Other individuals under patient's care	• A menu that displays all names of individuals that are buttons that user can click to access each individual's record of information *(NOTE: Begin prototype at this stage based on the assumption patient has already signed up and inputted all their personal information along with information of individuals under their care, i.e. health card number, address, phone number, email, etc.)*
SCHEDULING FOLLOW-UP	2.0 The system needs to provide scheduling options for patients visiting healthcare providers	• Date • Time • Healthcare providers include: f. Family Medical Clinic g. Walk-in Clinic h. Diagnostic Labs i. Specialists j. Hospitals	• A calendar that provides access to select date and time for appointment • Shows only times available • A confirmation email to be sent to both healthcare provider and patient • Option to add appointment to user's calendar and healthcare provider calendar *(NOTE: Data can be populated from the Ontario healthcare directory listing contact for all hospitals, labs, medical clinics – for pilot study can start with onboarding GTA healthcare providers)*
SCHEDULING FOLLOW-UP	2.1 The system needs to provide option to reschedule an existing appointment	• Existing appointment time and date • Date • Time	
SCHEDULING FOLLOW-UP	2.2 The system needs to provide location options for patients visiting healthcare	• Map showing multiple locations for specific services • Distance from current location comparison	• A map (Google Maps) that shows user the options determined by distance of specific services *(NOTE: Data can be populated from Google Maps combined with Ontario healthcare directory to show user's closest healthcare provider for their needs as determined by distance)*

Touchpoint	Requirement [actions]	Content [objects]	Function [functions]
ARRIVAL	3.0 The system needs to provide sign-in option upon arrival at physician's medical clinic	• Sign in	• A button for user to click to sign in when arrived at healthcare provider • Confirmation in real time to alert healthcare provider to add patient to waiting queue
ARRIVAL	3.1 The system provides wait time in real time to users	• Check wait time information (hour and minutes)	• A button for user to click to check wait time remaining which will display the time in real time
CONSULTATION DIAGNOSTIC TESTS	4.0 The system needs to display all diagnostic test results associated with the patient	• Images of diagnostic test results • Diagnostic tests include: a. Bloodwork b. Xray c. Mammogram d. Ultrasound e. MRI f. CT Scan	• A list of all diagnostic test results associated with the patient • Time and date stamp for each result *(Blockchain benefits)*
CONSULTATION DIAGNOSTIC TESTS	4.1 The system will have option for user to add diagnostic test result by scanning and adding image to patient record or upload digital file	• Scanning screen	• A button for user to click to scan test result and a button to add to patient records *(Similar functionality to how you can scan a check with your mobile phone which will update your bank account online through your bank's mobile app)*
CONSULTATION DIAGNOSTIC TESTS	4.2 The system needs to display diagnostic tests options for doctor recommended patient tests	• Diagnostic tests including: a. Bloodwork b. Xray c. Mammogram d. Ultrasound e. MRI f. CT Scan	• A list of all diagnostic test options • Radio buttons to indicate which tests have been selected by doctor for patient • Link to Scheduling screen for patient to book appointment at their preferred diagnostic test location, pre-filtered locations which have specific diagnostic test offered
CONSULTATION DIAGNOSTIC TESTS	5.0 The system needs to display past patient medical history (EMR)	• List of patient medical history • Date • Time • EMR includes: a. Family physician b. Hospital visits c. Past procedures d. Diagnostic tests	• A list of patient medical history • Time and date stamp for each result *(Blockchain benefits)*

Appendix G

Application 10 Prototype Use Cases

Touchpoint	Use Case	User and System Actions
1.0 SCHEDULING	Schedule an appointment at a walk-in clinic. Imagine you need to visit a walk-in clinic for a minor health issue. Instead of having to go to the walk-in clinic and wait for more than two hours, you can choose your preferred location and proceed to the walk-in clinic closer to your estimated appointment time, minimizing your wait time. Let's go through the app and see how you can do this. ASSUMPTIONS: • You have already signed up to use identiCHAIN prior to this session and have been given your unique alphanumeric username and password to access identiCHAIN • You have already uploaded your personal information on identiCHAIN prior to this session and your identification has been verified (i.e. health card, contact info, etc.) • Your records are stored on the cloud, not on your phone • The profiles of your family members are available for you to access through identiCHAIN because they have given you prior consent • Jane = you; Peter = your spouse; Chelsea = your daughter; Luke = your son; Janice = your senior mother • You have already uploaded the contact information of your family physician to the app prior to this session	1.1 | The system prompts user to login to app. 1.2 | The user enters their user name (PUBLIC KEY) and password (PRIVATE KEY) and chooses option to log in to app. 1.3 | The system prompts the user to select profile to access: Jane, Peter, Chelsea, Luke, Janice 1.4 | The user selects Jane. 1.5 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.6 | The user selects Schedule. 1.7 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital or View All Appointments 1.8 | The user selects Walk-In Clinic. 1.9 | The system checks database to display map with Walk-In Clinics near user populated by Google Maps using user's current location. 1.10 | The system displays each location's estimated wait time. 1.11 | The user selects Eglinton Station Medical Centre. 1.12 | The system displays options for user to call Walk-in Clinic selected or to proceed to check-in. 1.13 | The user selects Check-In. 1.14 | The system prompts user to give permission for identiCHAIN to send health card information to walk-in clinic through pop-up. 1.15| The user selects Yes, I give permission. 1.16 | The system displays confirmation message with estimated wait time. 1.17 | The system updates Walk-In Clinic's calendar with user's new appointment adding the user to the queue of patients for the day.

Touchpoint	Use Case	User and System Actions
2.0 HISTORY	Share blood test results with new family physician. Imagine you just moved to a new city and you're at your first appointment with your new family physician. Your new physician does not have your previous medical record and has requested for you to do blood tests and return for a follow-up appointment because she cannot do an accurate assessment of your health until she has blood test results. You have a complete history of your medical record form your previous physician on this app along with the blood test results you just completed a month ago for your previous family physician. Instead of going for additional blood tests, then having to rebook another appointment for a repeat visit on another date, you can show and send the physician your diagnostic results right away using this app. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects History. 1.3 | The system prompts the user to select which medical record or result to access: Family Physician Medical Records, Hospital Medical Records, Diagnostic Results, Specialists Records, Walk-In Clinic Records, View All History 1.4 | The user selects Diagnostic Results. 1.5 | The system checks database to display all Diagnostic Results associated with user: Blood test, X-ray, Mammogram, Ultrasound, MRI, CT Scan 1.6 | The user selects Blood test. 1.7 | The system displays all blood test results associated with user, filtered by year. 1.8 | The user selects 2020. 1.9 | The system checks the database to display all the blood test results from 2020. 1.10 | The user chooses the entry for January 7 2020. 1.11 | The system checks the database to display the blood test result from January 7 2020, displaying the date and location where blood tests were taken.
3.0 ARRIVAL	Sign in at hospital emergency room. Imagine you just arrived at the hospital emergency room at Sunnybrook Health Sciences. The waiting room is still full of waiting patients and you have not been able to reach a nurse to sign in. You need to check in and you also want to know the wait time until you can see the attending physician. You can sign in with the app and begin the preliminary triage process by completing a preliminary questionnaire on the app while you wait for a nurse to do a full assessment. It will be sent immediately upon completion to the nurse's station and you will automatically be added to the patient queue. You can also check the estimated wait time remaining while you wait. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Arrival. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital 1.4 | The user selects Hospital. 1.5 | The system prompts the user to sign in or check wait time (Check wait time will be visible, but inactive because use has not signed in. 1.6 | The user selects Sign In. 1.7 | The system checks database to display map with Hospitals near user populated by Google Maps using user's current location. 1.8 | The user selects Sunnybrook Health Sciences. 1.9 | The system displays options for user to call Hospital selected or to proceed to check-in. 1.10 | The user selects Check-In. 1.11 | The system prompts user to confirm Check-in. 1.12 | The user selects Yes, Confirm. 1.13 | The system prompts user to give permission for identiCHAIN to send health card information to hospital through pop-up.

Touchpoint	Use Case	User and System Actions
3.0 ARRIVAL (cont.)	Sign in at hospital emergency room.	1.14| The user selects Yes, I give permission. 1.15 | The system displays confirmation message with estimated wait time. 1.16 | The system updates Hospital's patient queue, adding the user to the queue of patients for the day. 1.17 | The system prompts user to fill out preliminary triage assessment. 1.18 | The user selects Triage Assessment. 1.19 | The system displays assessment questions for user to complete. 1.20 | The user fills out assessment and selects Send to Nurse. 1.21 | The system displays confirmation that the assessment form has been sent to the hospital nurse's station. 1.22 | The system displays the estimated wait time remaining.
4.0 SCHEDULING	Schedule an appointment with your family physician for a yearly checkup. Imagine you need to schedule an appointment with your family physician for yourself for a yearly checkup. Instead of having to call your doctor's office, you can schedule your appointment using this app. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Schedule. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital or View All Appointments 1.4 | The user selects Family Medical Clinic. 1.5 | The system checks database to display Family Medical Clinic associated with user and clinic's address information. 1.6 | The system displays options for user to call Family Medical Clinic or to proceed to book appointment. 1.7 | The user selects to proceed by selecting Check Availability. 1.8 | The system displays options for user to book New Appointment or Edit Existing Appointment. 1.9 | The user selects New Appointment. 1.10 | The system searches database for all upcoming appointments associated with selected Family Medical Clinic. 1.11 | The system displays date options in a calendar format with dates available highlighted. 1.12 | The user selects February 27 2020. 1.13 | The system searches database and displays all times available at Family Medical Clinic for selected date. 1.14 | The user selects 11:45AM. 1.15 | The system displays options for user to Confirm selected date and time or Start Over with new appointment. 1.16 | The user selects Yes, Confirm. 1.17 | The system displays confirmation message. 1.18 | The system updates user's calendar with new appointment and updates Family Medical Clinic's calendar with user's new appointment.

Touchpoint	Use Case	User and System Actions
5.0 UPDATE	Update medical record from consultation with family physician. Imagine you just finished a consultation with your family physician. To keep a record of your diagnosis, instead of asking for a paper-based copy, your family physician can upload their electronic record directly to the app so that it can be accessed through the app in the future. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Update. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital 1.4 | The system prompts the user with the amount of records pending verification from the user. 1.5 | The user selects Family Medical Clinic [1]. 1.6 | The system displays the new medical entry waiting for verification. 1.7 | The system displays the medical record from the family physician pending verification along with doctor's information, date and time consult was conducted. 1.8 | The user selects Verify. 1.9 | The system prompts user to Confirm or Delete pending result. 1.10 | The user selects Yes, Add this entry. 1.11 | The system prompts the user to select which profile to add medical record entry to. 1.12 | The user selects Jane. 1.13 | The system confirms the user has successfully added the medical entry to their profile with time and date verified. 1.14 | The system adds the record to the blockchain displaying the unique blockchain hash associated with the record as confirmation. 1.15 | The system updates the family medical clinic with the user's confirmation and adds the medical record entry to the user's history.
6.0 SCHEDULING	Schedule an appointment with a diagnostic laboratory for blood test. Imagine you need to book an appointment for a blood test as recommended by your family physician. Signed requisition forms are mandatory for you to bring to the diagnostic lab. Instead of calling the lab to schedule an appointment and having to bring your health card along with the requisition form, you can schedule your appointment using this app along with uploading the requisition form. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Schedule. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital or View All Appointments 1.4 | The user selects Diagnostic Lab. 1.5 | The system displays options for users to select which diagnostic service is needed: Blood test, X-ray, Mammogram, Ultrasound, MRI, CT Scan 1.6 | The user selects Blood test. 1.7 | The system prompts user to Scan or Upload requisition forms or Verify existing test result. 1.8 | The user selects to Take Picture of Blood test requisition form. 1.9 | The system displays camera screen for user to take picture of requisition form. 1.10 | The user takes picture of blood test requisition form. 1.11 | The system confirms date and time of picture taken and prompts user that upload was successful.

Touchpoint	Use Case	User and System Actions
6.0 SCHEDULING (cont.)	Schedule an appointment with a diagnostic laboratory for blood test.	1.12 | The system displays options for user to look for location, take another picture or access instructions associated with specific diagnostic test selected. 1.13 | The user selects Instructions to view specific instructions associated with selected diagnostic test. 1.14 | The system displays options for user to look for location or take another picture. 1.15 | The user selects Look for Location. 1.16 | The system checks database to display map with Diagnostic Labs near user populated by Google Maps using user's current location. 1.17 | The user selects Sunnybrook Health Sciences. 1.18 | The system displays options for user to call Diagnostic Lab selected or to Book Appointment. 1.19 | The user selects Check Availability. 1.20 | The system displays options for user to book New Appointment or Edit Existing Appointment. 1.21 | The user selects New Appointment. 1.22 | The system searches database for all upcoming appointments associated with Diagnostic Lab selected. 1.23 | The system displays date options in a calendar format with dates available highlighted. 1.24 | The user selects February 27 2020. 1.25 | The system searches database and displays all times available at Diagnostic Lab selected for selected date. 1.26 | The user selects 10:00AM. 1.27 | The system displays options for user to Confirm selected date and time or Start Over with new appointment. 1.28 | The user selects Yes, Confirm. 1.29 | The system prompts user to give permission for identiCHAIN to send health card information to diagnostic lab through pop-up. 1.30| The user selects Yes, I give permission. 1.31 | The system displays confirmation message. 1.32 | The system updates user's calendar with new appointment and updates Family Medical Clinic's calendar with user's new appointment.

Touchpoint	Use Case	User and System Actions
7.0 HISTORY	Share x-ray results taken at hospital with specialist at follow-up visit. Imagine you fractured your wrist a few weeks ago and went to the hospital emergency room. Today, you are currently in a consultation with a specialist to determine the next steps of care. Unfortunately, the hospital has not sent over your results from the x-rays taken. As a result, the specialist cannot make an accurate diagnosis. However, you have the x-ray images from the hospital that can be accessed through this app. Instead of having to take another set of x-rays, then having to rebook another appointment for a repeat visit on another date, you can show the specialist the x-ray images during your consultation and send them to the specialist digitally through the app. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects History. 1.3 | The system prompts the user to select which medical record or result to access: Family Physician Medical Records, Hospital Medical Records, Diagnostic Results, Scheduled Procedures Records, Walk-In Clinic Records, Specialist Medical Records 1.4 | The user selects Diagnostic Results. 1.5 | The system checks database to display all Diagnostic Results associated with user: Blood test, X-ray, Mammogram, Ultrasound, MRI, CT Scan 1.6 | The user selects X-ray. 1.7 | The system displays all x-ray results associated with user, filtered by year. 1.8 | The user selects 2020. 1.9 | The system checks the database to display all the x-ray results from 2020. 1.10 | The user chooses the entry for January 7 2020. 1.11 | The system checks the database to display the blood test result from January 7 2020, displaying the date and location where blood tests were taken. 1.12 | The user selects Send to Doctor. 1.13 | The system checks the database to display the health care providers associated with the user's profile. 1.14 | The system prompts the user to select which health care provider to send the selected result to. 1.15 | The user selects Dr. Smith (Specialist). 1.16 | The system prompts the user to confirm to send the selected x-ray result. 1.17 | The user selects Yes, I give permission. 1.18 | The system confirms that the test result has been sent to the Specialist. 1.19 | The system adds a record of this transaction/communication to the blockchain displaying the unique blockchain hash associated with the transaction as confirmation. 1.20 | The system adds the record to the blockchain displaying the unique blockchain hash associated with the record as confirmation.

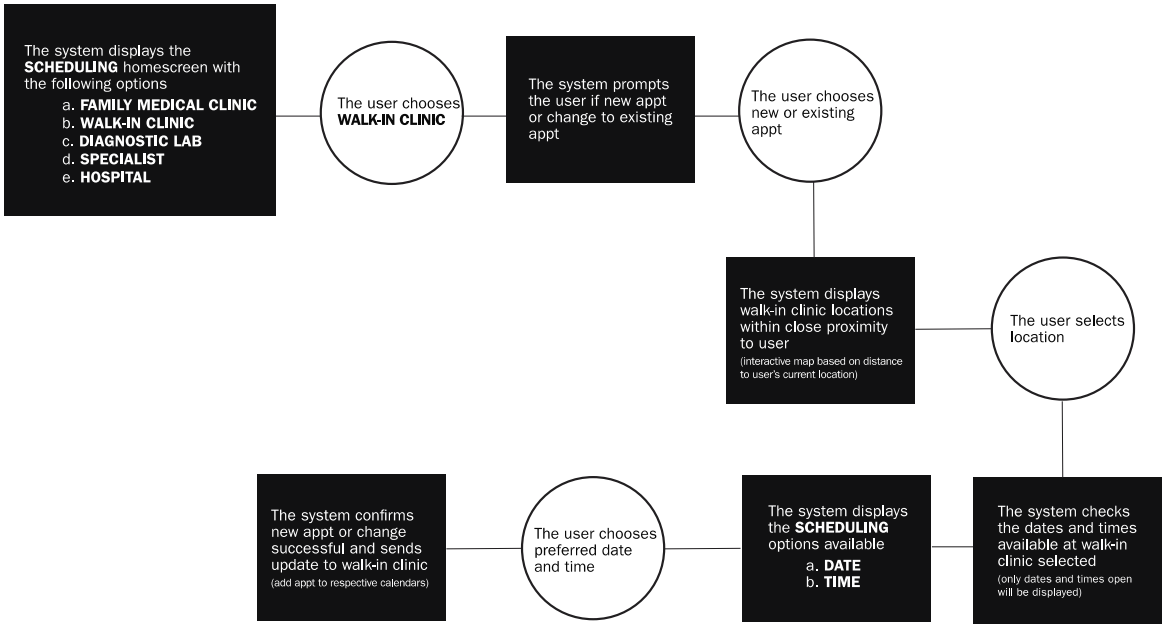
Touchpoint	Use Case	User and System Actions
8.0 ARRIVAL	Signing in electronically at family medical clinic office. Imagine you just arrived at your family medical clinic for an appointment with your family physician. The waiting room is full of patients and there is a line waiting to speak with the receptionist. Instead of having to wait in line, you can just take a seat and sign in electronically on the app. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Arrival. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital 1.4 | The user selects Family Medical Clinic. 1.5 | The system prompts the user to sign in or check wait time (Check wait time will be visible, but inactive if user is not already signed in) 1.6 | The user selects Sign in option. 1.7 | The system searches database and displays all upcoming appointments associated with user and Family Medical Clinic selected. 1.8 | The user selects February 22 2020 at 10:00AM. 1.9 | The system confirms the user has successfully signed in with date and time confirmation. 1.10 | The system updates the family medical clinic's electronic sign in log with the user's sign in time confirmation, placing the user in priority sequence in the patient queue.
9.0 UPDATE	Update your history with just completed x-ray results. Imagine you just completed an x-ray at a diagnostic lab. Instead of the lab sending the results to your family physician, the lab can upload the results to the app in real time. You just have to sign in to the app, verify and confirm the result and it will be added to your profile and accessed through the app. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Update. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital 1.4 | The system prompts the user with the amount of records pending verification from the user. 1.5 | The user selects Diagnostic Lab [3]. 1.6 | The system displays options for users to select which diagnostic service to access: Blood test, X-ray, Mammogram, Ultrasound, MRI, CT Scan 1.7 | The system prompts the user with the amount of diagnostic test records pending verification from the user. 1.8 | The user selects X-ray [1]. 1.9 | The system displays the x-ray result from the diagnostic lab pending verification along with the lab's information, date and time the x-ray was conducted. 1.10 | The user selects Verify. 1.11 | The system prompts user to Confirm or Delete pending result. 1.12 | The user selects Yes, Add this entry. 1.13 | The system prompts the user to select which profile to add medical record entry to. 1.14 | The user selects Jane.

Touchpoint	Use Case	User and System Actions
9.0 UPDATE (cont.)	Update your history with just completed x-ray results.	1.15 | The system confirms the user has successfully added the medical entry to their profile with time and date verified. 1.16 | The system adds the record to the blockchain displaying the unique blockchain hash associated with the record as confirmation. 1.17 | The system updates the family medical clinic with the user's confirmation and adds the medical record entry to the user's history.
10.0 UPDATE	Update multiple user profiles simultaneously. Imagine you just got diagnosed with an allergy and your family physician wants to update your children's history with this allergy potential at your consultation. Instead of having to go in and manually update each child's profile independently, there is the option to update different profiles associated with the user simultaneously. Let's go through the app and see how you can do this.	1.1 | The system prompts the user to select one of four main navigation options: Schedule, Arrival, History, Update 1.2 | The user selects Update. 1.3 | The system prompts the user to select healthcare provider: Family Medical Clinic, Walk-in Clinic, Diagnostic Lab, Specialist, Hospital 1.4 | The user selects Family Medical Clinic. 1.5 | The system prompts user that a new medical entry is waiting for verification. 1.6 | The user selects Verify. 1.7 | The system prompts user to Confirm or Delete pending result. 1.8 | The user selects Yes, Add this entry. 1.9| The system prompts the user to select which profile to add medical record entry to. 1.10 | The user selects Jane, Chelsea and Luke. 1.11 | The system confirms the user has successfully added the medical entry to the corresponding profiles with time and date verified. 1.12 | The system adds the record to the blockchain displaying the unique blockchain hash associated with the record as confirmation. 1.13 | The system updates the family medical clinic with the user's confirmation and adds the medical record entry to the user's history.

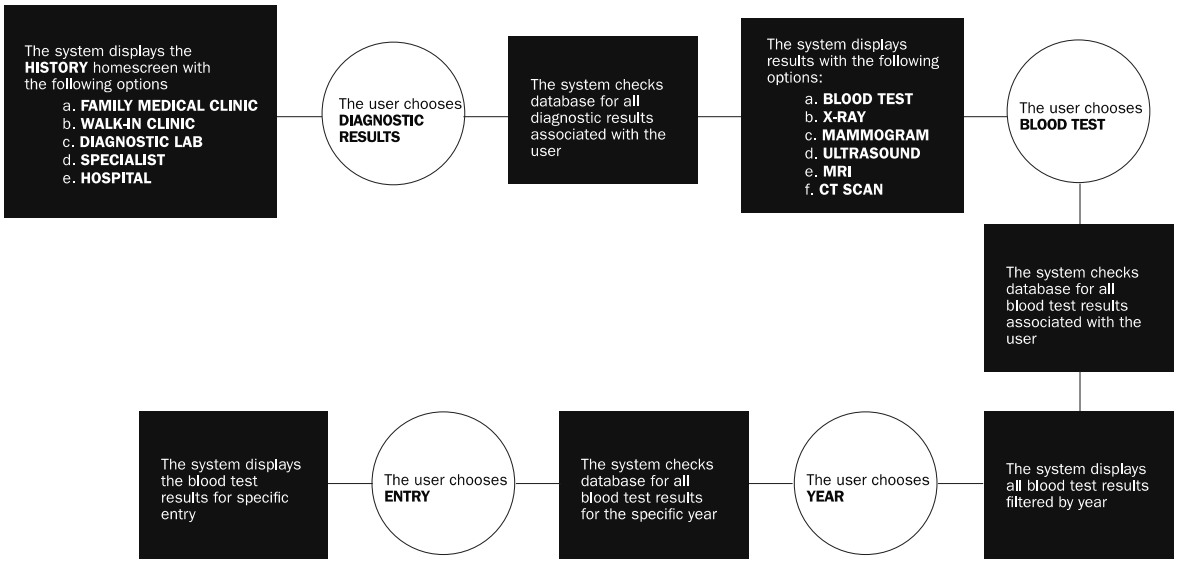
Appendix H

Application Flow Diagrams

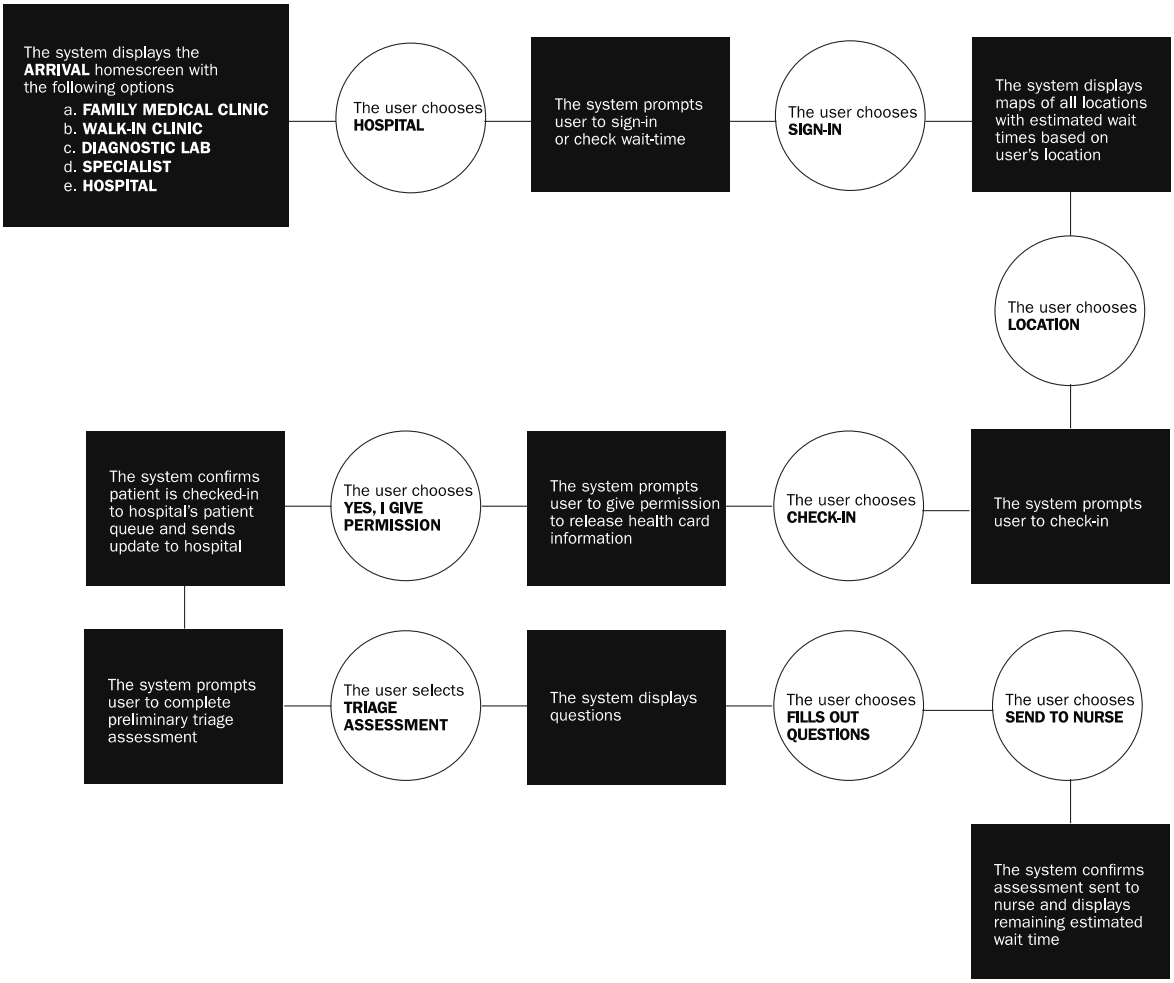
USE CASE 1.0
Schedule an Appointment at a Walk-In Clinic



USE CASE 2.0
Share Blood Test Results with New Family Physician

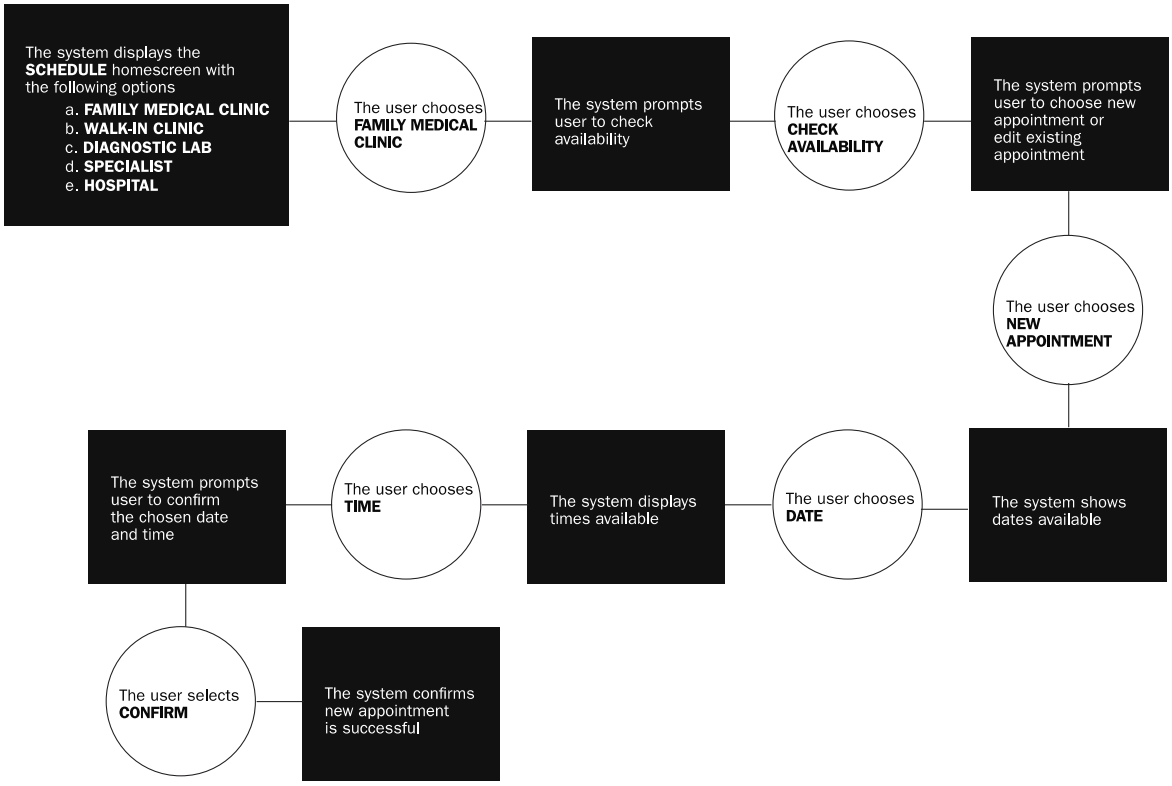


USE CASE 3.0
Sign In at Hospital Emergency Room



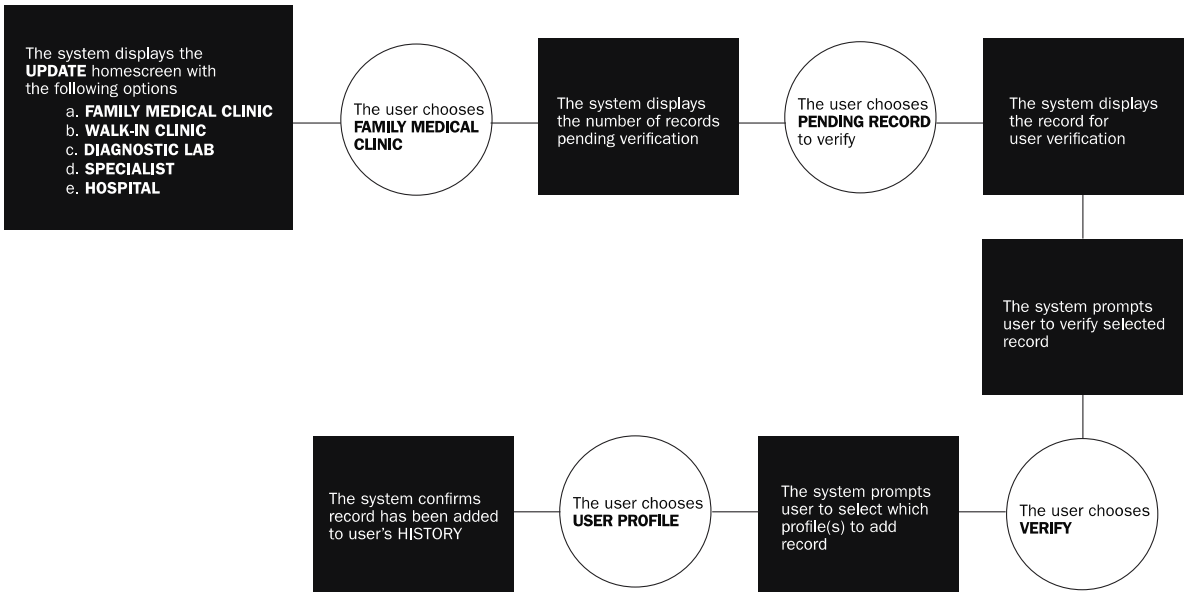
USE CASE 4.0

Schedule an Appointment with Your Family Physician for a Yearly Check-Up



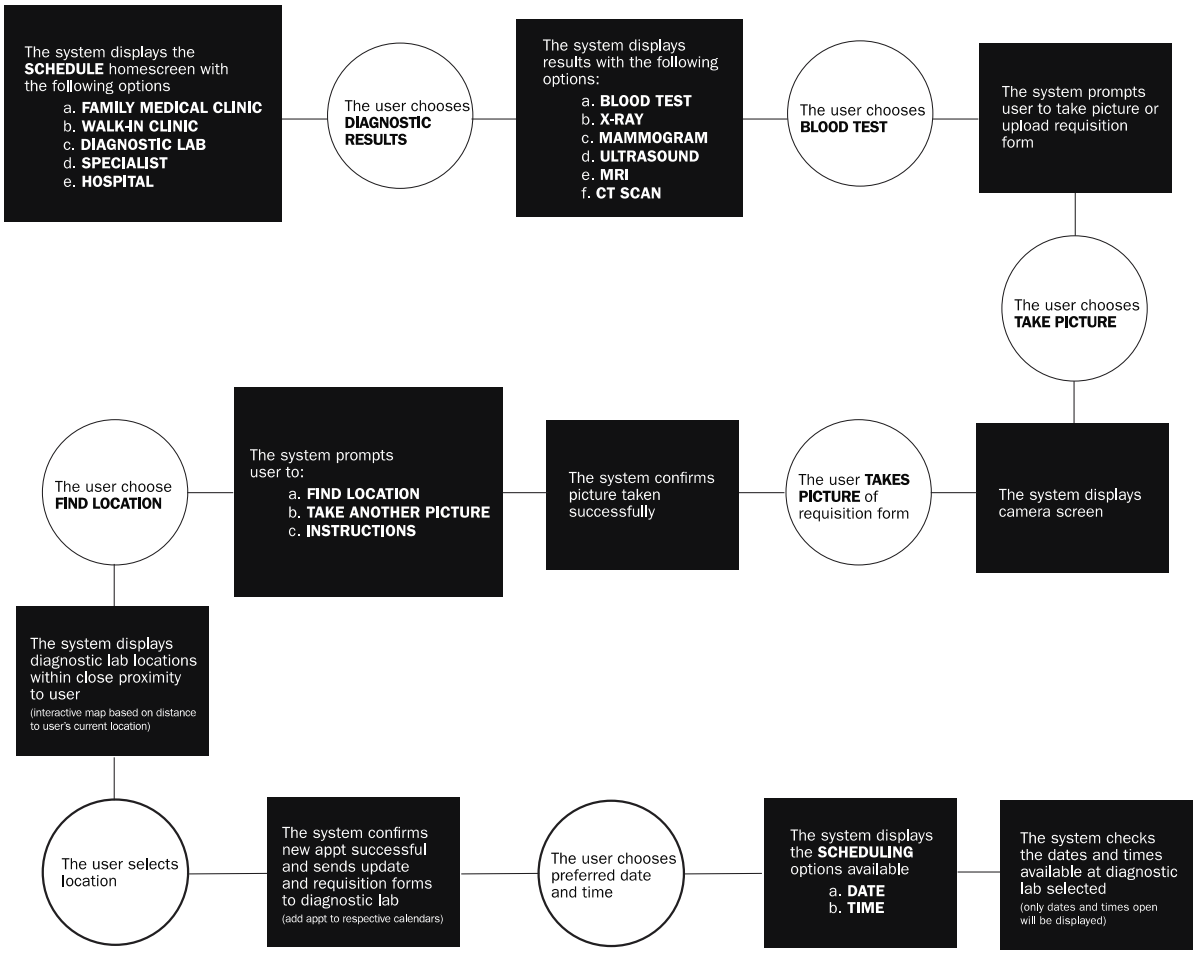
USE CASE 5.0

Update Medical Record from Consultation with Family Physician



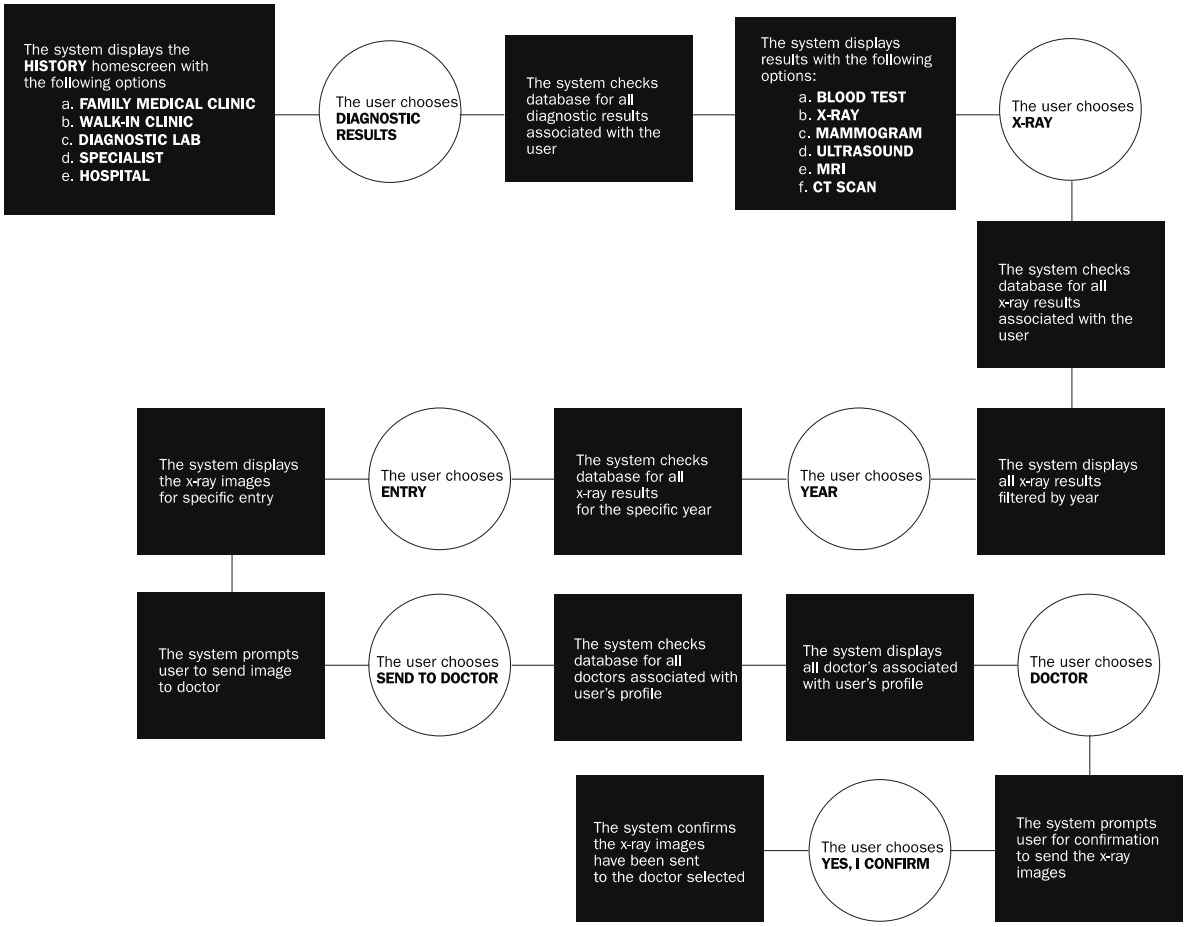
USE CASE 6.0

Schedule an Appointment with a Diagnostic Laboratory for Blood Test



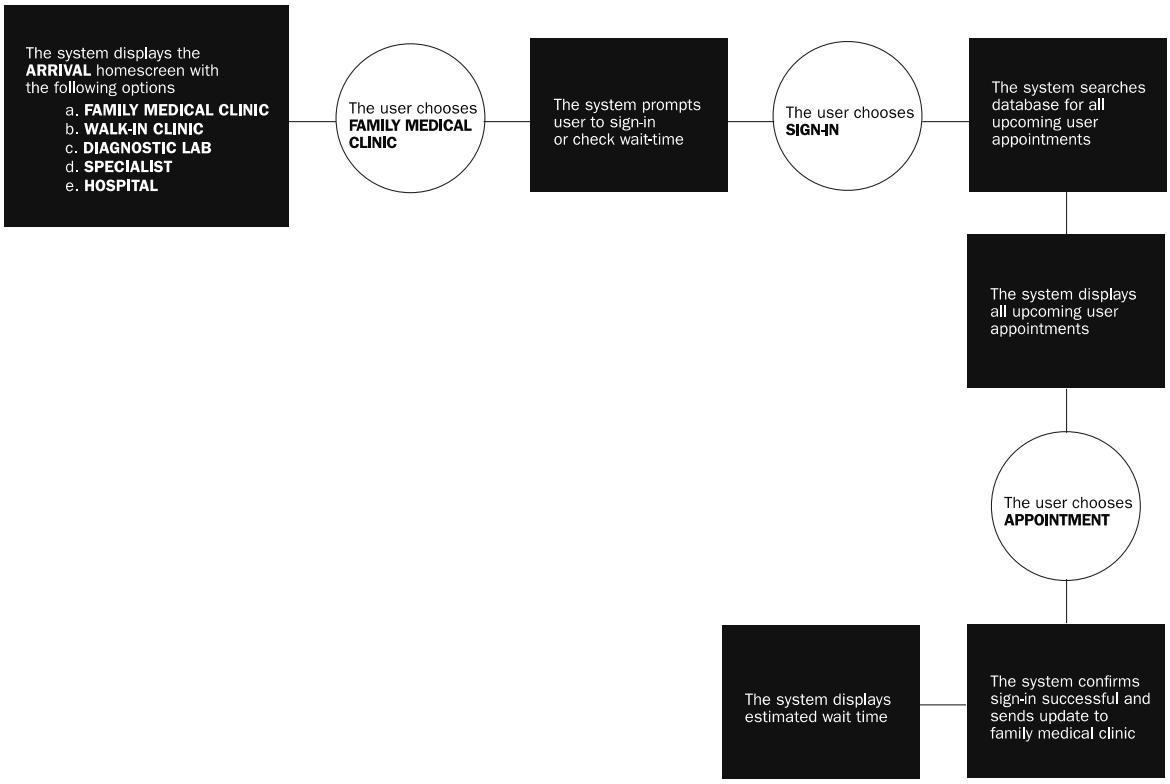
USE CASE 7.0

Share X-Ray Results Taken at Hospital with Specialist at Follow-Up Visit



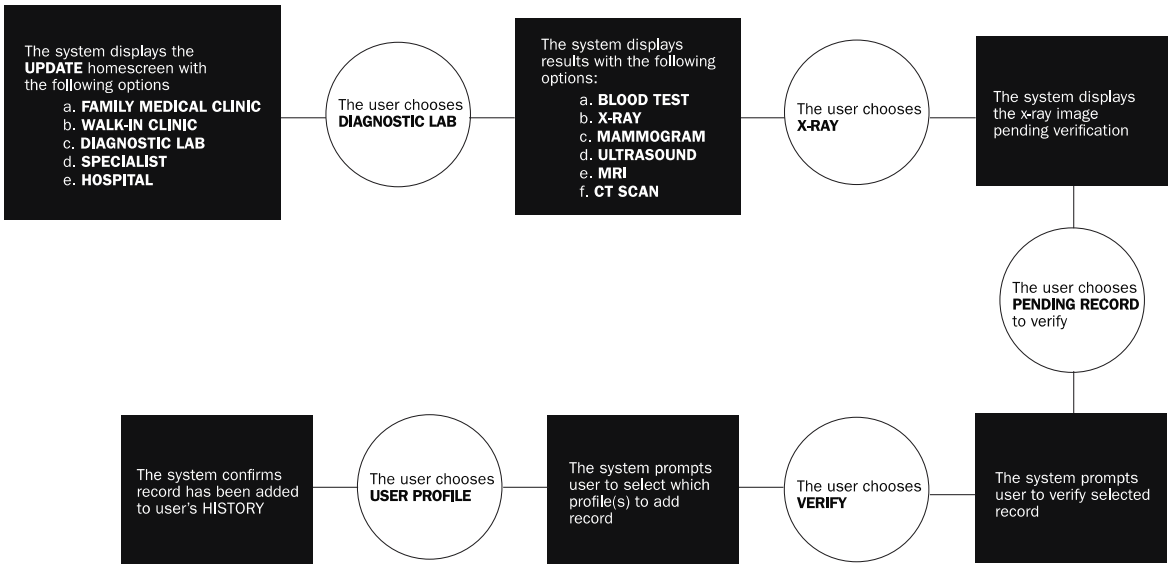
USE CASE 8.0

Signing In Electronically at Family Medical Clinic



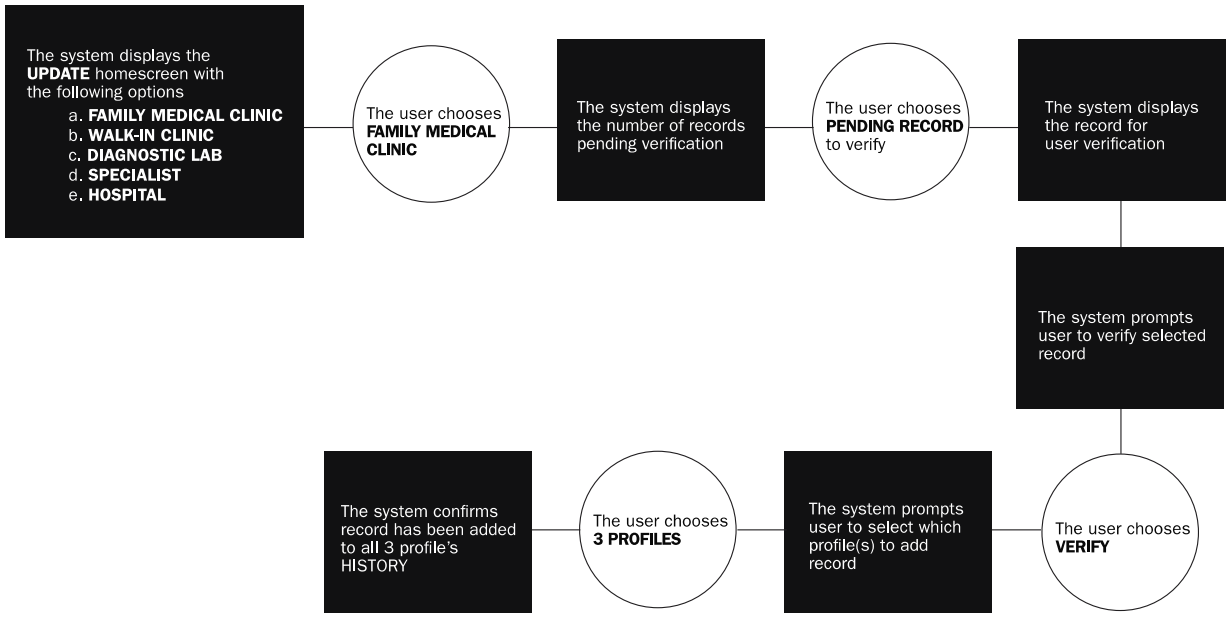
USE CASE 9.0

Update Your History with Just Completed X-Ray Results



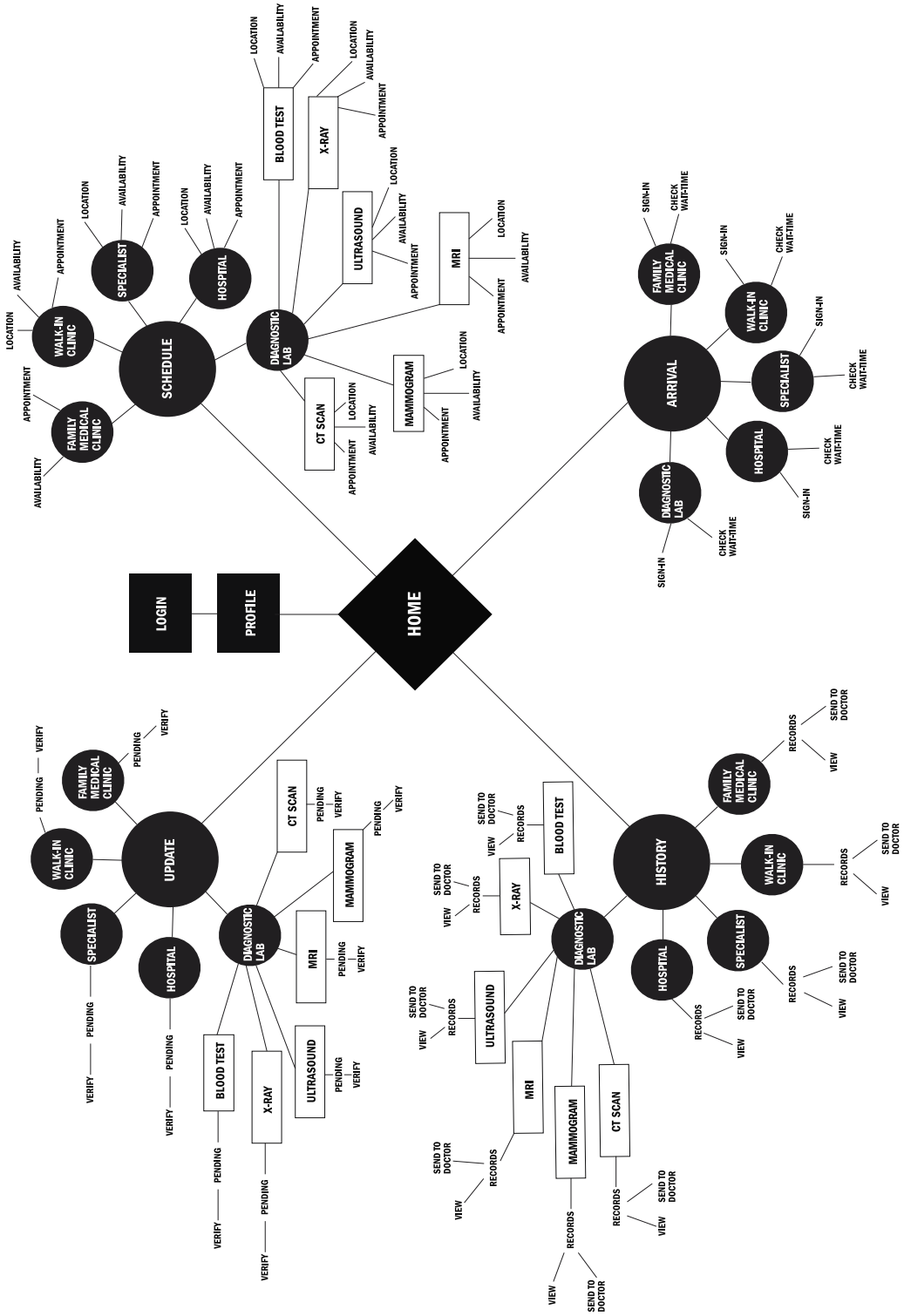
USE CASE 10.0

Update Multiple User Profiles Simultaneously



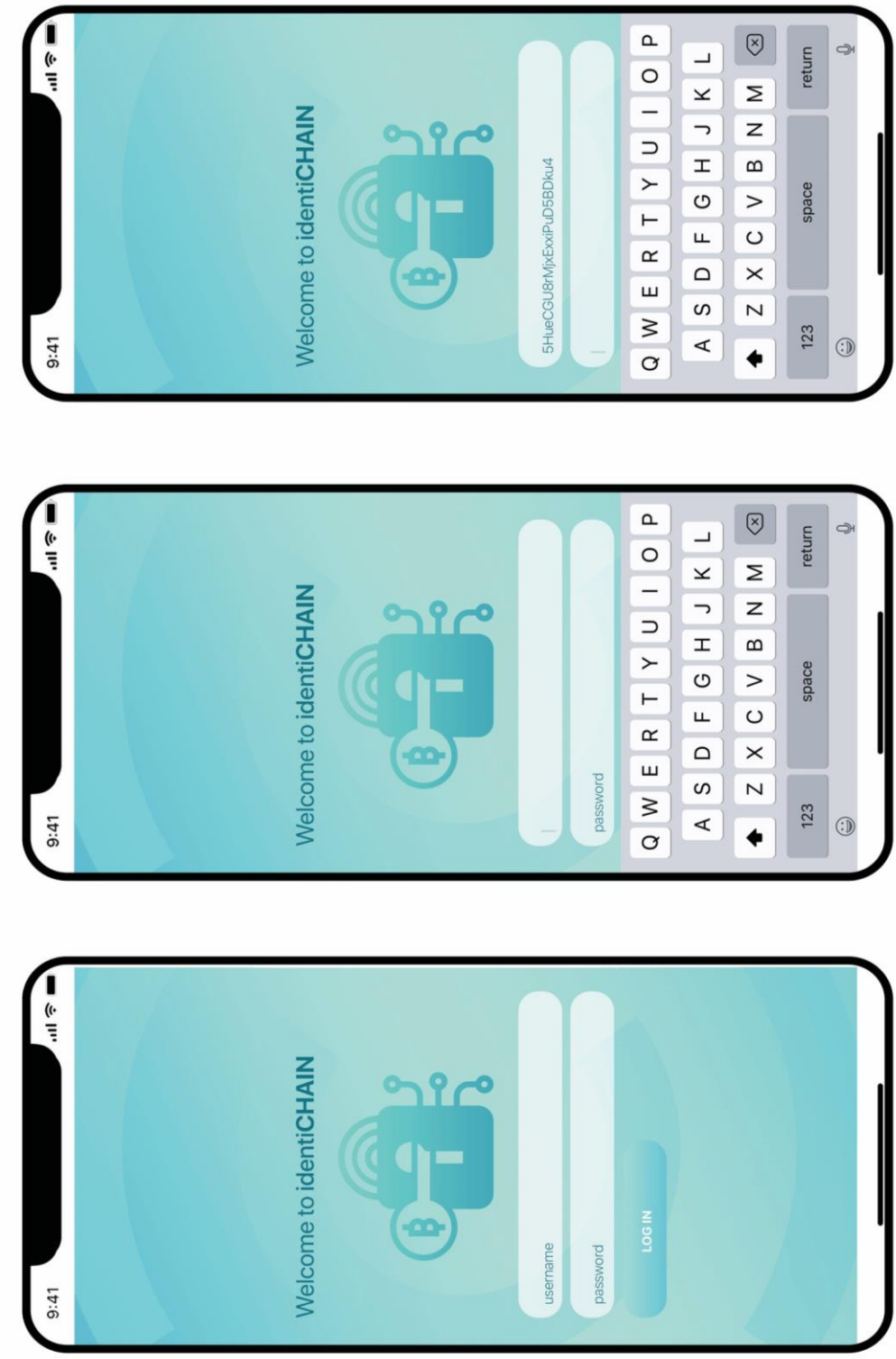
Appendix I

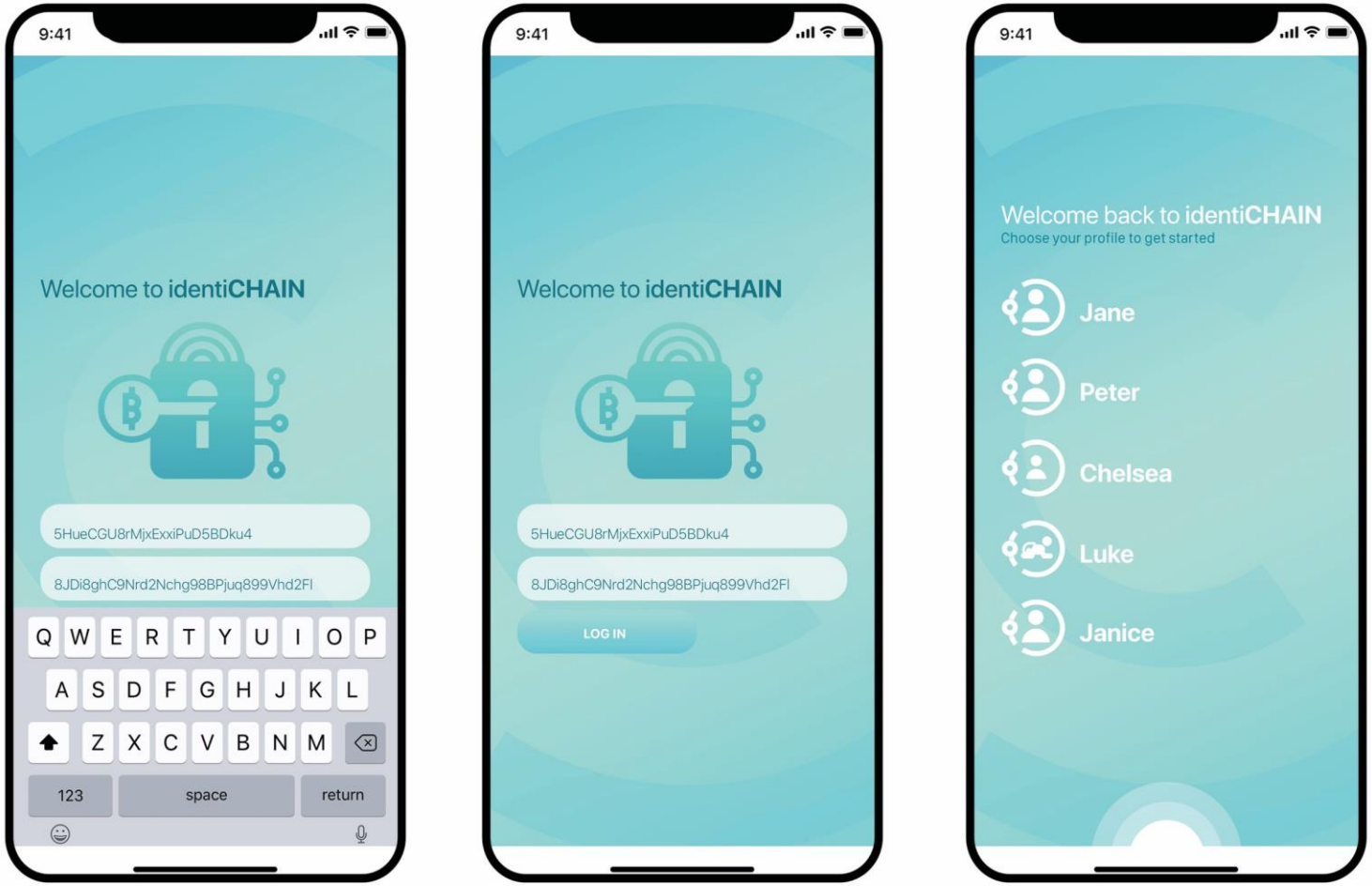
Application System Map

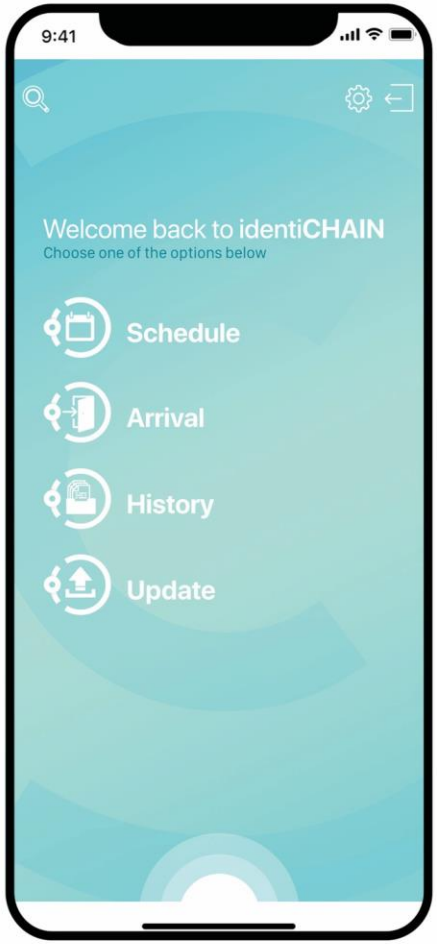


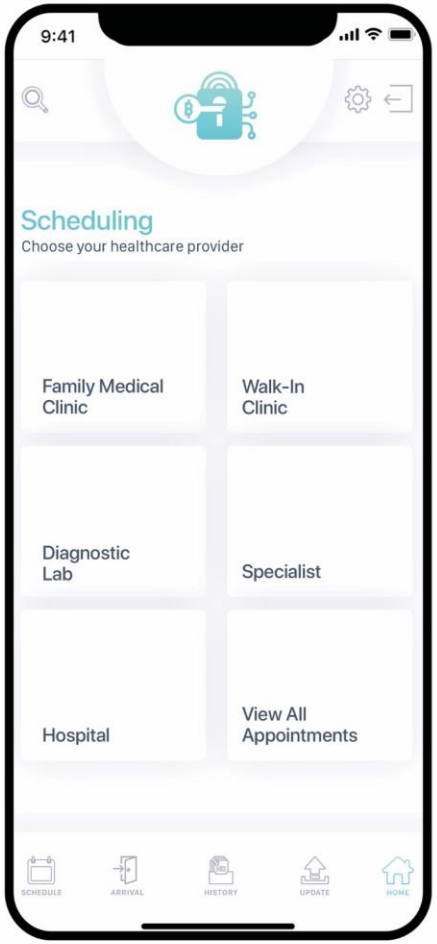
Appendix J

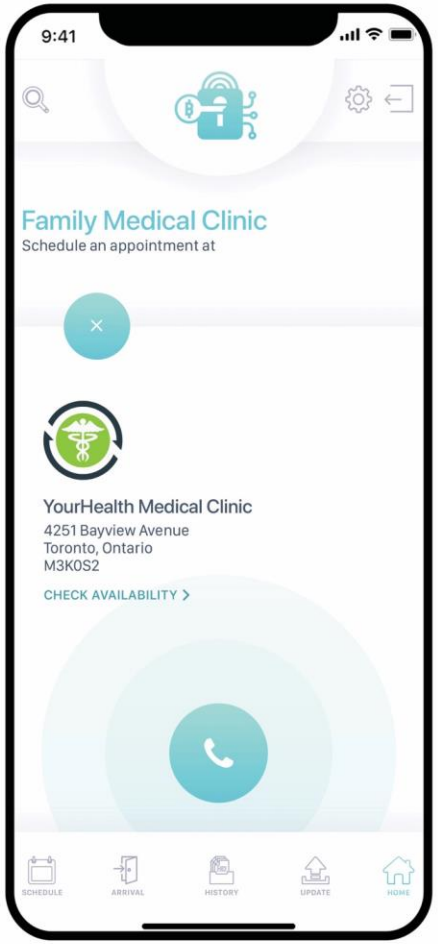
Application Visual Designs

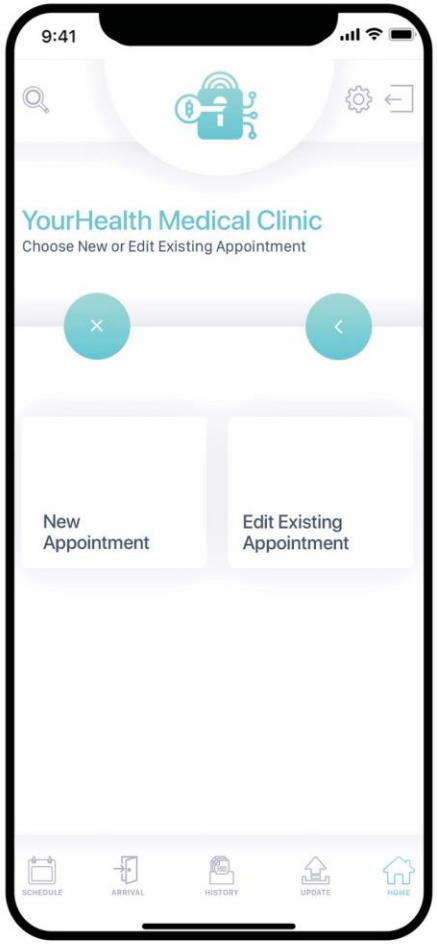


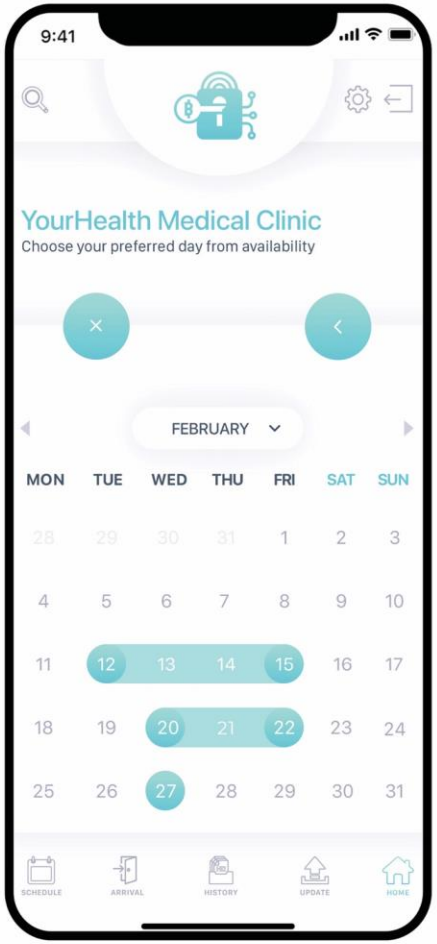

9:41
Welcome to identiCHAIN
5HueCGU8rMjxExxiPuD5BDku4
8JDi8ghC9Nrd2Nchg98BPjuq899Vhd2FI
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
space
return
9:41
Welcome to identiCHAIN
5HueCGU8rMjxExxiPuD5BDku4
8JDi8ghC9Nrd2Nchg98BPjuq899Vhd2FI
LOG IN
9:41
Welcome back to identiCHAIN
Choose your profile to get started
Jane
Peter
Chelsea
Luke
Janice

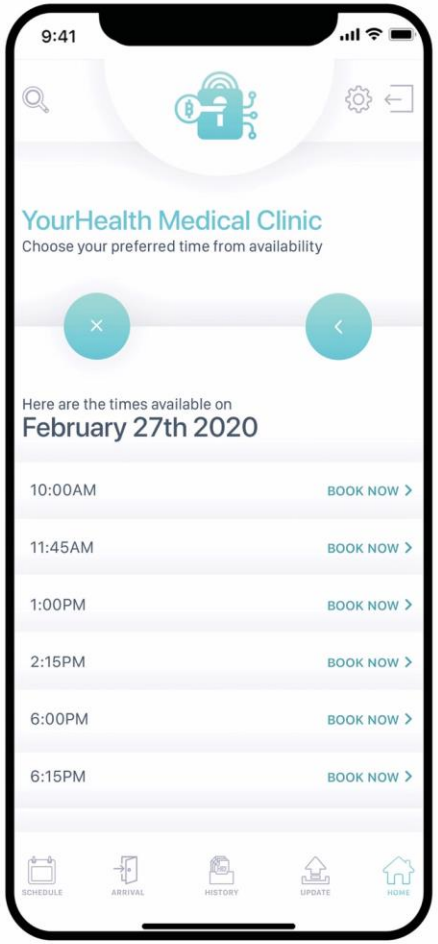

9:41
Welcome back to identiCHAIN
Choose one of the options below
Schedule
Arrival
History
Update

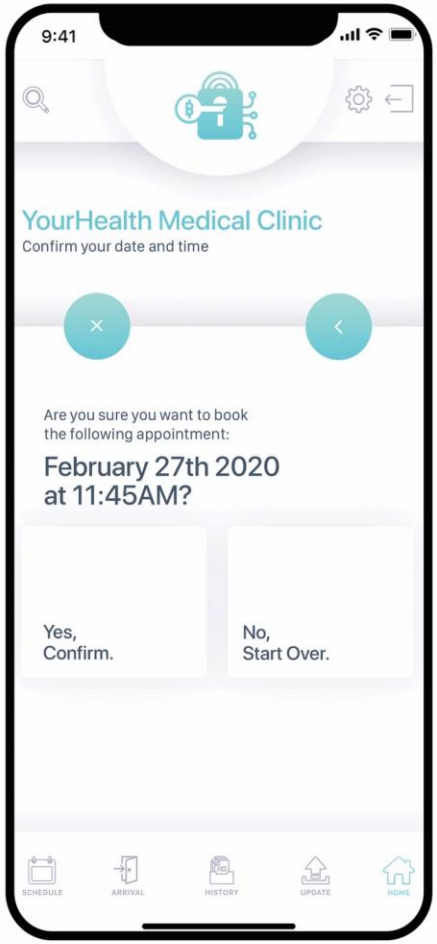

9:41
Scheduling
Choose your healthcare provider
Family Medical Clinic
Walk-In Clinic
Diagnostic Lab
Specialist
Hospital
View All Appointments
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

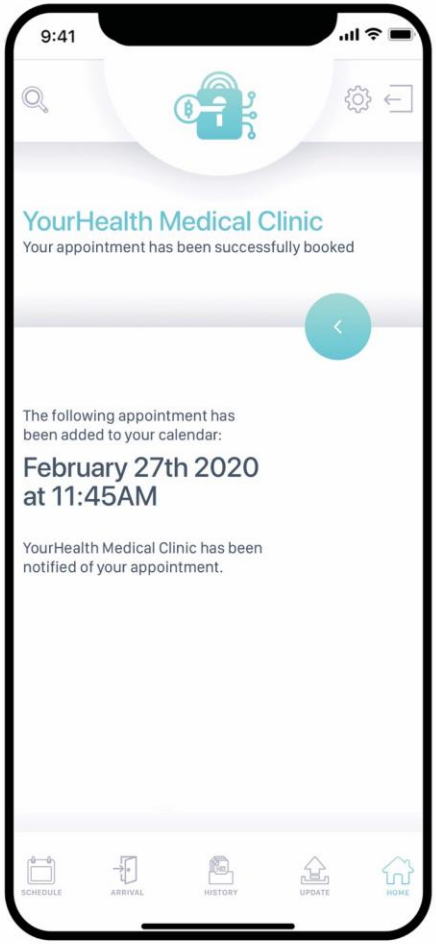

9:41
Family Medical Clinic
Schedule an appointment at
YourHealth Medical Clinic
4251 Bayview Avenue
Toronto, Ontario
M3K0S2
CHECK AVAILABILITY
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

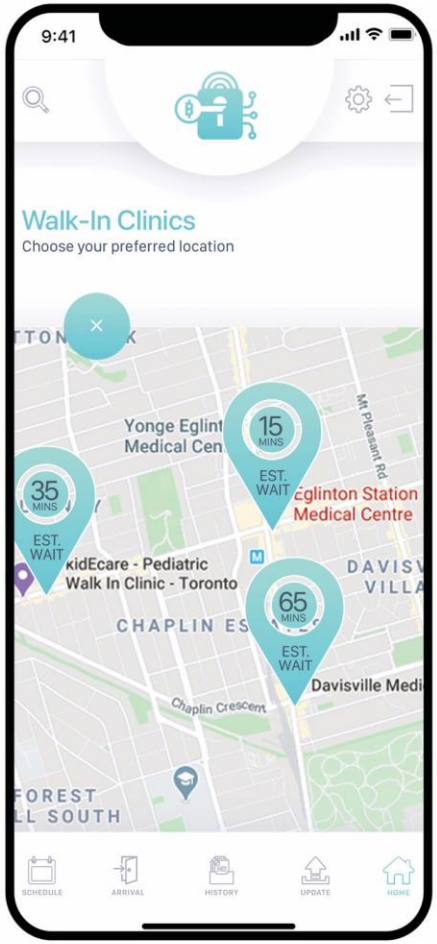

9:41
YourHealth Medical Clinic
Choose New or Edit Existing Appointment
New Appointment
Edit Existing Appointment
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

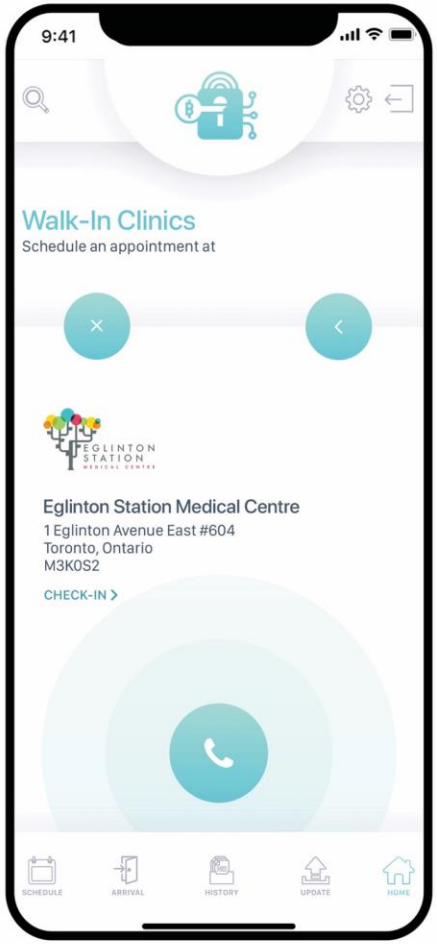

9:41
YourHealth Medical Clinic
Choose your preferred day from availability
FEBRUARY
MON TUE WED THU FRI SAT SUN
28 29 30 31 1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

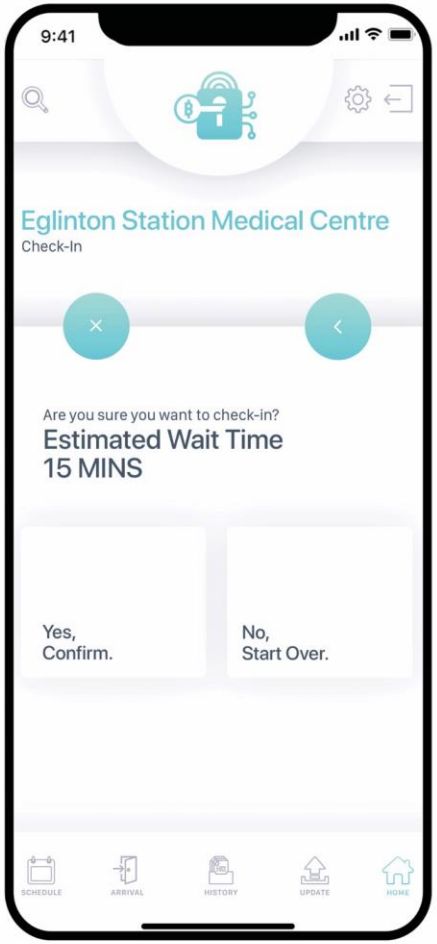

9:41
YourHealth Medical Clinic
Choose your preferred time from availability
Here are the times available on
February 27th 2020
10:00AM BOOK NOW
11:45AM BOOK NOW
1:00PM BOOK NOW
2:15PM BOOK NOW
6:00PM BOOK NOW
6:15PM BOOK NOW
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME


9:41
YourHealth Medical Clinic
Confirm your date and time
Are you sure you want to book the following appointment:
February 27th 2020 at 11:45AM?
Yes, Confirm.
No, Start Over.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

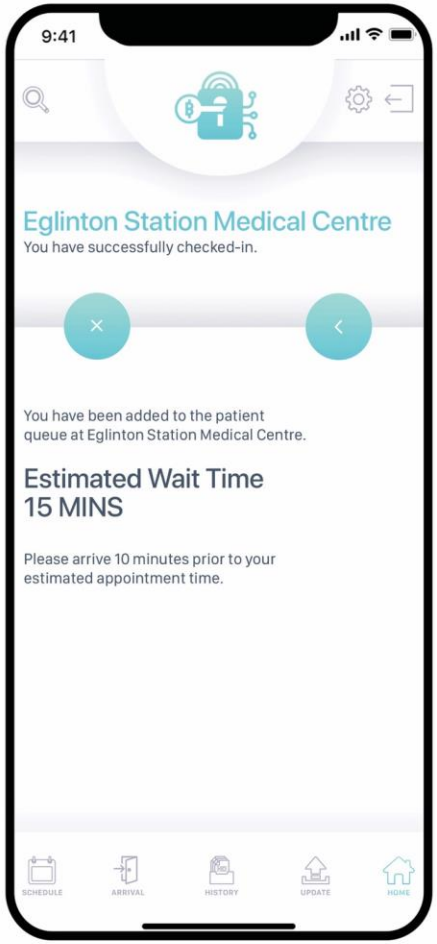

9:41
YourHealth Medical Clinic
Your appointment has been successfully booked
The following appointment has been added to your calendar:
February 27th 2020 at 11:45AM
YourHealth Medical Clinic has been notified of your appointment.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

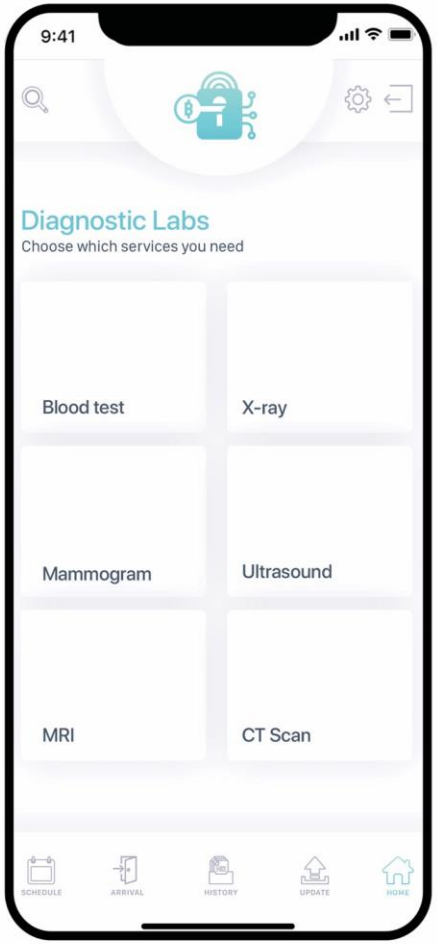

9:41
Walk-In Clinics
Choose your preferred location
15 MINS EST. WAIT
35 MINS EST. WAIT
65 MINS EST. WAIT
Yonge Eglint Medical Cen
Mt Pleasant Rd
eglinton Station Medical Centre
kidEcare - Pediatric Walk In Clinic - Toronto
CHAPLIN ES
Davisville Medi
Chaplin Crescent
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

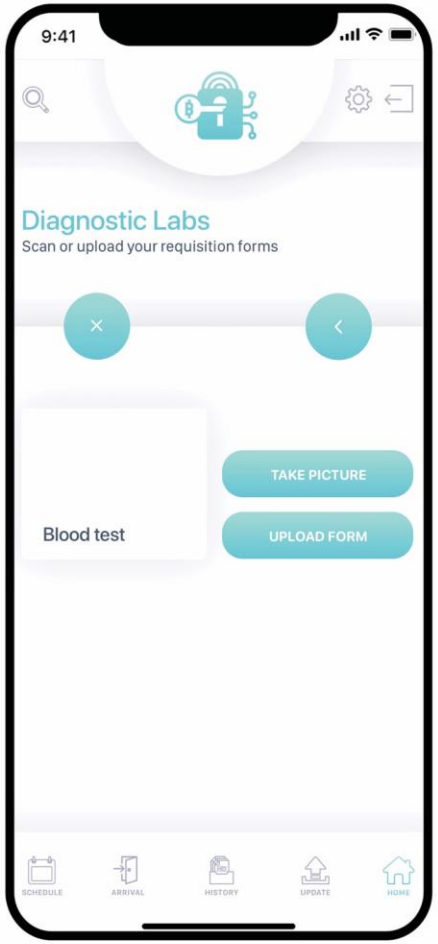

9:41
Walk-In Clinics
Schedule an appointment at
Eglinton Station Medical Centre
1 Eglinton Avenue East #604
Toronto, Ontario
M3K0S2
CHECK-IN
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

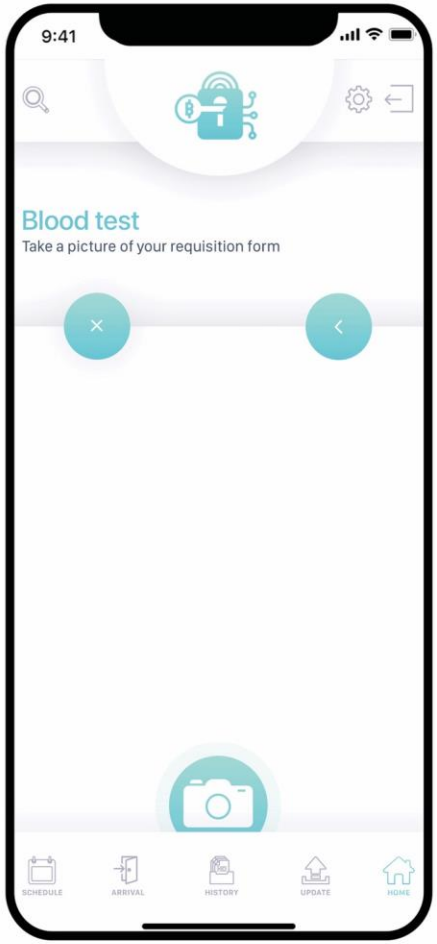

9:41
Eglinton Station Medical Centre
Check-In
Are you sure you want to check-in?
Estimated Wait Time
15 MINS
Yes,
Confirm.
No,
Start Over.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

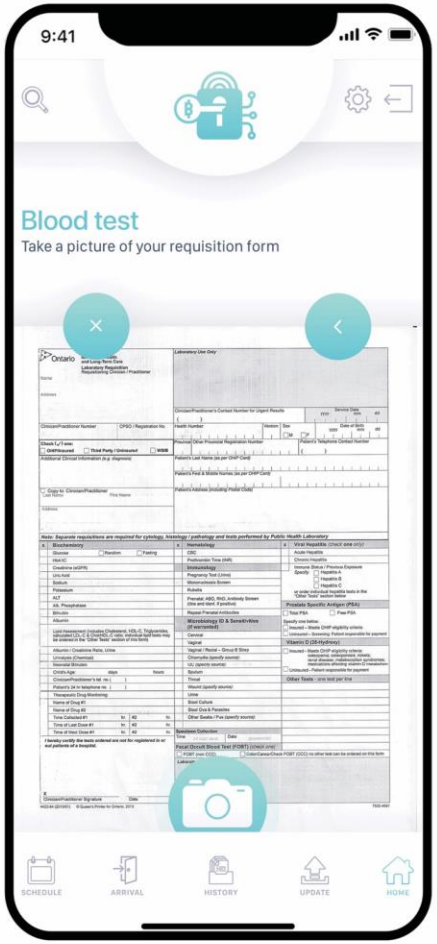

9:41
Eglinton Station Medical Centre
Check-In
Do you give permission to identiCHAIN to provide your healthcard information to Eglinton Station Medical Centre?
Ontario
Health • Santé
JANE WALKER
5584 - 486 - 674 - YM
Yes,
I give permission.
No,
Don't share my info.

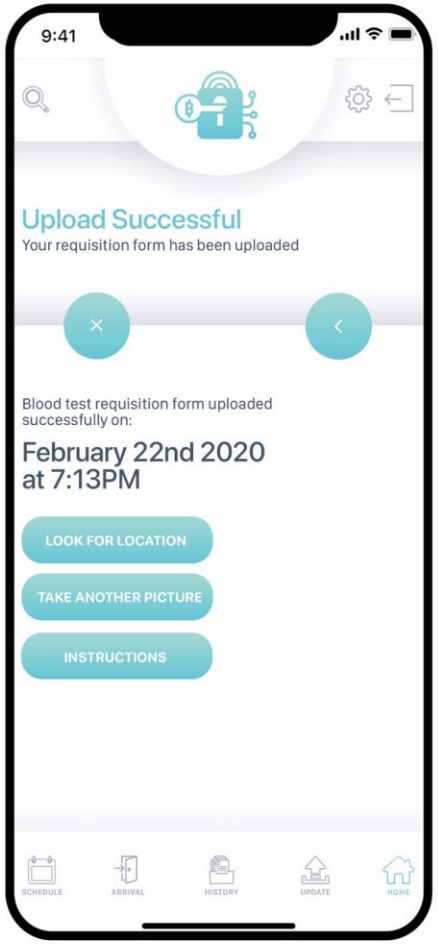

9:41
Eglinton Station Medical Centre
You have successfully checked-in.
You have been added to the patient queue at Eglinton Station Medical Centre.
Estimated Wait Time
15 MINS
Please arrive 10 minutes prior to your estimated appointment time.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

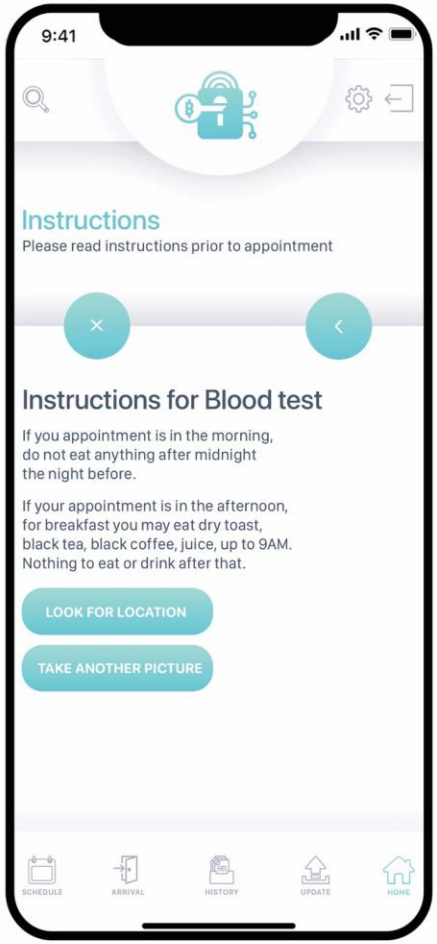

9:41
Diagnostic Labs
Choose which services you need
Blood test
X-ray
Mammogram
Ultrasound
MRI
CT Scan
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

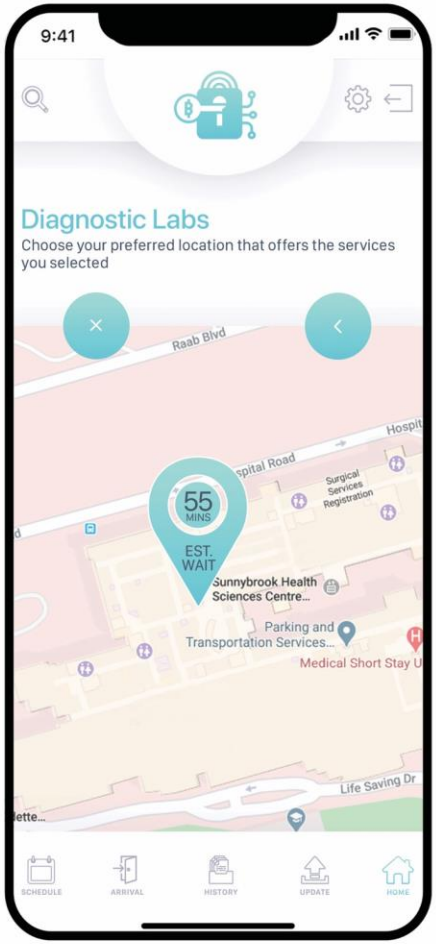

9:41
Diagnostic Labs
Scan or upload your requisition forms
Blood test
TAKE PICTURE
UPLOAD FORM
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

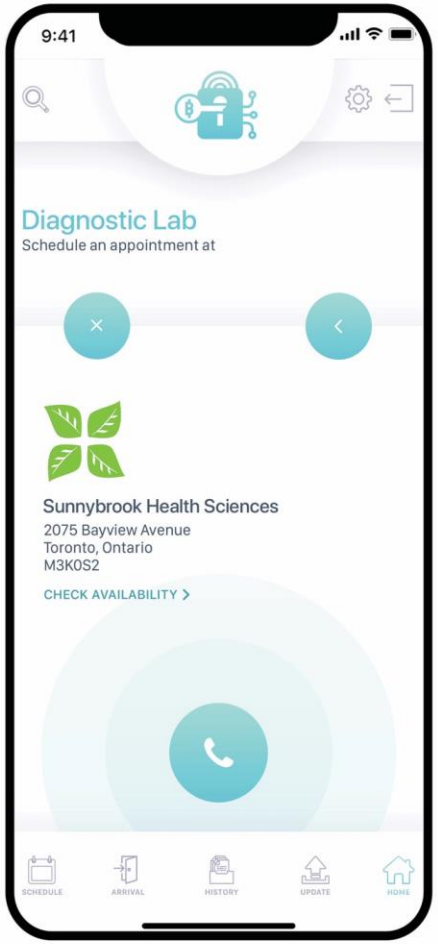

9:41
Blood test
Take a picture of your requisition form
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

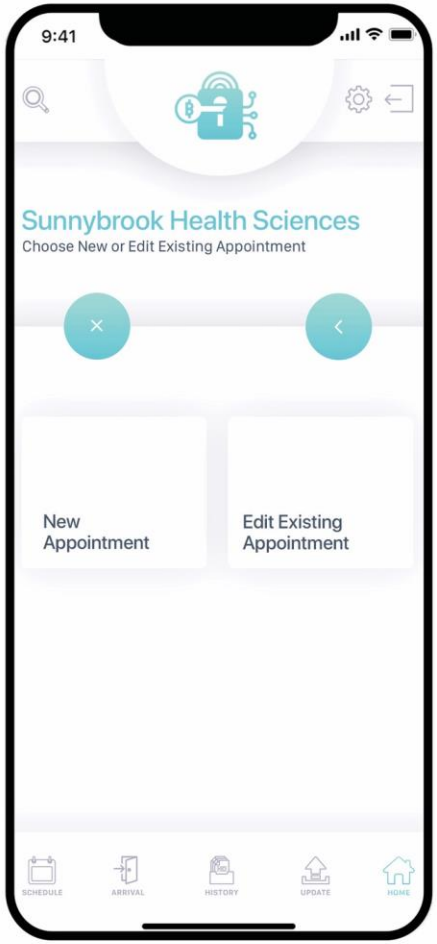

9:41
Blood test
Take a picture of your requisition form
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

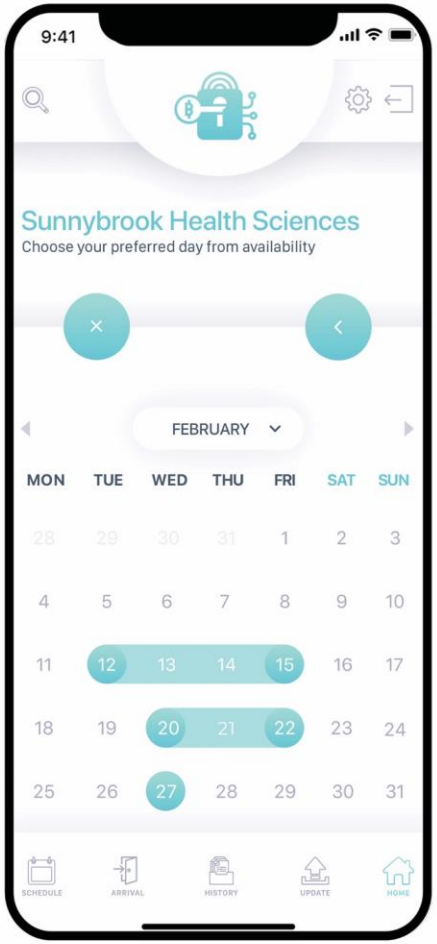

9:41
Upload Successful
Your requisition form has been uploaded
Blood test requisition form uploaded successfully on:
February 22nd 2020 at 7:13PM
LOOK FOR LOCATION
TAKE ANOTHER PICTURE
INSTRUCTIONS
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

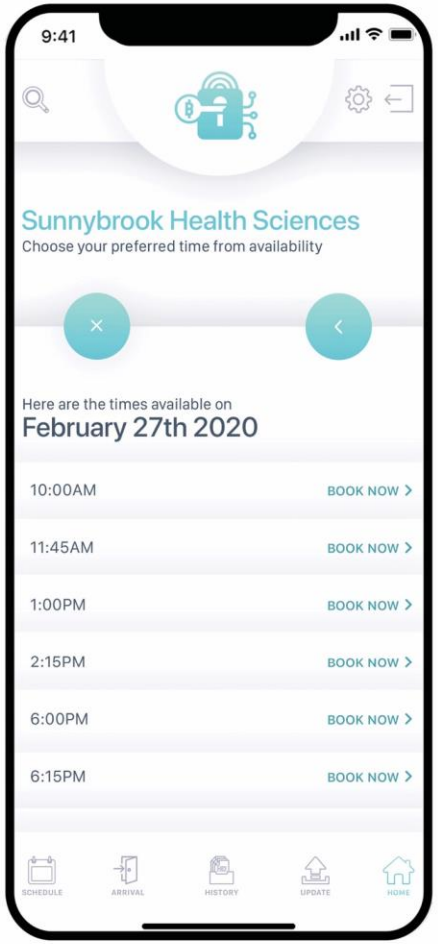

9:41
Instructions
Please read instructions prior to appointment
Instructions for Blood test
If you appointment is in the morning,
do not eat anything after midnight
the night before.
If your appointment is in the afternoon,
for breakfast you may eat dry toast,
black tea, black coffee, juice, up to 9AM.
Nothing to eat or drink after that.
LOOK FOR LOCATION
TAKE ANOTHER PICTURE
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

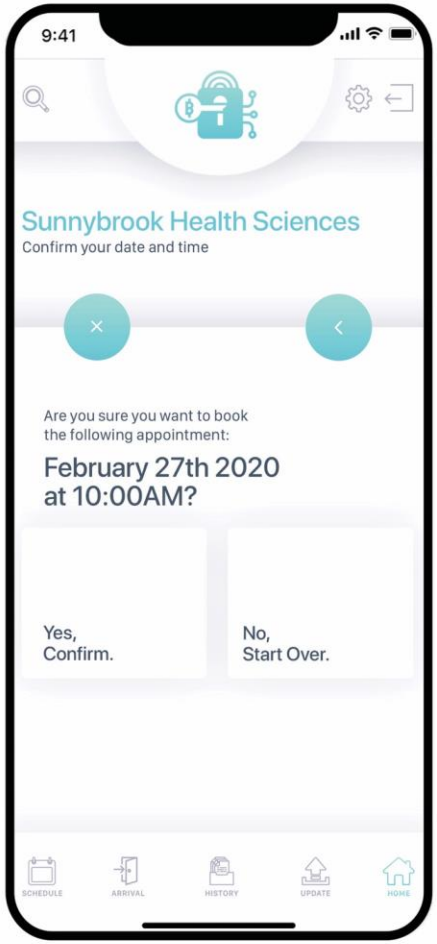

9:41
Diagnostic Labs
Choose your preferred location that offers the services
you selected
Raab Blvd
55
MINS
EST.
WAIT
Surgical
Services
Registration
Sunnybrook Health
Sciences Centre...
Parking and
Transportation Services...
Life Saving Dr
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME


9:41
Diagnostic Lab
Schedule an appointment at
Sunnybrook Health Sciences
2075 Bayview Avenue
Toronto, Ontario
M3K0S2
CHECK AVAILABILITY
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

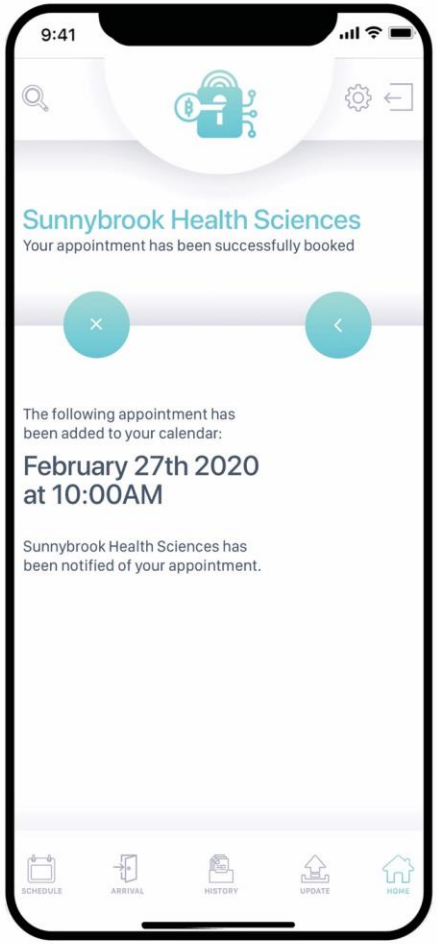

9:41
Sunnybrook Health Sciences
Choose New or Edit Existing Appointment
New Appointment
Edit Existing Appointment
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

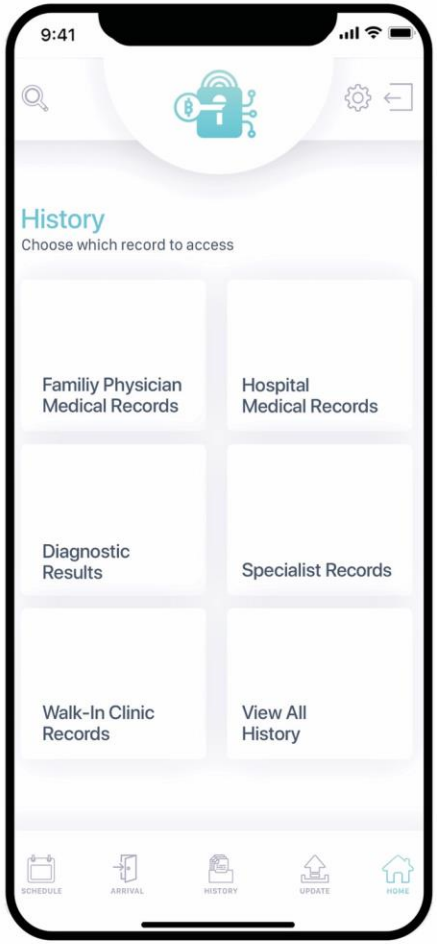

9:41
Sunnybrook Health Sciences
Choose your preferred day from availability
FEBRUARY
MON TUE WED THU FRI SAT SUN
28 29 30 31 1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

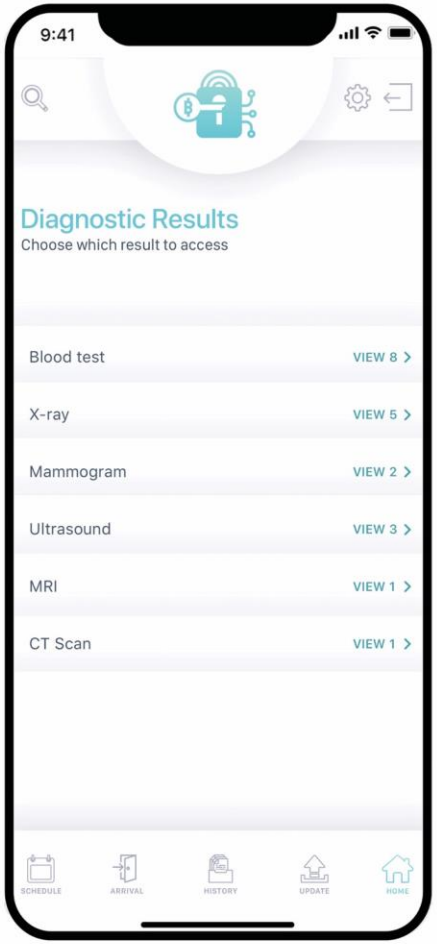

9:41
Sunnybrook Health Sciences
Choose your preferred time from availability
Here are the times available on
February 27th 2020
10:00AM BOOK NOW
11:45AM BOOK NOW
1:00PM BOOK NOW
2:15PM BOOK NOW
6:00PM BOOK NOW
6:15PM BOOK NOW
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

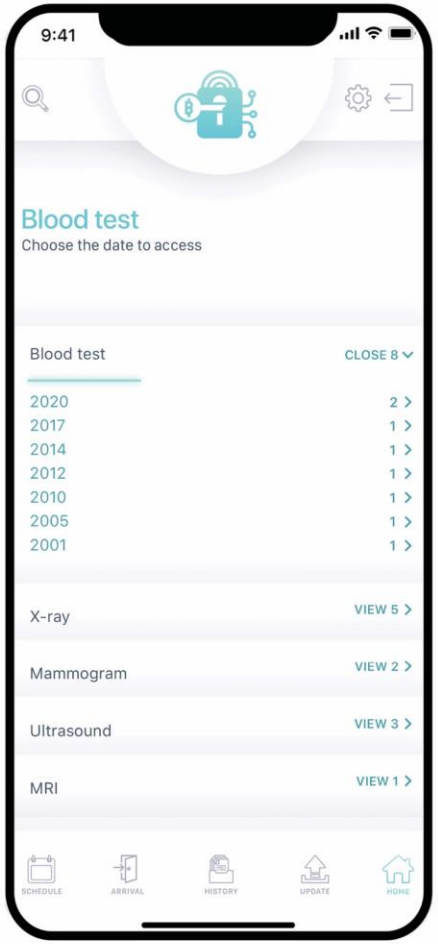

9:41
Sunnybrook Health Sciences
Confirm your date and time
Are you sure you want to book the following appointment:
February 27th 2020 at 10:00AM?
Yes, Confirm.
No, Start Over.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

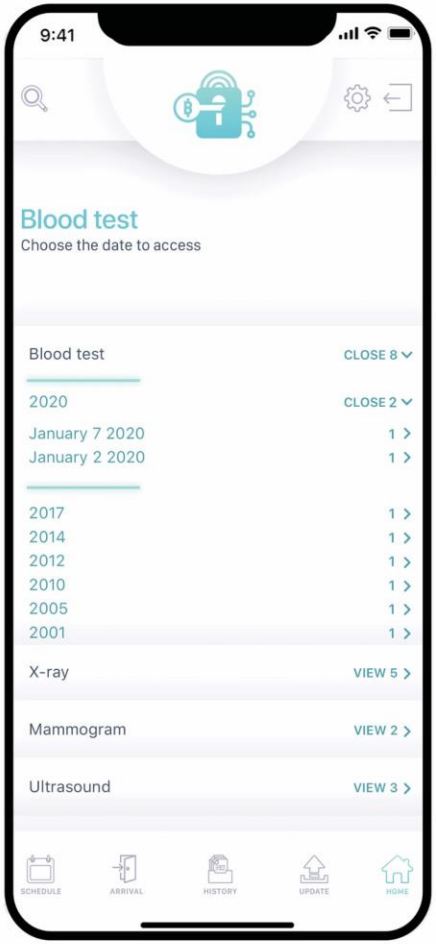

9:41
Sunnybrook Health Sciences
Confirm your date and time
Do you give permission to identiCHAIN to provide your healthcard information to Sunnybrook Health Sciences?
Ontario
Health • Santé
JANE WALKER
5584 - 486 - 674 - YM
1981 - 12 - 15
2007 - 12 - 15
2012 - 12 - 15
Yes, I give permission.
No, Don't share my info.

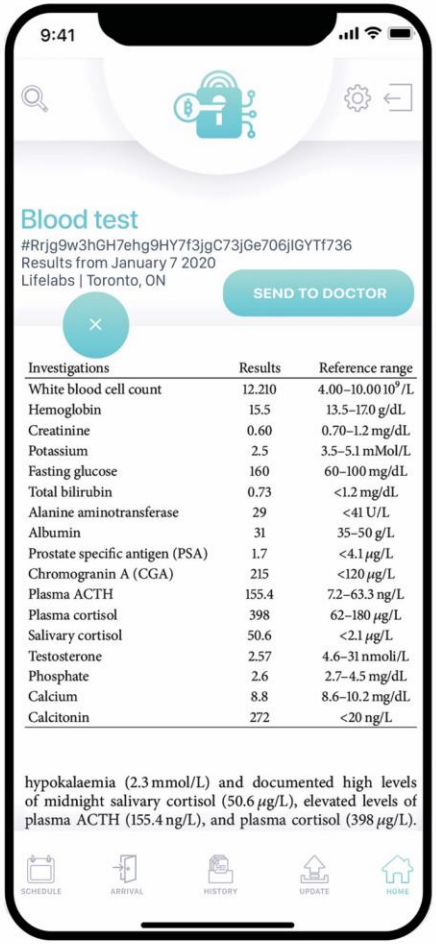

9:41
Sunnybrook Health Sciences
Your appointment has been successfully booked
The following appointment has been added to your calendar:
February 27th 2020 at 10:00AM
Sunnybrook Health Sciences has been notified of your appointment.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

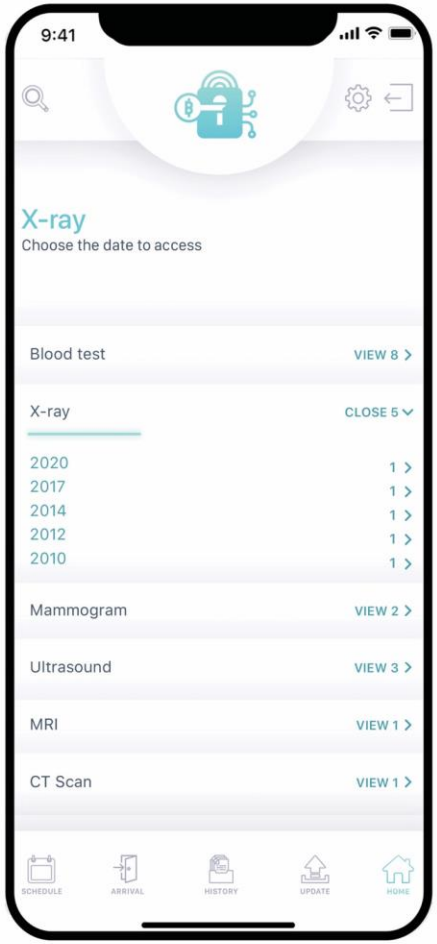

9:41
History
Choose which record to access
Familiy Physician Medical Records
Hospital Medical Records
Diagnostic Results
Specialist Records
Walk-In Clinic Records
View All History
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME


9:41
Diagnostic Results
Choose which result to access
Blood test VIEW 8
X-ray VIEW 5
Mammogram VIEW 2
Ultrasound VIEW 3
MRI VIEW 1
CT Scan VIEW 1
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

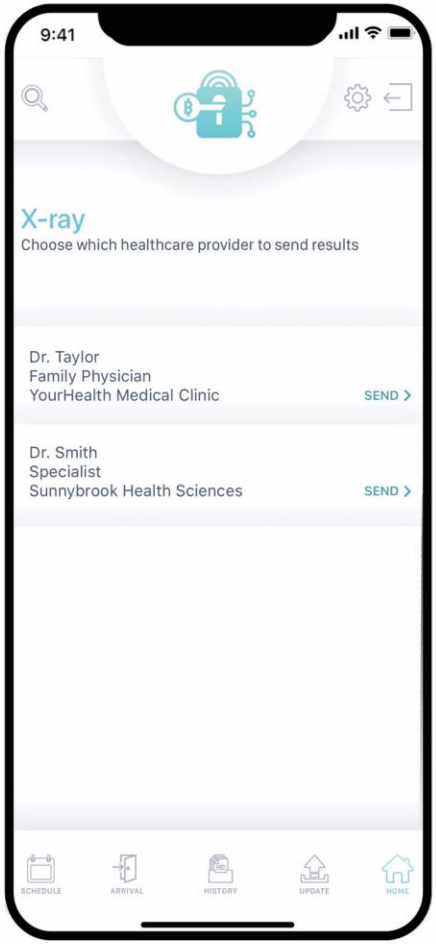

9:41
Blood test
Choose the date to access
Blood test CLOSE 8
2020 2
2017 1
2014 1
2012 1
2010 1
2005 1
2001 1
X-ray VIEW 5
Mammogram VIEW 2
Ultrasound VIEW 3
MRI VIEW 1
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

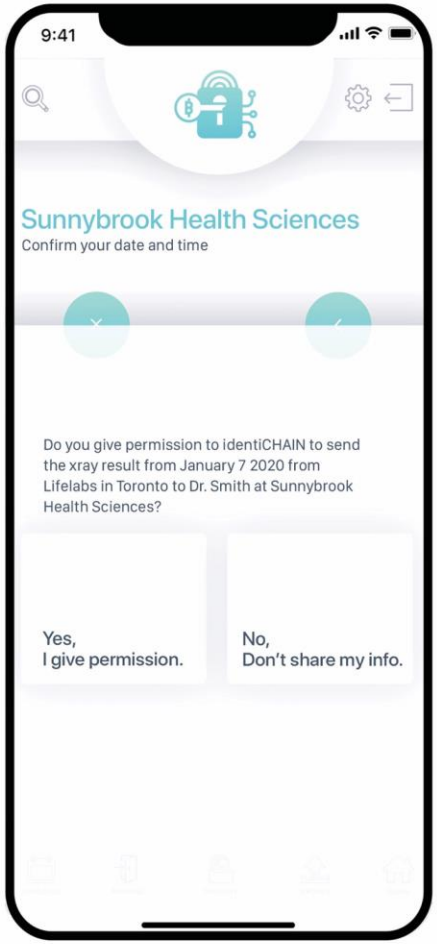

9:41
Blood test
Choose the date to access
Blood test
CLOSE 8
2020
CLOSE 2
January 7 2020
1
January 2 2020
1
2017
1
2014
1
2012
1
2010
1
2005
1
2001
1
X-ray
VIEW 5
Mammogram
VIEW 2
Ultrasound
VIEW 3
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

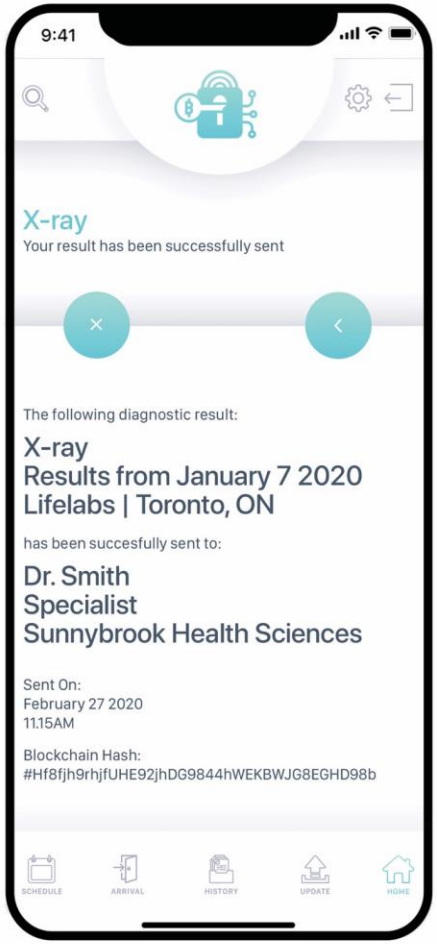

9:41
Blood test
#Rrjg9w3hGH7ehg9HY7f3jgC73jGe706jIGYTf736
Results from January 7 2020
Lifelabs | Toronto, ON
SEND TO DOCTOR
Investigations | Results | Reference range
White blood cell count | 12.210 | 4.00–10.00 10^9/L
Hemoglobin | 15.5 | 13.5–17.0 g/dL
Creatinine | 0.60 | 0.70–1.2 mg/dL
Potassium | 2.5 | 3.5–5.1 mMol/L
Fasting glucose | 160 | 60–100 mg/dL
Total bilirubin | 0.73 | <1.2 mg/dL
Alanine aminotransferase | 29 | <41 U/L
Albumin | 31 | 35–50 g/L
Prostate specific antigen (PSA) | 1.7 | <4.1 μg/L
Chromogranin A (CGA) | 215 | <120 μg/L
Plasma ACTH | 155.4 | 7.2–63.3 ng/L
Plasma cortisol | 398 | 62–180 μg/L
Salivary cortisol | 50.6 | <2.1 μg/L
Testosterone | 2.57 | 4.6–31 nmoli/L
Phosphate | 2.6 | 2.7–4.5 mg/dL
Calcium | 8.8 | 8.6–10.2 mg/dL
Calcitonin | 272 | <20 ng/L
hypokalaemia (2.3 mmol/L) and documented high levels of midnight salivary cortisol (50.6 μg/L), elevated levels of plasma ACTH (155.4 ng/L), and plasma cortisol (398 μg/L).
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

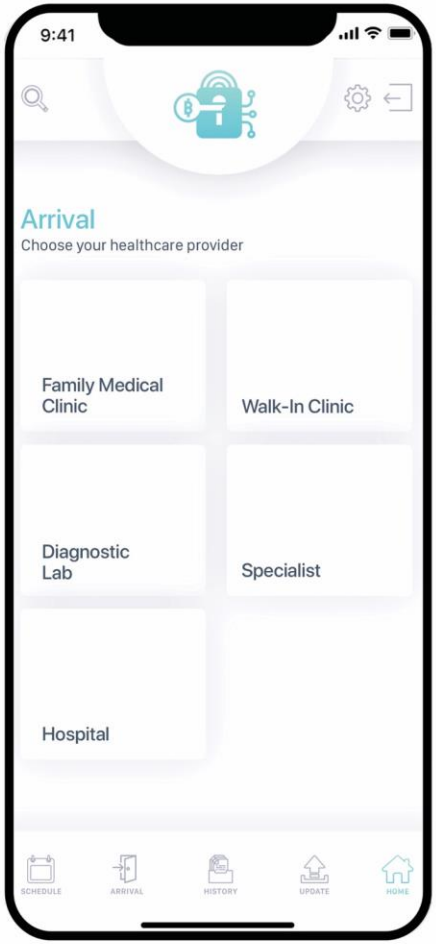

9:41
X-ray
Choose the date to access
Blood test
VIEW 8
X-ray
CLOSE 5
2020
1
2017
1
2014
1
2012
1
2010
1
Mammogram
VIEW 2
Ultrasound
VIEW 3
MRI
VIEW 1
CT Scan
VIEW 1
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

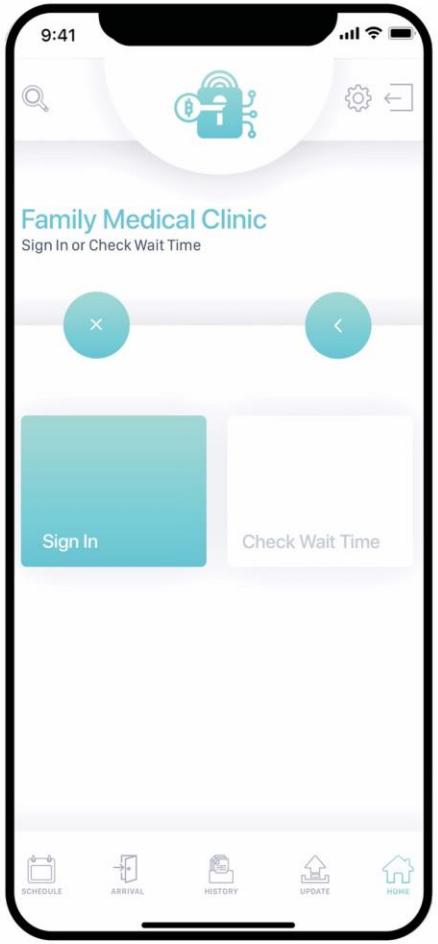

9:41
X-ray
#EgF8573HG7dhgj5J8gf67GSFE9gE56jhDgww2
Results from January 7 2020
Lifelabs | Toronto, ON
SEND TO DOCTOR
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

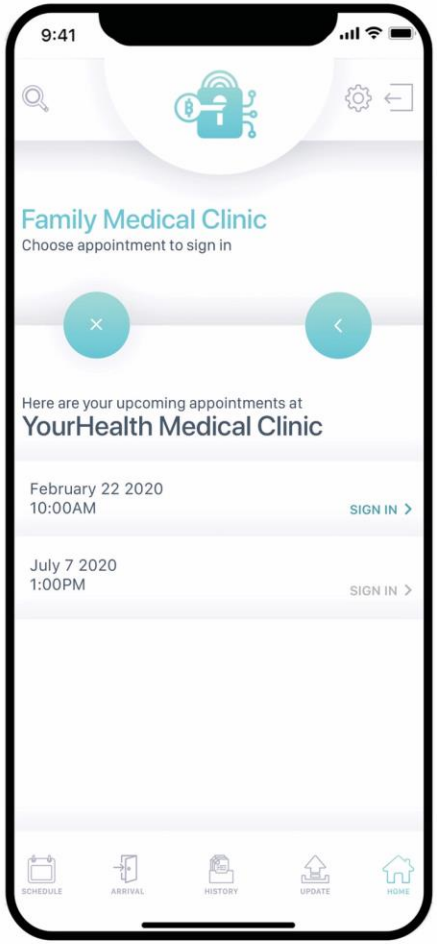

9:41
X-ray
Choose which healthcare provider to send results
Dr. Taylor
Family Physician
YourHealth Medical Clinic
SEND
Dr. Smith
Specialist
Sunnybrook Health Sciences
SEND
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

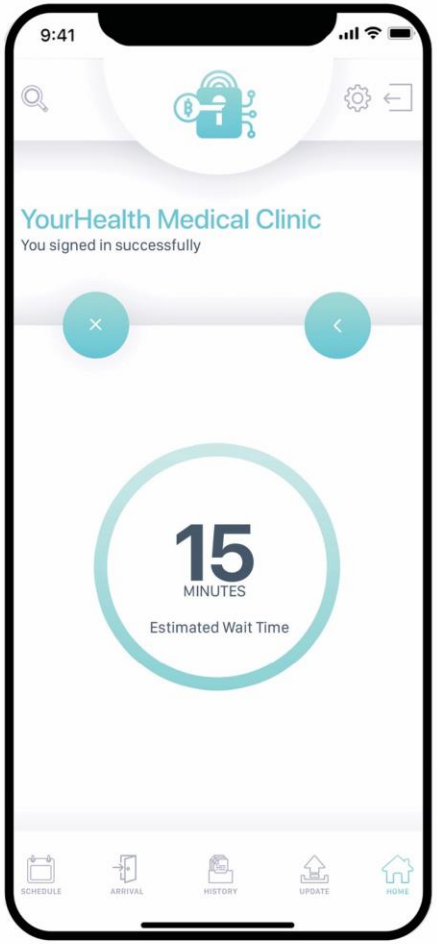

9:41
Sunnybrook Health Sciences
Confirm your date and time
Do you give permission to identiCHAIN to send the xray result from January 7 2020 from Lifelabs in Toronto to Dr. Smith at Sunnybrook Health Sciences?
Yes,
I give permission.
No,
Don't share my info.

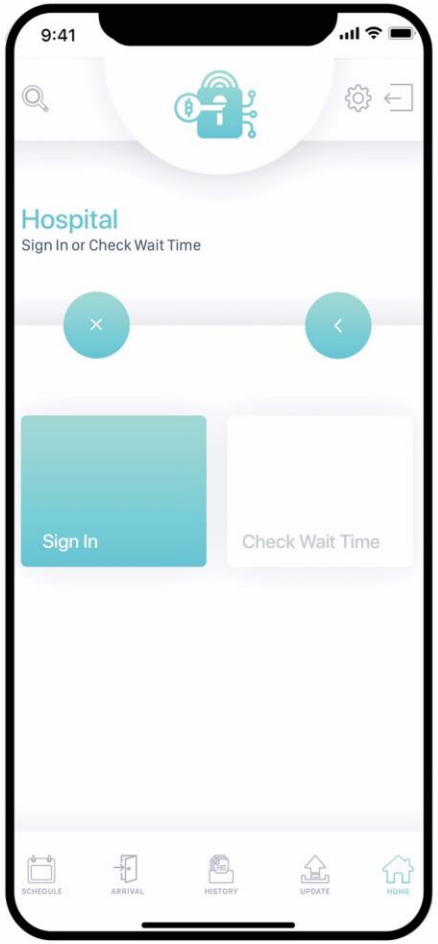

9:41
X-ray
Your result has been successfully sent
The following diagnostic result:
X-ray
Results from January 7 2020
Lifelabs | Toronto, ON
has been succesfully sent to:
Dr. Smith
Specialist
Sunnybrook Health Sciences
Sent On:
February 27 2020
11.15AM
Blockchain Hash:
#Hf8fjh9rhjfUHE92jhDG9844hWEKBWJG8EGHD98b
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

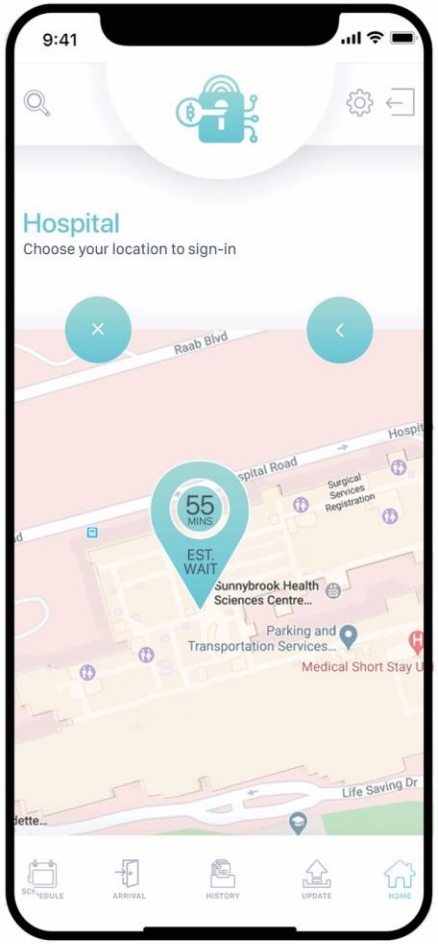

9:41
Arrival
Choose your healthcare provider
Family Medical Clinic
Walk-In Clinic
Diagnostic Lab
Specialist
Hospital
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

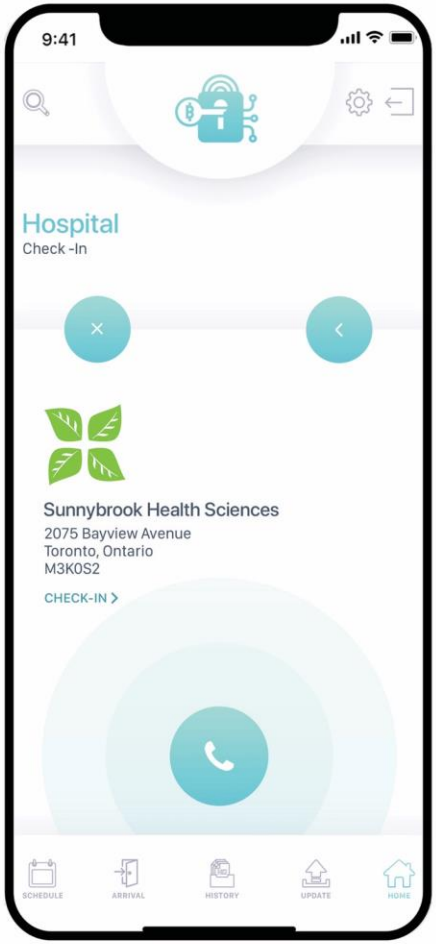

9:41
Family Medical Clinic
Sign In or Check Wait Time
Sign In
Check Wait Time
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

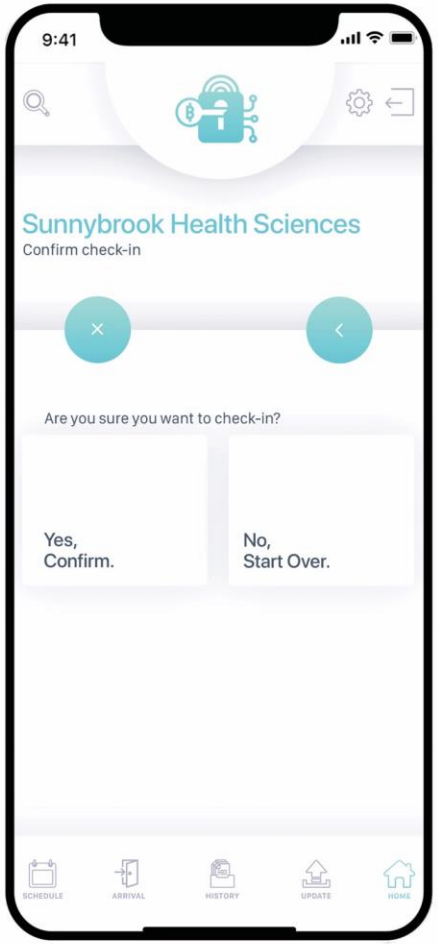

9:41
Family Medical Clinic
Choose appointment to sign in
Here are your upcoming appointments at
YourHealth Medical Clinic
February 22 2020
10:00AM
SIGN IN
July 7 2020
1:00PM
SIGN IN
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

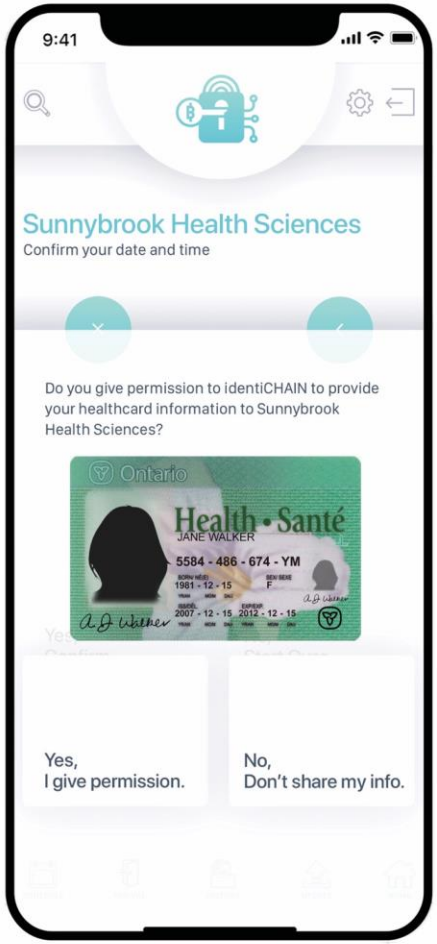

9:41
YourHealth Medical Clinic
You signed in successfully
15
MINUTES
Estimated Wait Time
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

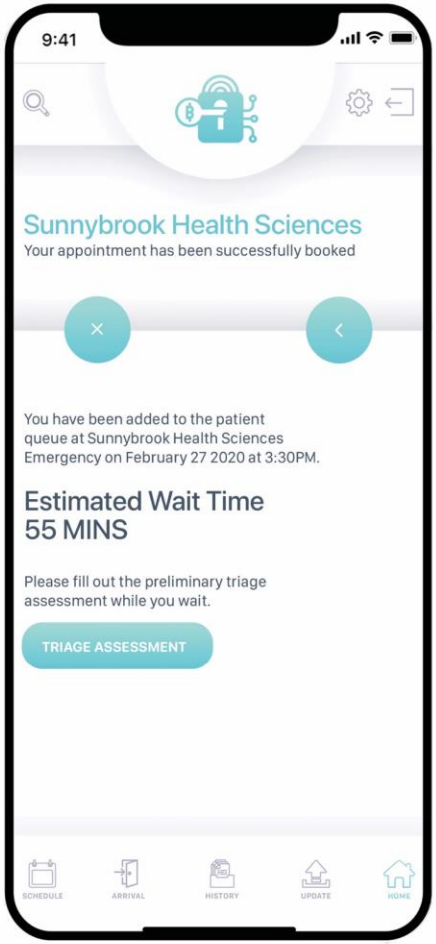

9:41
Hospital
Sign In or Check Wait Time
Sign In
Check Wait Time
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

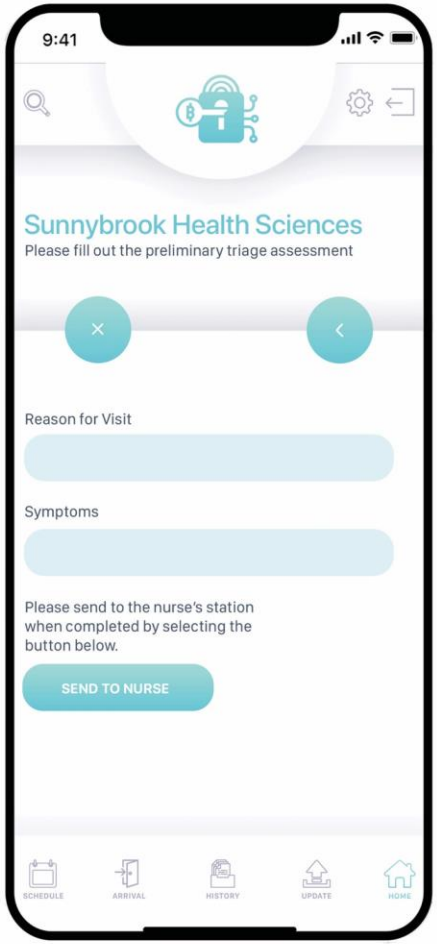

9:41
Hospital
Choose your location to sign-in
Raab Blvd
55
MINS
EST.
WAIT
Surgical Services Registration
Sunnybrook Health Sciences Centre...
Parking and Transportation Services...
Life Saving Dr
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

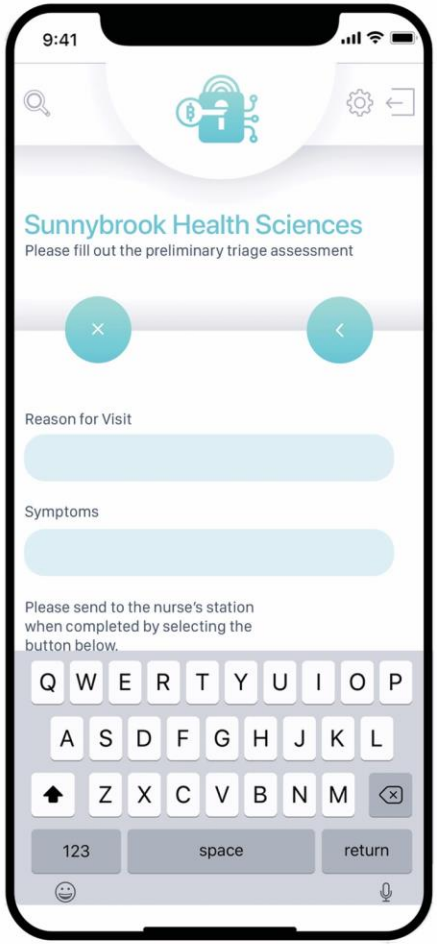

9:41
Hospital
Check -In
Sunnybrook Health Sciences
2075 Bayview Avenue
Toronto, Ontario
M3K0S2
CHECK-IN
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

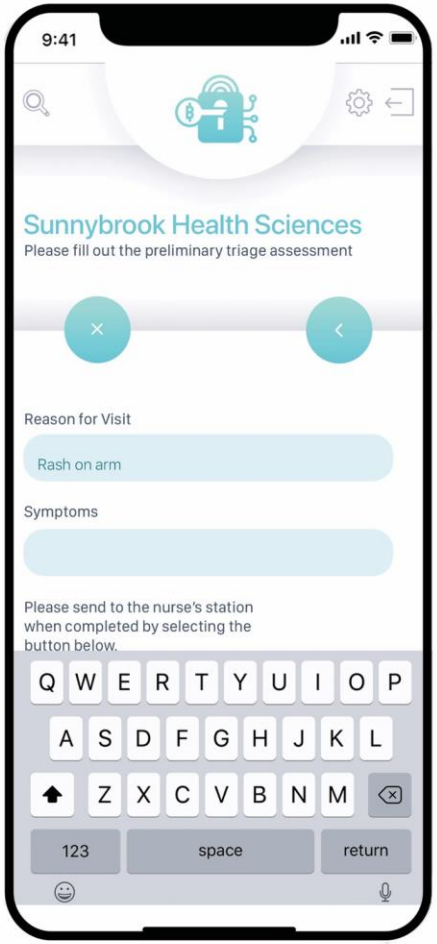

9:41
Sunnybrook Health Sciences
Confirm check-in
Are you sure you want to check-in?
Yes,
Confirm.
No,
Start Over.
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

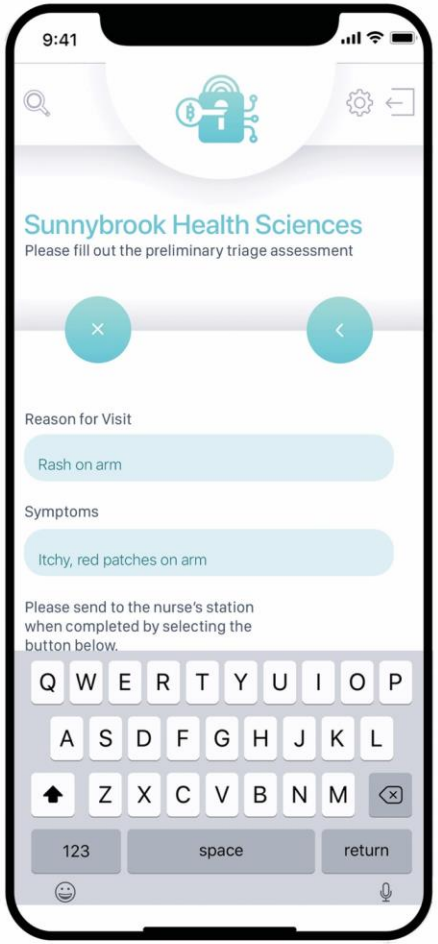

9:41
Sunnybrook Health Sciences
Confirm your date and time
Do you give permission to identiCHAIN to provide your healthcard information to Sunnybrook Health Sciences?
Ontario
Health • Santé
JANE WALKER
5584 - 486 - 674 - YM
1981 - 12 - 15
F
2007 - 12 - 15
2012 - 12 - 15
Yes,
I give permission.
No,
Don't share my info.

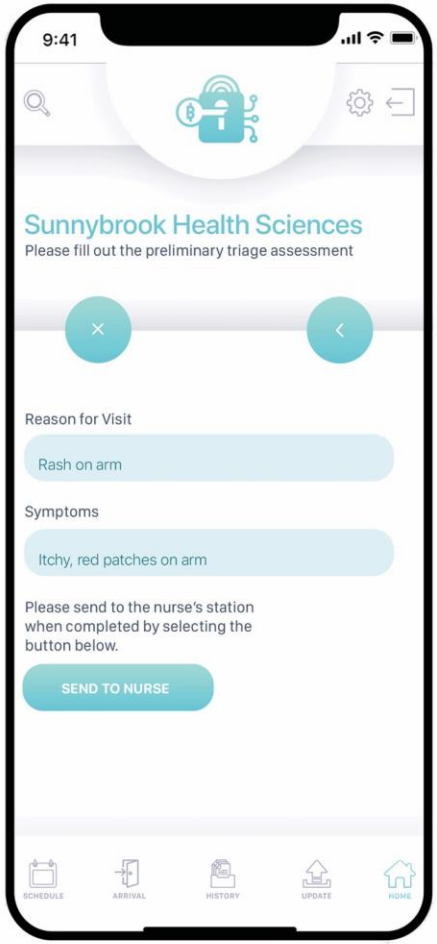

9:41
Sunnybrook Health Sciences
Your appointment has been successfully booked
You have been added to the patient queue at Sunnybrook Health Sciences Emergency on February 27 2020 at 3:30PM.
Estimated Wait Time
55 MINS
Please fill out the preliminary triage assessment while you wait.
TRIAGE ASSESSMENT
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

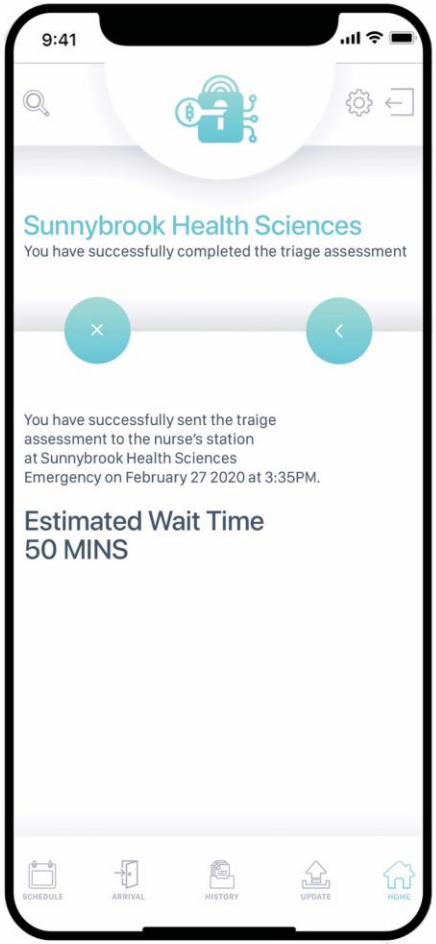

9:41
Sunnybrook Health Sciences
Please fill out the preliminary triage assessment
Reason for Visit
Symptoms
Please send to the nurse's station when completed by selecting the button below.
SEND TO NURSE
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

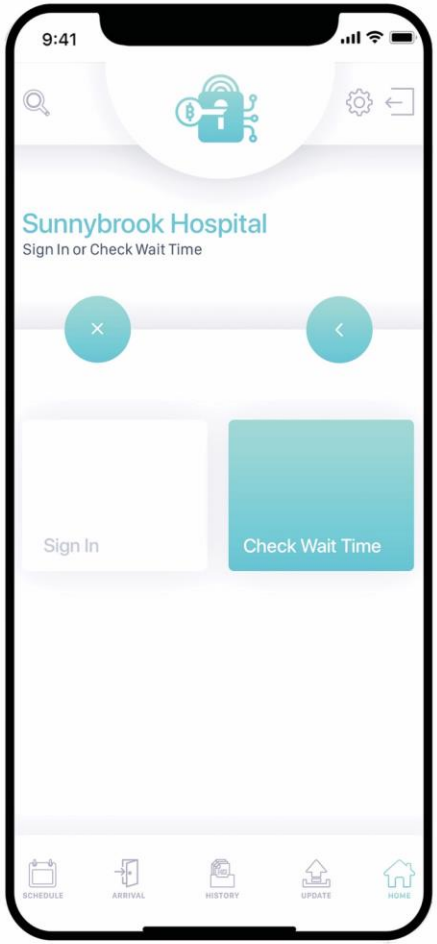

9:41
Sunnybrook Health Sciences
Please fill out the preliminary triage assessment
Reason for Visit
Symptoms
Please send to the nurse's station when completed by selecting the button below.
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
space
return

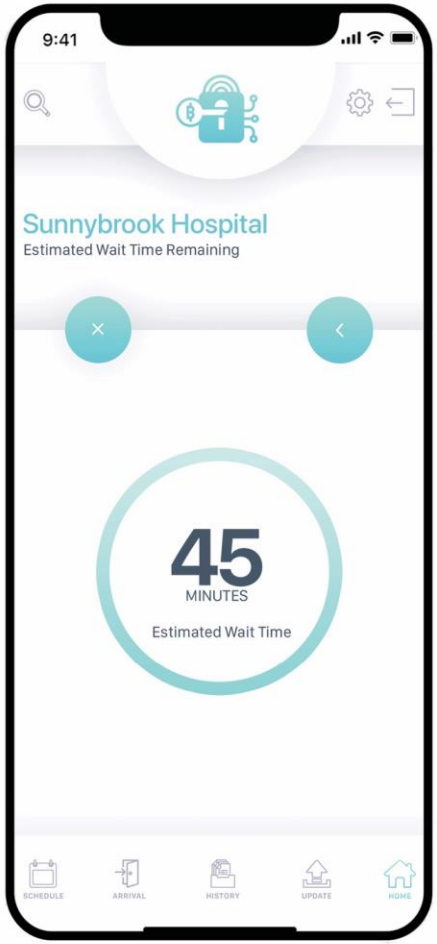

9:41
Sunnybrook Health Sciences
Please fill out the preliminary triage assessment
Reason for Visit
Rash on arm
Symptoms
Please send to the nurse's station when completed by selecting the button below.
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
space
return

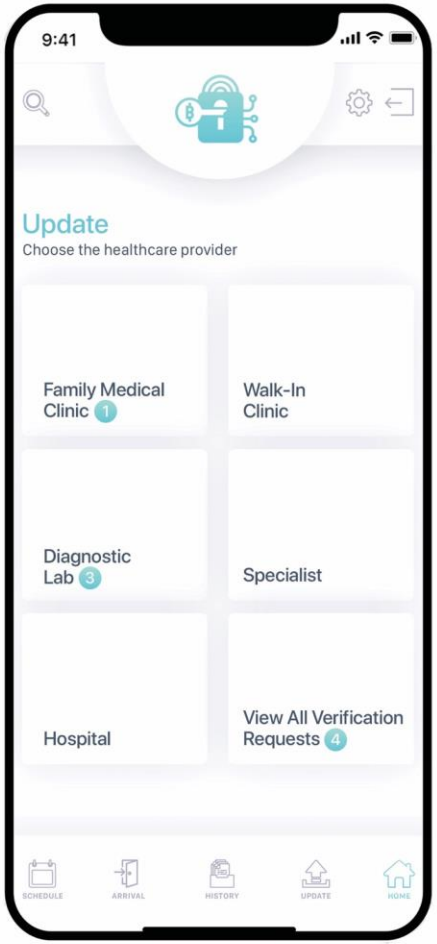

9:41
Sunnybrook Health Sciences
Please fill out the preliminary triage assessment
Reason for Visit
Rash on arm
Symptoms
Itchy, red patches on arm
Please send to the nurse's station when completed by selecting the button below.
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
space
return

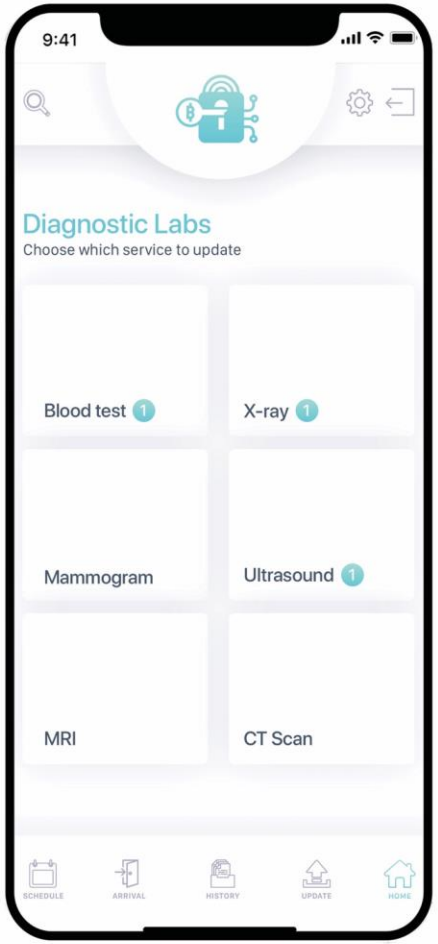

9:41
Sunnybrook Health Sciences
Please fill out the preliminary triage assessment
Reason for Visit
Rash on arm
Symptoms
Itchy, red patches on arm
Please send to the nurse's station when completed by selecting the button below.
SEND TO NURSE
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME


9:41
Sunnybrook Health Sciences
You have successfully completed the triage assessment
You have successfully sent the traige assessment to the nurse's station at Sunnybrook Health Sciences Emergency on February 27 2020 at 3:35PM.
Estimated Wait Time
50 MINS
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

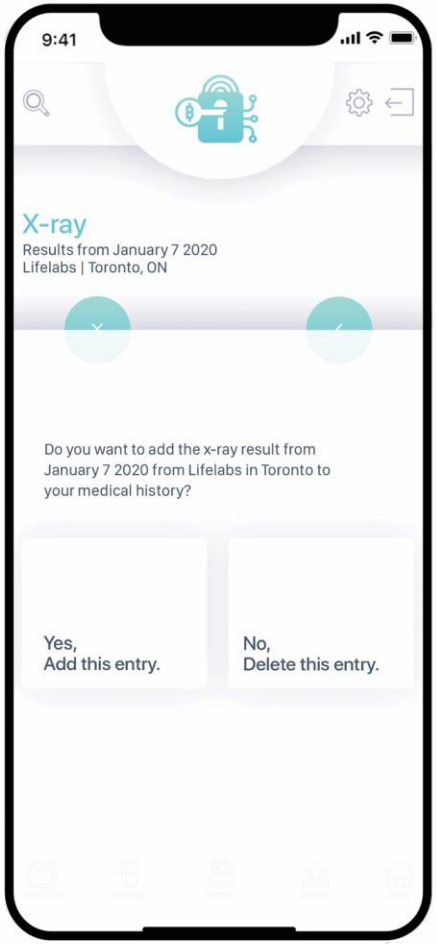

9:41
Sunnybrook Hospital
Sign In or Check Wait Time
Sign In
Check Wait Time
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

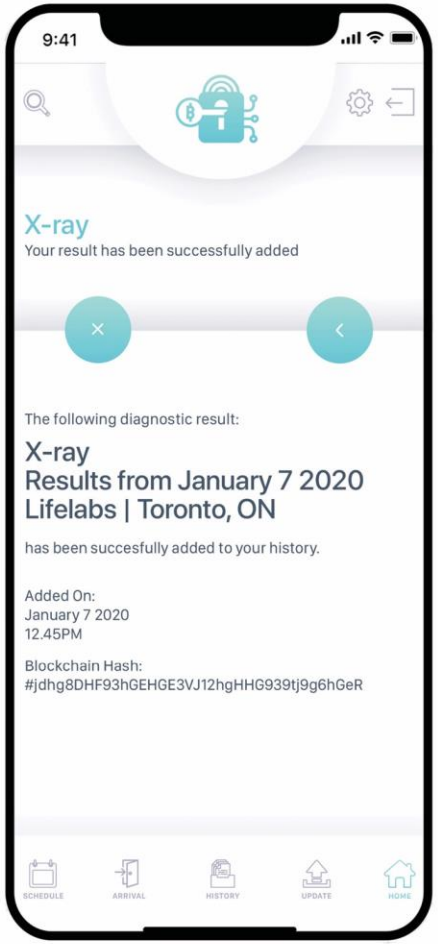

9:41
Sunnybrook Hospital
Estimated Wait Time Remaining
45
MINUTES
Estimated Wait Time
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

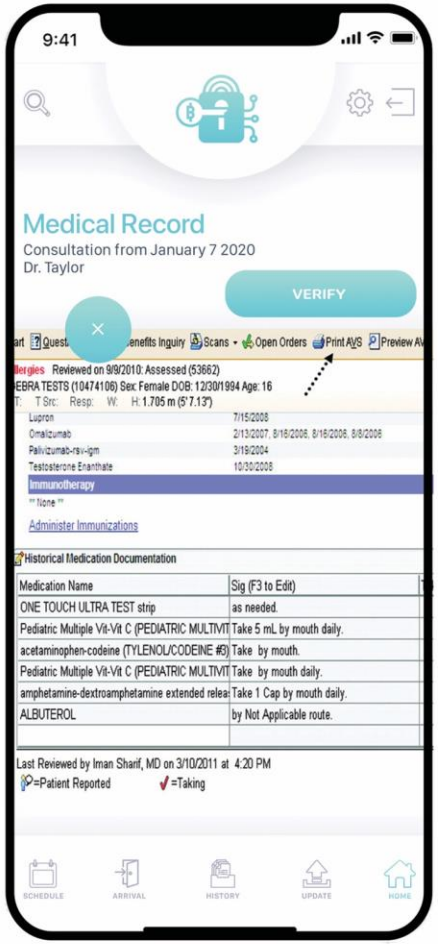

9:41
Update
Choose the healthcare provider
Family Medical Clinic 1
Walk-In Clinic
Diagnostic Lab 3
Specialist
Hospital
View All Verification Requests 4
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

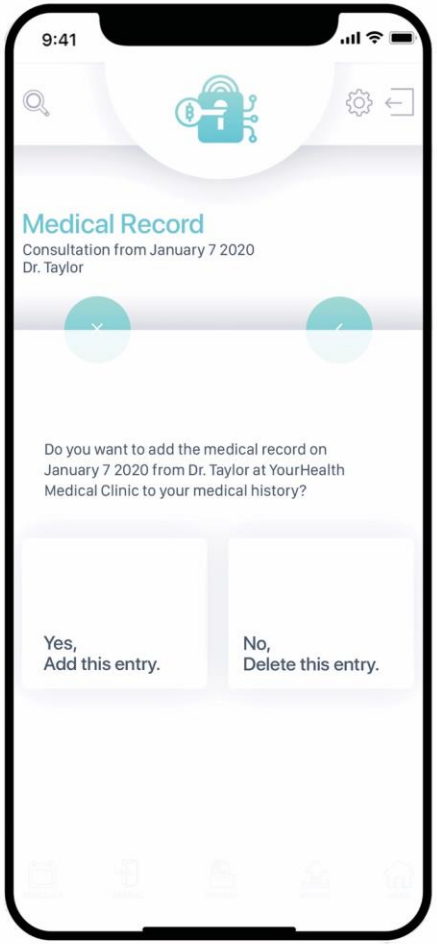

9:41
Diagnostic Labs
Choose which service to update
Blood test 1
X-ray 1
Mammogram
Ultrasound 1
MRI
CT Scan
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

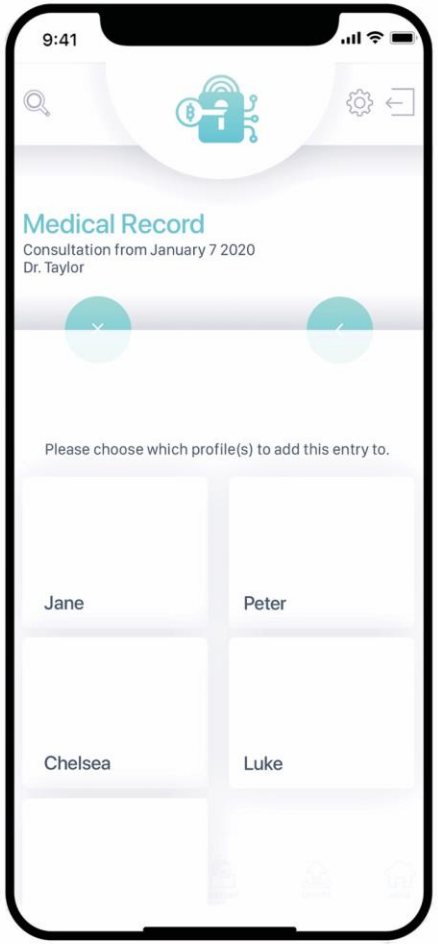

9:41
X-ray
Results from January 7 2020
Lifelabs | Toronto, ON
VERIFY
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

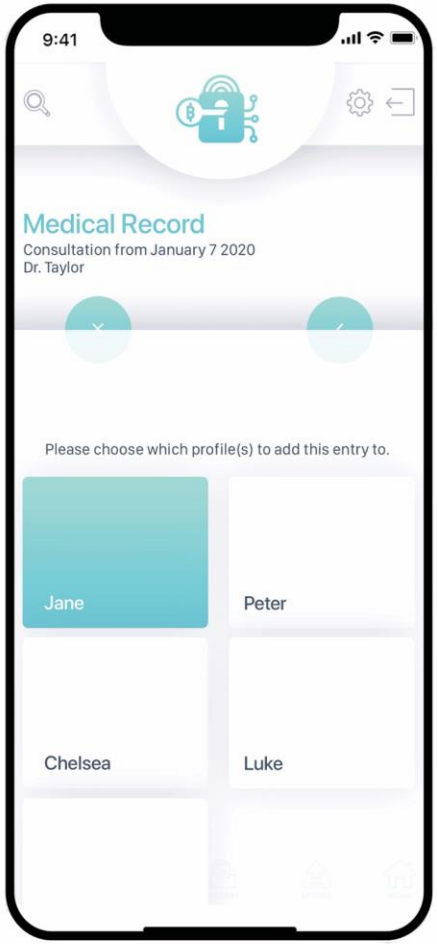

9:41
X-ray
Results from January 7 2020
Lifelabs | Toronto, ON
Do you want to add the x-ray result from January 7 2020 from Lifelabs in Toronto to your medical history?
Yes,
Add this entry.
No,
Delete this entry.

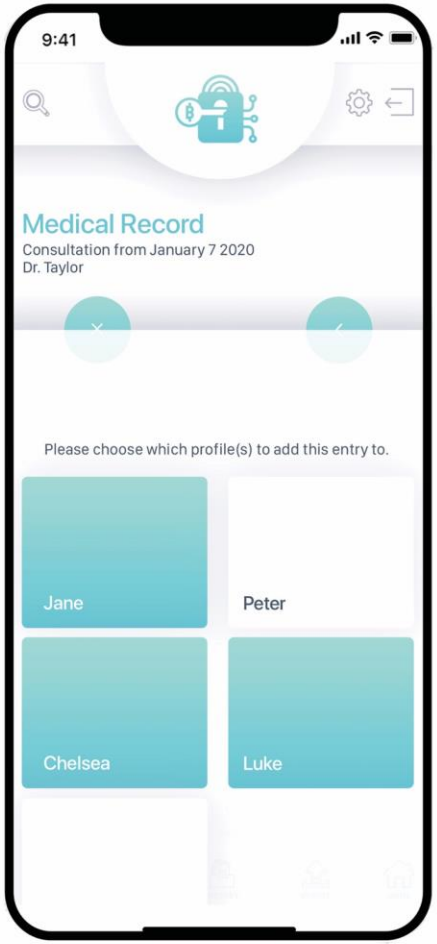

9:41
X-ray
Your result has been successfully added
The following diagnostic result:
X-ray
Results from January 7 2020
Lifelabs | Toronto, ON
has been succesfully added to your history.
Added On:
January 7 2020
12.45PM
Blockchain Hash:
#jdhg8DHF93hGEHGE3VJ12hgHHG939tj9g6hGeR
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

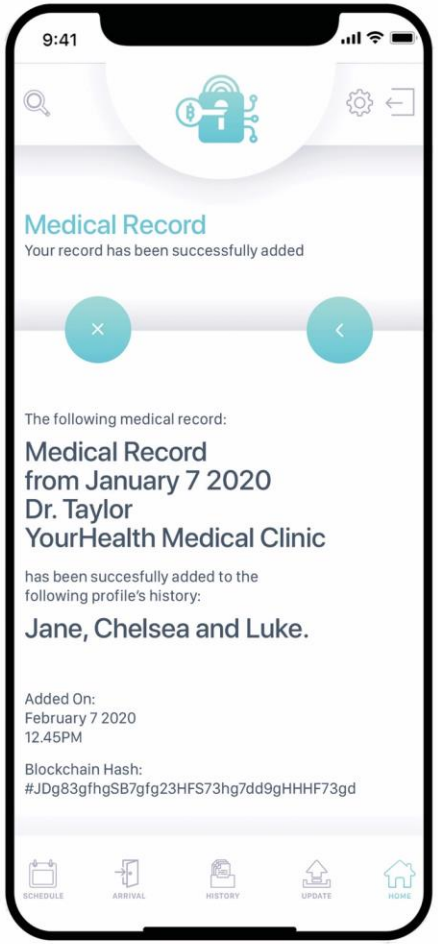

9:41
Medical Record
Consultation from January 7 2020
Dr. Taylor
VERIFY
Lupron 7/15/2008
Omalizumab 2/13/2007, 8/18/2008, 8/16/2008, 8/8/2006
Palivizumab-rsiv-igm 3/19/2004
Testosterone Enanthate 10/30/2008
Immunotherapy
"None"
Administer Immunizations
Historical Medication Documentation
Medication Name
Sig (F3 to Edit)
ONE TOUCH ULTRA TEST strip
as needed.
Pediatric Multiple Vit-Vit C (PEDIATRIC MULTIVIT
Take 5 mL by mouth daily.
acetaminophen-codeine (TYLENOL/CODEINE #3)
Take by mouth.
Pediatric Multiple Vit-Vit C (PEDIATRIC MULTIVIT
Take by mouth daily.
amphetamine-dextroamphetamine extended relea
Take 1 Cap by mouth daily.
ALBUTEROL
by Not Applicable route.
Last Reviewed by Iman Sharif, MD on 3/10/2011 at 4:20 PM
=Patient Reported
=Taking
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME


9:41
Medical Record
Consultation from January 7 2020
Dr. Taylor
Do you want to add the medical record on January 7 2020 from Dr. Taylor at YourHealth Medical Clinic to your medical history?
Yes,
Add this entry.
No,
Delete this entry.


9:41
Medical Record
Consultation from January 7 2020
Dr. Taylor
Please choose which profile(s) to add this entry to.
Jane
Peter
Chelsea
Luke


9:41
Medical Record
Consultation from January 7 2020
Dr. Taylor
Please choose which profile(s) to add this entry to.
Jane
Peter
Chelsea
Luke


9:41
Medical Record
Consultation from January 7 2020
Dr. Taylor
Please choose which profile(s) to add this entry to.
Jane
Peter
Chelsea
Luke


9:41
Medical Record
Your record has been successfully added
The following medical record:
Medical Record
from January 7 2020
Dr. Taylor
YourHealth Medical Clinic
has been succesfully added to the
following profile's history:
Jane, Chelsea and Luke.
Added On:
February 7 2020
12.45PM
Blockchain Hash:
#JDg83gfhgSB7gfg23HFS73hg7dd9gHHHF73gd
SCHEDULE
ARRIVAL
HISTORY
UPDATE
HOME

Appendix K

Second Study User Testing Session Introduction

USER TESTING SESSION
Introduction

Thank you for participating in this second study of my research today. My research focuses on 'Improving the User Experience in Healthcare'.

FRAMEWORK AND PROCESS

Following a service design framework, after research, exploration of potential solutions followed by the creation of the determined solution, a working prototype, I want to test the effectiveness of my solution with the same participants that took part in my first study. I want to see if the solution I developed addresses the majority of concerns and challenges revealed through our previous interview and co-design session.

RECAP OF FIRST STUDY FINDINGS

When we first met for the First Study of my research, we co-created patient journey maps and had a discussion about the challenges a patient faces when navigating through the healthcare system.

PROPOSED SOLUTION

What I've developed as a solution to the majority of the themes uncovered from the First Study is a patient digital identity app called identiCHAIN.

With identiCHAIN a patient can:

1. Schedule appointments electronically for different healthcare providers
2. Check in to their healthcare appointments and check wait times in real time
3. Maintain and access an up-to date secure and consolidated repository of their entire medical record for their whole family

WHY BLOCKCHAIN?

With identiCHAIN, a patient has a consolidated, secure repository to store all their health records. This security is achieved by building identiCHAIN on a blockchain technology platform.

Do you know what blockchain is/does?

Blockchain is essentially a database that can store transactions/records providing you with a number of benefits. It assures:

1. Authenticity of your medical records (Each record/transaction must be verified by all parties before it can be added to the blockchain)
2. Security (Pubic/Private key – unique alphanumeric sequence combination to verify your identity – can't be hacked)
3. Gives you control of your medical record and who can access it
4. Convenient and accessible (it can be accessed through your phone/ipad, etc.)
5. Efficient – It's very quick because everything is available through the app
6. Provides transparency (Every record and transaction/communication is date and time stamped)

SECOND STUDY: USER TESTING SESSION

This brings us to why I've asked you here today. I'm going to conduct a user testing session of the digital identity prototype I developed. I've created 11 use cases that we will walk through today to test the usability and effectiveness of the app.

I want you to talk out aloud throughout the entire session. I want you to talk about your actions as you are going through the tasks and include any thoughts you have about the prototype as you interact with it. For example, "I am scrolling down the page. Oops, it looks like there is no more information." I will prompt you as you go through the tasks. I will be recording this session for transcription. At the end of each use case, I will ask you to fill out the questionnaire questions that correspond to the specific use case before continuing on to the next scenario. At the end of the testing session, I will ask you to fill out the remaining questions on the questionnaire that concern the overall app's functionality and usability.

You can choose to stop participating at any time during this session. All information I collect today will remain confidential as outlined in the consent form and if you approve. All notes, conversations, pictures and audio from today's session will support my thesis research and will adhere to the confidentiality and security measures outlined in the consent form. You may discontinue this session at any time today. If there are no further questions, let's begin.

PROTOTYPE ASSUMPTIONS

Let me start this session by telling you some background information about the prototype.

Before we begin, let's assume that you have already signed up for the app by providing all your personal information, such as your health card information and address. Anytime you have to send your health card information to a healthcare provider, the system will always prompt you to give access before any of your information is released to third parties.

You have already been given your unique Public and Private key (Username and Password) to access the app securely. This unique alphanumeric sequence combination is unique to yourself and is used to verify your identity without you having to repeatedly prove your identity. For example, you will no longer have to show your health card at every visit to a healthcare provider. Your health card information will be released at your discretion to third parties securely through the app. It's important to note that all your records are stored on the cloud and only viewed through the app. Therefore, your medical records are not stored on your mobile device.

You have already received consent from your family members to access and manage their medical profiles on the app. Based on these assumptions, let's begin going through our use cases. After completing each use case, I will ask you to fill out the corresponding questions from the questionnaire. If you have no questions, let's begin.

Appendix L

Second Study User Testing Session Questionnaire

USE CASE 1.0 SCHEDULING
Schedule an appointment at a walk-in clinic.

		strongly disagree 1	2	3	4	5	6	strongly agree 7	NA
1.	The login process made me feel my personal information is safe and secure.	○	○	○	○	○	○	○	○
2.	I find this functionality will minimize the time I have to wait at walk-in clinics.	○	○	○	○	○	○	○	○
3.	I feel confident I would be added successfully to the walk-in clinic's patient queue by checking in through the app.	○	○	○	○	○	○	○	○
4.	I feel comfortable that my health card information will be shared appropriately with the walk-in clinic.	○	○	○	○	○	○	○	○
5.	I find this functionality is an efficient method to schedule an appointment at a walk-in clinic.	○	○	○	○	○	○	○	○

USE CASE 2.0 HISTORY
Share blood test results with new family physician.

		strongly disagree 1	2	3	4	5	6	strongly agree 7	NA
6.	I found my health records were easy to access through the app.	○	○	○	○	○	○	○	○
7.	I would use this functionality when faced with this scenario because it is efficient.	○	○	○	○	○	○	○	○
8.	I found this functionality helped me communicate more effectively with my healthcare provider.	○	○	○	○	○	○	○	○
9.	The app makes me feel confident that my medical records are genuine.	○	○	○	○	○	○	○	○

USE CASE 3.0 ARRIVAL
Sign in at hospital emergency room.

		strongly disagree 1	2	3	4	5	6	strongly agree 7	NA
10.	I am happy I did not have to wait in line to sign in at reception because I signed in through the app.	○	○	○	○	○	○	○	○
11.	I feel comfortable completing the preliminary assessment questions through the app.	○	○	○	○	○	○	○	○
12.	I am satisfied with the speed of the sign in process through the app.	○	○	○	○	○	○	○	○

USE CASE 3.0 SCHEDULING (CONTINUED)
Schedule an appointment with a diagnostic laboratory for blood test and x-ray.

13. I find the app makes it easy to check the 'wait time remaining'.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

14. I am happy I can check the wait time remaining anytime through the app.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

USE CASE 4.0 | SCHEDULING
Schedule an appointment with your family physician for a yearly check-up.

15. I find this functionality will save me time when I schedule an appointment with my family physician.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

16. I was satisfied with the instructions the app provided me for completing the task.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

17. I find this functionality is an efficient method to schedule healthcare appointments with my family physician.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

USE CASE 5.0 UPDATE
Update medical record from consultation with family physician.

18. I found the process of verifying my medical records left me feeling my personal information is safe and secure.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

19. I found it easy and convenient to update my history through this app.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

20. I find this functionality will help me keep my medical history organized.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

USE CASE 6.0 SCHEDULING
Schedule an appointment with a diagnostic laboratory for blood test.

21. I am satisfied with the ease and amount of time to complete the tasks in this scenario.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

22. I feel comfortable that the steps to complete this task are easy to remember and repeat in the future.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

23. I feel confident my requisition forms and health information will be sent securely electronically to the diagnostic lab through the app.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

24. I find the scan and upload of requisition forms process through this app made me feel my personal information is safe and secure.

strongly disagree 1 2 3 4 5 6 7 strongly agree NA

USE CASE 7.0 HISTORY
Share x-ray results taken at hospital with specialist at follow-up visit.

25. I found this functionality integrated my health records obtained through different health care providers efficiently.

26. I am satisfied with the amount of time it took to complete the tasks in this scenario.

27. I find the functionality to show and send my diagnostic results a useful tool to help manage my health care journey more efficiently.

28. I found the 'send diagnostic' test result process left me feeling my personal information is safe and secure.

	strongly disagree						strongly agree	
	1	2	3	4	5	6	7	NA
25.	○	○	○	○	○	○	○	○
26.	○	○	○	○	○	○	○	○
27.	○	○	○	○	○	○	○	○
28.	○	○	○	○	○	○	○	○

USE CASE 8.0 ARRIVAL
Signing in electronically at family medical clinic office.

29. I am happy I did not have to present my health card upon arrival because the family medical clinic already had my information when I signed in through the app.

30. I am happy I did not have to wait in line to sign in at reception because I signed in through the app.

31. I am satisfied with the speed of the sign in process through the app.

	strongly disagree						strongly agree	
	1	2	3	4	5	6	7	NA
29.	○	○	○	○	○	○	○	○
30.	○	○	○	○	○	○	○	○
31.	○	○	○	○	○	○	○	○

USE CASE 9.0 UPDATE
Update your history with just completed x-ray results.

32. I found the process of verifying my diagnostic test results left me feeling my personal information is safe and secure.

33. I found this functionality integrated my health records obtained through different health care providers efficiently.

34. I found it easy and convenient to update my history through this app.

	strongly disagree						strongly agree	
	1	2	3	4	5	6	7	NA
32.	○	○	○	○	○	○	○	○
33.	○	○	○	○	○	○	○	○
34.	○	○	○	○	○	○	○	○

USE CASE 10.0 UPDATE
Update multiple user profiles simultaneously.

35. I found it easy and convenient to update multiple profiles simultaneously.

36. I feel this functionality will help me keep my family's medical history organized and up-to-date.

	strongly disagree						strongly agree	
	1	2	3	4	5	6	7	NA
35.	○	○	○	○	○	○	○	○
36.	○	○	○	○	○	○	○	○

USE CASE 10.0 UPDATE (CONTINUED)
Update multiple user profiles simultaneously.

37. I found the process of adding a medical record left me feeling my personal information is safe and secure.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

USE CASE 11.0 REPEAT [USE CASE 7.0]

38. I found the app process of accessing my medical history to be familiar and easy to navigate the second time I used it.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

END OF USER TESTING SESSION
Overall App Usability and Functionality Questions

39. The app requires a reasonable number of steps to accomplish what I want to do.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

40. The app saves me time because it keeps my healthcare information organized.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

41. I would find the app useful in keeping track of my healthcare information.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

42. I would find the app helps in communicating with different healthcare providers.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

43. I would find the app securely stores my healthcare information.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

44. I trust the app shares healthcare information securely with healthcare providers.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

45. I am comfortable with accessing my healthcare information through the app.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

46. I would find the app gives me control over my healthcare information.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

47. I would find the app will help me navigate my healthcare journey more efficiently.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

48. I would use the app when visiting different healthcare providers.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

49. I would find the app is simple and easy to use.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

50. I learned to use the app quickly.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

END OF USER TESTING SESSION (CONTINUED)
Overall App Usability and Functionality Questions

51. The app uses language that is easy to understand.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

52. The app interface provides useful information on where I am in the process and navigation.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

END OF USER TESTING SESSION
Additional Questions for Healthcare Providers

53. I feel the app would be beneficial for patients.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

54. I feel the app would make my job easier.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

55. I feel the app would improve wait times at my place of work.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

56. I feel the app would minimize inadequate or lack of patient information.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

57. I feel the app would improve communication with patients.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

58. I would be comfortable with the authenticity of the patient health records on the app.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

59. I feel the app would reduce repetitive administrative processes.

strongly disagree — strongly agree

1	2	3	4	5	6	7	NA
◯	◯	◯	◯	◯	◯	◯	◯

THANK YOU.

Appendix M

Approvals from York University Ethics Board

YORK
UNIVERSITÉ
UNIVERSITY

OFFICE OF RESEARCH ETHICS (ORE)
5th Floor, Kaneff Tower

4700 Keele St.
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Certificate #:	**STU 2019-100**
Approval Period:	**09/19/19-09/19/20**

ETHICS APPROVAL

To: **Christine O'Dell – Graduate Student**
School of the Arts, Media, Performance & Design
codell@yorku.ca

From: Alison M. Collins-Mrakas, Sr. Manager and Policy Advisor, Research Ethics
(on behalf of Jenn Kuk, Chair, Human Participants Review Committee)

Date: Thursday September 19, 2019

Title: **Improving the User Experience in Healthcare Through Service Design: A Blockchain-based Digital Identity Solution for Patients**

Risk Level: ☒ Minimal Risk ☐ More than Minimal Risk

Level of Review: ☒ Delegated Review ☐ Full Committee Review

I am writing to inform you that this research project, **"Improving the User Experience in Healthcare Through Service Design: A Blockchain-based Digital Identity Solution for Patients "** has received ethics review and approval by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines.

Note that approval is granted for one year. Ongoing research – research that extends beyond one year – must be renewed prior to the expiry date.

Any changes to the approved protocol must be reviewed and approved through the amendment process by submission of an amendment application to the HPRC prior to its implementation.

Any adverse or unanticipated events in the research should be reported to the Office of Research ethics (ore@yorku.ca) as soon as possible.

For further information on researcher responsibilities as it pertains to this approved research ethics protocol, please refer to the attached document, **"RESEARCH ETHICS: PROCEDURES to ENSURE ONGOING COMPLIANCE".**

Should you have any questions, please feel free to contact me at: 416-736-5914 or via email at: acollins@yorku.ca.

Yours sincerely,

Alison M. Collins-Mrakas M.Sc., LLM
Sr. Manager and Policy Advisor,
Office of Research Ethics

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Certificate #:	**STU 2019-126**
Approval Period:	**12/05/19-12/05/20**

ETHICS APPROVAL

To: **Christine O'Dell - Graduate Student**
Design
codell@yorku.ca

From: Alison M. Collins-Mrakas, Sr. Manager and Policy Advisor, Research Ethics
(on behalf of Jennifer Kuk, Chair, Human Participants Review Committee)

Date: Thursday December 5, 2019

Title: **Improving the User Experience in Healthcare Through Service Design: A Blockchain-based Digital Identity Solution for Patients**

Risk Level: ☒ Minimal Risk ☐ More than Minimal Risk

Level of Review: ☒ Delegated Review ☐ Full Committee Review

I am writing to inform you that this research project, **"Improving the User Experience in Healthcare Through Service Design: A Blockchain-based Digital Identity Solution for Patients"** has received ethics review and approval by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines.

Ongoing research – research that extends beyond one year – must be renewed prior to the expiry date.

Any changes to the approved protocol must be reviewed and approved through the amendment process by submission of an amendment application to the HPRC prior to its implementation.

Any adverse or unanticipated events in the research should be reported to the Office of Research ethics (ore@yorku.ca) as soon as possible.

For further information on researcher responsibilities as it pertains to this approved research ethics protocol, please refer to the attached document, **"RESEARCH ETHICS: PROCEDURES to ENSURE ONGOING COMPLIANCE".**

Should you have any questions, please feel free to contact me at: 416-736-5914 or via email at: acollins@yorku.ca.

Yours sincerely,

Alison M. Collins-Mrakas M.Sc., LLM
Sr. Manager and Policy Advisor,
Office of Research Ethics

Appendix N

Sample Consent Form

Informed Consent Form

Date:

Study Name:
Improving the user experience in healthcare through service design:
A blockchain-based digital identity solution for patients

Researcher:
Christine O'Dell
Master of Design Program, York University
Principal Investigator
codell@yorku.ca

Supervisor:
Sandra Gabriele
Associate Professor, York University
Supervisor
sandrag@yorku.ca

Purpose of the Pilot Study:
The purpose of this pilot study is to help inform the design of a digital identity system to improve the user experience of Ontario's healthcare system.

The research methodology includes a series of in-depth interviews with front-line healthcare professionals (administrator and clinical roles) and end-users (patients) in three categories of care within the Ontario healthcare system, including primary care, secondary care and acute care. The research will be presented to a defense committee at the researcher's master oral defense and reported in a written thesis.

What You Will Be Asked to Do in the Research:
Your role as a participant is to answer the questions posed during the in-depth interview in a truthful and honest manner, based on your experiences and opinions. I will not ask you to disclose any personal information or medical information, except as expressly necessary for interaction and categorization of research (i.e. occupation). The focus of this research is to obtain information on healthcare administrative processes and opportunities for improvements to efficiency and convenience. The estimated time commitment for you is 1 hour. I will ask you to answer questions describing your interactions with the Ontario healthcare system and your judgements on both the positive and negative aspects of your interactions. We will also be co-designing a journey map to visually represent your experience with the Ontario healthcare system.

Risks and Discomforts:
We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You:
The potential benefits you will garner from your involvement in this research proposal include: learning about the benefits of creating journey maps as a research method; a platform to voice your concerns about the current healthcare administrative system and the ability to contribute your insights and knowledge through a co-design process with the researcher in creating prototypes that the researcher will develop based on each participant's perspectives.

Voluntary Participation and Withdrawal:
Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer, to stop participating, or to refuse to answer any particular questions will not

influence the nature of the ongoing relationship you may have with the researchers or study staff, or the nature of your relationship with York University either now, or in the future.

In the event you withdraw from the study early, all associated data collected will be immediately destroyed. Should you wish to withdraw after the study, you will have the option to also withdraw your data up until the analysis is complete.

Confidentiality:
Documentation of data collected will be in hard copy form (field notes, visual probes from journey map activity as part of in-depth interviews) and electronic form (transcription of field notes, photos of journey maps, and audio recordings if consent is given).

In order to ensure anonymity/confidentiality of participants and the confidentiality of data during the conduct of research and dissemination of results, anonymization techniques that will be utilized include assigning pseudonyms to replace direct identifiers of participants (i.e. replace names of participants). The researcher will not collect any personal information of participants. If you consent, we will be audio recording and photographing the session. The audio recordings will be erased, once transcribed. Only your hands will be visible in the images and your name will not be attached to your image.

All hard copy data collected (consent forms, written field notes and visual probes created during interview activity) will be stored securely in a locked filing cabinet at the researchers home. Only the researcher will have access to this file cabinet. All hard copy data (consent forms, written field notes and visual probes created during interview activity) will be disposed of using a cross-cut shredder by June 6 2022 (2 years from the completion of the thesis oral presentation).

All electronic data (audio recordings, document files of interview transcriptions) will be stored securely on the researcher's password-protected desktop in a password-protected folder. Only the researcher will have access to this folder. All electronic data will be securely deleted from the password protected folder by June 6, 2022 (2 years from the completion of the thesis oral presentation).

Unless you choose otherwise, all information you supply during the research will be held in confidence, your name or any information that could identify you specifically will not appear in any report or publication of the research.

Confidentiality will be provided to the fullest extent possible by law.

Aggregated responses to questions, drawings, journey maps and photographs will be used for thesis presentations, conference presentations, journal articles and for educational presentations. In addition, the data collected will undergo ethics review by the Human Participants Review Sub-Committee, our institutional Ethics Review Committee. Any secondary use of anonymized data by the research team will be treated with the same degree of confidentiality and anonymity as in the original research project.

Questions About the Research?
If you have questions about the research in general or about your role in the study, please feel free to contact me at codell@yorku.ca or my supervisor, Sandra Gabriele at sandrag@yorku.ca and/or 416-736-2100. You may also contact the Graduate Program in Design at mdesyork@yorku.ca and/or 416-736-2100.

This research has received ethics review and approval by the Delegated Ethics Review Committee, which is delegated authority to review research ethics protocols by the Human Participants Review Sub-Committee, York University's Ethics Review Board, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I_____consent to participate in *"Applying Service Design with Blockchain-Based Digital Identity Solutions: An Exploration of the User Experience in Enhancing Ontario's Healthcare Interoperability Ecosystem"* conducted by Christine O'Dell. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature _____ Date _____
Participant

Signature _____ Date _____
Principal Investigator

Additional consent (where applicable, if specifically provided by the participant), the following is strictly optional and does not preclude any participation in the above research:

1. **Audio recording**

☐ I consent to the audio-recording of my interview(s)

2. **Use of photographs**

☐ I consent to the photographing of the session

I _____ consent to the use of images of my environment and property (including photographs), in the following ways (please check all that apply):

In academic articles	[ ] Yes	[ ] No
In print, digital and slide form	[ ] Yes	[ ] No
In academic presentations	[ ] Yes	[ ] No
In thesis materials	[ ] Yes	[ ] No

Signature:

_____ _____
Participant: (name) Date:

PANEL ON RESEARCH ETHICS

Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Christine O'Dell

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **13 January, 2019**