Redesigning healthcare outside of the hospital: The telehealth booth

Alyssa Caballero

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ATTESTATION OF AUTHORSHIP

I hereby declare that this submission is my own work and that to the best of my knowledge it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma by a university or other institution of higher learning, except where due recognition is given in the acknowledgements.

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To my village – my friends and whānau. Thank you for being my cheerleaders in this crazy journey. Your endless support and belief in me kept me going.

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ABSTRACT

Telehealth has seen exponential growth in clinical settings, remote-based care, and as a result of the COVID-19 pandemic. However, healthcare inequities and the digital divide are still barriers to accessing telehealth services. Healthcare is still largely inaccessible to patients who cannot get time off work to get to a regional hospital, those in remote areas who cannot afford the extra travel costs and hospital parking, or to parents who cannot find alternative childcare for when they attend their appointment. Telehealth presents an opportunity to provide more equitable access to specialist appointments. The telehealth booth is a new concept and one possible solution to address health inequities by providing the technology, equipment, and private space to attend a telehealth appointment locally without having to travel far to receive healthcare. Existing literature reveals a gap in knowledge on the user experience of telehealth and the telehealth booth, specifically, and how design can contribute to making the telehealth booth accessible and usable to patients.

This research hopes to highlight the importance of using design-led methodologies and methods, particularly in a health-related area, to unpack and understand user experiences and communicate information effectively when implementing a new healthcare service in the community. Following a human-centered design approach paired with action research, a range of design and qualitative research methods were used to explore how user experience design could help understand the patient experience of the booth. These insights then informed exploration of how communication design can be used to improve the ease-of-use and overall experience of the telehealth booth service. The design outcomes of this research include a patient information resource kit that provides information about telehealth and the telehealth booth, what to expect when attending a telehealth booth appointment, and instructions on how to use the technology within the booth. This research also calls attention to the potential for improving the physical aspects of the telehealth booth and its implementation in different public spaces in the future.

POSITIONING THE RESEARCHER

BACKGROUND

Creativity has always been a part of my life, whether it was through music, painting, or design. I had always seen creativity as something that had to end in beautiful output without putting too much thought into the process of achieving a good outcome. My passion for creativity led me to pursue design at an undergraduate level, where I specialized in user experience/user interface (UX/UI). During my degree, I was fortunate to spend a semester abroad in Malmö, Sweden studying Interaction Design and was introduced to looking past the product and focusing more on the user. This experience flipped the way I saw creativity and I learned that I was drawn to process-based design and research aspects rather than creating websites and mobile apps.

I had my first taste of design for health when I completed an internship with Good Health Design[1] where another student and I re-designed a dementia carers booklet[2] (See figure 1) to be more positive and easier to follow. This experience changed my perspective on design and how it can be used to create a positive impact on others compared to focusing on aesthetics and final outcomes.

I spent a year working in an office job following my undergraduate degree while doing some freelance projects. I decided to return to university to do a more research-based project in design for health. My main goals were to strengthen my critical analysis skills as a researcher while developing my writing abilities.

Figure 1. Good Health Design. (2019). *Dementia carer booklet re-design.*

1 Good Health Design is a multidisciplinary design and research studio situated at AUT's School of Art and Design, that focuses on using design to address healthcare challenges.

2 https://goodhealthdesign.com/projects/dementia-auckland-carer-booklet

THE RESEARCH OPPORTUNITY

At the start of this research, there were no telehealth booths available for patient appointments in the community anywhere in New Zealand. One District Health Board (DHB) – Waitematā DHB was starting an improvement project on how best to implement the new concept in their catchment area. At the time of the writing of this exegesis, a Telehealth booth had been recently installed as part of the Waitematā DHB's pilot roll out and is starting to be used for outpatient appointments in a rural area in the wider Northern Auckland region. The opportunity for me as a designer was to investigate how user experience design could help understand the patient experience of the booth, and then use communication design as an output to assist patients.

THE IMPACT OF COVID-19

The COVID pandemic had a significant impact on my research. As the New Zealand COVID lockdown situation fluctuated throughout the duration of my research, I had to adjust to the changes in healthcare settings and COVID restrictions. I intended to conduct my data collection with patients who had used the community booth to observe and ask for feedback directly. Since I had no access to patients who were the intended users of the booth, my user testing walkthroughs had to be conducted with staff instead. My plans were also changed as I had to focus on the in-hospital booth that was being used for a different purpose at the time. Further COVID-imposed restrictions in the hospital also meant that I had to move my physical patient feedback surveys to an online format.

INTRODUCTION

Telehealth and telemedicine may sound similar in name but differ slightly in meaning. Telehealth is an overarching term for conducting health appointments, research, and education virtually through communication technologies that rely on internet services (About Telehealth, 2021), such as video calls or photos, typically taken by patients from their home. Telemedicine is a subgroup of telehealth and refers to clinical services via remote patient self-monitoring tools such as monitoring blood pressure and heart rate (Gajarawala and Pelkowski, 2021; Health for Development, 2020). Many factors such as getting time off work, child-care, the distance to get to a regional hospital, and parking costs at hospitals, are all barriers to receiving healthcare. Telehealth presents an opportunity to provide more equitable access to specialist appointments for patients who face these problems. In 2018, Waitematā DHB conducted a study where just under half of patients in the study accepted a telehealth appointment due to convenience, with the top four reasons being to reduce travel, save time and money, and having a shorter waiting time (Bohot and Dixon, 2019). However, this is with the assumption that every patient has access or knowledge to use the internet and devices for appointments.

Telehealth booths are transportable, soundproof pods equipped with the technology and Wi-Fi needed to conduct a telehealth and/or telemedicine appointment. The booth aims to give more equitable access to patients who do not have the resources to attend specialist appointments at their regional hospital, or access to technology to do so remotely from their home.

The overarching objective of this research was to explore how the telehealth booth can take healthcare out of the traditional context of face-to-face 'in situ' interaction to address healthcare inequity, while maximising ease of access and use. This would be achieved by looking at the booth through a user experience design lens to understand the patient journey and then use these findings to create a communication design output that would assist patients in using the booth.

While there are few studies internationally on the acceptability and usability of telehealth booths within these remote communities, relatively few studies focus specifically on how communication design can improve the patient experience of using Telehealth booths. There is currently no research on the topic in the New Zealand context.

CONTEXTUAL REVIEW

HEALTH INEQUITY IN AOTEAROA

Healthcare inequity has been a long-standing problem in Aotearoa, New Zealand (Sheridan et al., 2011). Equity, as defined by the Ministry of Health (2019), recognizes that different groups of people with different circumstances need tailored approaches or resources when receiving or accessing their healthcare services. Many socioeconomic factors come into play when accessing the healthcare system. Three factors in particular: time, travel, and financial costs, are the main reasons telehealth is a more viable option for patients.

DISTANCE FROM CARE

Wickramasinghe et al., (2016) state that for indigenous people, access to high-quality healthcare is often hindered due to distance from a major hospital. This is especially so for people who live in remote areas, and people with limited time, means, or mobility to travel to their nearest healthcare facility (Bohot and Dixon, 2019). A study in Queensland, Australia analyzed the factors that encouraged patients choose a telehealth option (Smith et al., 2003). In addition to travel time, secondary costs such as fuel, parking, and food expenses make attending a hospital-based appointment even harder (Smith, et al., 2003). Even for those who live near the city, patients would still have to take time off work to be able to attend an appointment in person. Similarly here in New Zealand, for those who live regionally, it can take up to a whole day for patients to get to the closest big city for a specialist appointment (Bohot and Dixon, 2019).

TIME, COST, AND SOCIAL ISSUES

The rates of patients not showing up to their health appointments in New Zealand have been high historically (McBride, 2017). For example, in 2006, 7.6% of all of Nelson Hospital's patients were not turning up to their specialist appointments, with almost one-fifth of these patients being Māori, the indigenous people of New Zealand (Nelson Mail, 2006). Māori in particular were less likely to attend their specialist hospital appointments due to hospitals often being associated with distressing memories of loved ones lost or financial pressures (McBride, 2017). In the 2017/2018 financial year, the Counties Manukau DHB reported that outpatient specialist appointments (first and follow-up) had a 10.7% did-not-attend (DNA) rate for both Māori and non-Māori (Counties Manukau Health, 2018). There were multiple reasons patients would miss appointments, such as complications related to their health, not realizing the significance of the appointment, issues with traveling, or other commitments (Counties Manukau Health, 2018).

More recently in 2020, at the West Coast District Health Board (DHB), the DNA rates of Māori were at their highest at 18% (Williams, 2020). The Māori Health Team there conducted follow up calls to investigate why Māori patients were not attending their appointments, with one respondent sharing their difficulties as a parent who could not get alternative childcare. In addition to this, there were often issues with traveling to the hospital, as this meant extra petrol costs that were out of the family's weekly budget, or even simply having no access to a car or phone (Williams, 2020).

THE DIGITAL DIVIDE

While digital health services are increasing with the rise of technology and the impacts of COVID, the digital divide has become more apparent in accessing healthcare. The digital divide phenomenon is the lack of knowledge or little to no access to telecommunication devices or resources (Lythreatis et al., 2022). This particularly affects ethnic minorities, lower socio-economic groups, and those with less educational background in a negative way (Cortelyou-Ward et al., 2020), affecting their right to equitable healthcare access. Telehealth and the digital divide already existed pre-pandemic. In New Zealand, Māori and Pasifika have government-run groups that attempt at assisting the digital divide, however they still do not benefit from the transformation of the digital age (Cullen, 2001; Ikihele, 2018).

While there is an overall problem of accessing conventional specialist appointments, Bohot and Dixon's (2019) report shows 54.8% of patients from the study declining telehealth appointments specifically as they would rather see someone in person. A small number declined as patients did not have the knowledge or resources to conduct their end of the call. Wickramasinghe et al., (2016) found that there was also a lack of knowledge on the clinician side with operating the technology needed for a telehealth consultation. These findings indicate that telehealth booths can help improve access to telehealth appointments, and that future users of the telehealth booth could benefit from resources to help make it more accessible and easier to use.

THE RISE OF TELEHEALTH: NZ AND AROUND THE WORLD

Throughout the world, the concept of telehealth is not new. The earliest known use of telehealth in the United States was in the 1960s. Although not labeled specifically as telemedicine, first responders and emergency doctors were able to communicate via voice channels (Nesbitt & Katz-bell, n.d). Since then, the use of telehealth ranged from clinical settings (specialists contacting other hospitals for consultations), remote home-based care, to providing basic care in rural areas (Nesbitt, 2012; Gajarawala and Pelkowski, 2021). Today's telehealth enables healthcare appointments, research, and education to be conducted virtually through communication technologies that rely on internet services (About Telehealth, 2021). Benefits of the service include reducing stress of waiting times, unnecessary emergency department visits, ease of transportation difficulties and catering to rural areas, where patients can go up to six months without seeing a clinician (Gajarawala and Pelkowski, 2021; Fox et al., 2022)

A typical telehealth appointment can be via phone call or video call and requires a device to take a video/phone call, stable internet connection, and a suitable environment to take the call. Telehealth has had exponential growth throughout the last decade due to the advancements in technology and digital health, but in particular in recent years due to the need to safely access healthcare services during the global COVID pandemic.

AN AUDIT OF EXISTING TELEHEALTH MATERIAL

To understand the current processes of telehealth, I assessed the existing materials that were being provided for patients in the previous years that telehealth was operating in New Zealand. Through this audit, I aimed to understand what information is available to patients, the process/how the service works, and gain more knowledge about telehealth in general. Some materials were provided by Waitematā DHB around telehealth appointments, so I was able to understand both the clinician and patient-facing sides and how these worked together.

TELEHEALTH OUTPATIENT SURVEY

A survey by the Waitematā DHB was conducted in 2020 with outpatients who had a telehealth appointment via video or phone (Waitematā DHB, 2020). Patients were asked questions about their experience with using this service, from the technical aspects, to the quality of the appointment. There were a mix of multi-choice and open-ended questions so that patients could suggest improvements.

SURVEY RESULTS

Since this survey was taken from the time of the strict COVID lockdown in New Zealand, most patients were recommended telehealth or were not offered an alternative by their clinician, as the lockdown restricted unnecessary travel outside of their residence unless it was an emergency. In general, there was a positive response to using telehealth, but it was usually preferred for follow up appointments or for receiving results. A small group of participants still preferred to see their clinician in person, especially if a physical exam was needed. One thing to note however, is that the majority of participants in this survey had a phone appointment which requires less technology, access to appropriate equipment, and skill than video appointments.

COVID-19 IMPACTS AND DRIVE FOR TELEHEALTH

Since the World Health Organisation (WHO) classified COVID-19 as a global pandemic at the beginning of 2020 (Smith et al., 2020), countries all over the world have had to adapt their way of life to protect communities and save lives. A common strategy for many countries was to enforce a 'lockdown'. Curfews and restrictions were imposed nationwide in an attempt to slow down the spread of the virus (Financial Times, 2021), as healthcare services and resources became strained.

These abrupt changes in lifestyle have resulted in the need to provide alternatives to delivering healthcare to limit virus transmission, but also to tackle financial costs and staffing shortages. In 2018, one DHB (Counties Manukau) in New Zealand had estimated that DNAs indicatively cost them up to 3.6 million dollars (NZD) which included costs for staff, facilities, and additional admin processes (Counties Manukau Health, 2018). This is similar to another DHB's (West Coast DHB) estimate of between $200 - $400 per appointment (Williams, 2020). Staffing also became a major issue, with some Auckland hospitals operating with fewer staff due to sickness or isolation as the pandemic took off (RNZ, 2022; Quinn, 2022).

Digital health tools such as telehealth provided an option for receiving healthcare remotely to decrease costs and mitigate staffing issues. With this shift in delivering healthcare, there was a drive by Waitematā DHB specifically to increase awareness about telehealth appointments. However, there is still a lot to be done to make telehealth more common and widely used in New Zealand. The challenge with this shift is creating it in a patient-centered way that allows resources and information related to telehealth appointments to be easily accessible –which is where the telehealth booth becomes a much more viable and equitable option.

THE TELEHEALTH BOOTH

A telehealth or telemedicine booth, also known as a telehealth pod or health pod, is a designated space that contains the technology and equipment needed to conduct a telehealth appointment. This can be in the form of a small booth with four walls or an open kiosk. Currently there are different manufacturers of these booths such as Busypods from New Zealand, the Consult Station in France, or telemedicine kiosk in the United States. In New Zealand, a four-month telehealth trial conducted by Waitematā District Health Board (WDHB) demonstrated that telehealth could be a more accessible option for patients to access healthcare services, but also showed that there was a need to address the obstacles telehealth appointments presented. Although the telehealth booth was not used in the trial, it was suggested it could be used as a resource to address healthcare inequities caused by lack of access to the necessary technology and equipment needed to attend a telehealth appointment (Bohot and Dixon, 2019). While telehealth appointments were supposed to solve problems of access, there were still some obstacles to this service. These include a lack of technical knowledge when things went wrong, privacy concerns with patient data and the cultural adjustment to using the service (Peddle, 2007).

The findings of the NZ trial for telehealth were consistent with the findings of a 'Telemedicine Booth' trial previously conducted in Edinburgh, Scotland (Mair et al., 2008). Two of these booths were set up at the Royal Highland show - one of Scotland's most famous agricultural shows, attracting the rural and farming community. This trial aimed to test the concept of virtual appointments in telemedicine booths to see if it was a feasible option for future re-designs in healthcare delivery (Mair et al., 2008). The average consultation consisted of relaying simple variables such as blood pressure and pulse saturation levels. The booth was trialed on 238 participants with 93% completing a questionnaire on their experience – 84% agreed that using the booth would save them trips to the hospital or clinic, and 75% saw the booth as a chance to obtain specialist help. This trial received positive feedback, with the majority of the respondents feeling like the booth would save them a trip to the clinic. It has shown that the booths are a feasible and practical option to receive healthcare, but also highlights the opportunity to better engage communities to inform how the patient experience of telehealth and telehealth booths can be improved. Other studies have also explored the uptake of telehealth booths. They have found that telemedicine kiosks are becoming more frequent in malls and pharmacies across the United States (Telacare, 2017).

Kiosks can contain patient monitoring tools like a telemedicine booth or can be as simple as temperature screening or patient check in (Nachum et al., 2021; Olea Kiosks, 2020). Nachum et al. (2021) conducted a study that saw telemedicine kiosks being placed in private rooms within pharmacies in New York City, permitting patients to digitally connect with physicians without the need for a personal device which would cost $99USD (approx. $160NZD) per visit (Baum, 2017). These kiosks contained basic instruments that measured vital signs (blood pressure cuff, pulse oximeter, and thermometer) in addition to equipment for a video call (New York-Presbyterian, 2017). This study proved to have success with most users being travelers (students, business people, international/domestic tourists) who often do not have access to local primary care, with minimal requests for an in-person appointment (Nachum et al., 2021).

2

3

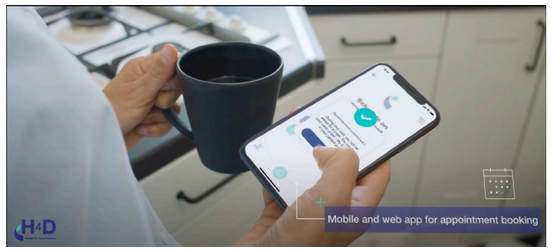
Figure 2. Nachum et al. (2021); 3. Baum. (2017). *Telemedicine kiosk in New York City.*

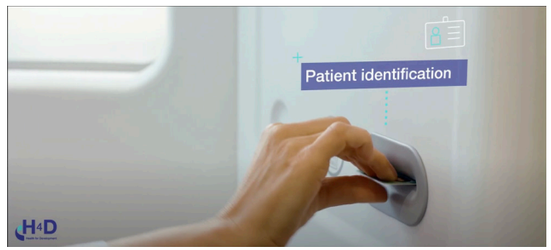
In France, an example of a telemedicine booth in an enclosed space is the Health for Development's (H4D) Consult Station. This booth contains measuring instruments, screens, and a communication system that can capture and share reliable data that can be used for a clinical teleconsultation or self-performed checkups (Health for Development, 2020). A study of the Consult Station in the greater Paris (Île-de-France) region was set in company buildings and townhalls, in suburbs where there is less general practitioner (GP) accessibility (Falgarone et al., 2022). There was a large acceptance of the booth among patients and GPs, and researchers found that the booth was a good way to address healthcare access in rural areas (Falgarone et al., 2022).

Telehealth booths offer the technology and a dedicated space to attend a telehealth appointment, however, there are still improvements to be made in the user experience of the booth – particularly for those who are unfamiliar with the technology involved or who may feel intimidated to access healthcare services in new ways.

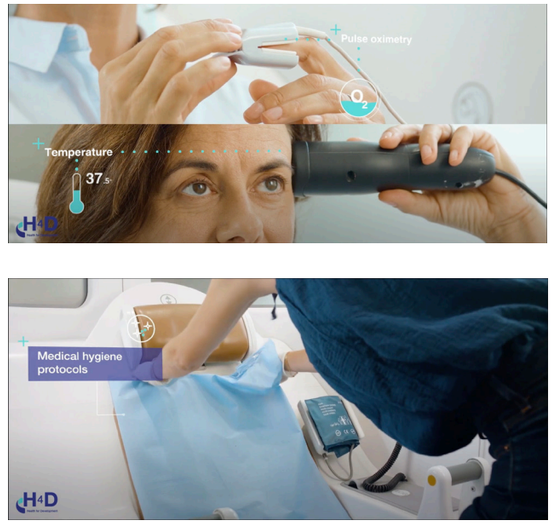
Figure 4. Health for Development. (2020). *The Consult Station in use.*

Patient makes appointment via mobile app

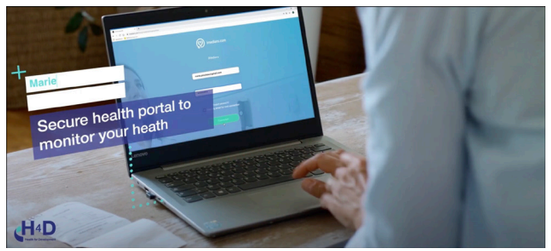


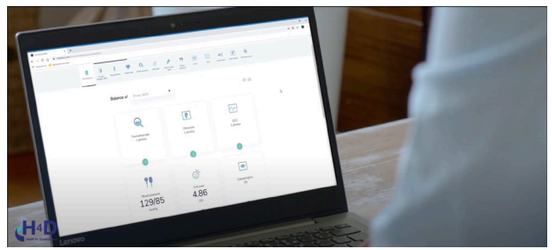


Clinician assistance/ consultation



Self monitoring medical tools





Employee cleans tools after booth is used

Access results from home

Figure 5. Health for Development. (2020). *Screenshots of the Consult Station in use.*

DESIGN IN HEALTHCARE

Design is everywhere – we see it in our everyday lives whether it is in road signs, voting forms, buildings, or medical devices. For designers in healthcare, navigating the use of design in a bureaucratic environment opens opportunities for innovation in enhancing patient services and challenging the role of design (Chamberlain et al., 2017). Healthcare is a practice that is fact-based, however, design complements this as design practice goes beyond tangible aspects and extends to design thinking and person-centred methodologies that are crucial in this context (Chamberlain et al., 2017).

TWO COMPLEMENTARY DISCIPLINES

Global health and design have common characteristics that make a great pairing for collaboration. While healthcare has a set of goals to achieve, design brings the methods and framework to fulfill these goals.

Design for Health - a global initiative committed to increasing the understanding, appropriate use, and value of design as an approach to help achieve global health goals - created a resource that highlights the top 10 common principles of design and global health (Design for Health, n.d). The ones most relevant to my research were:

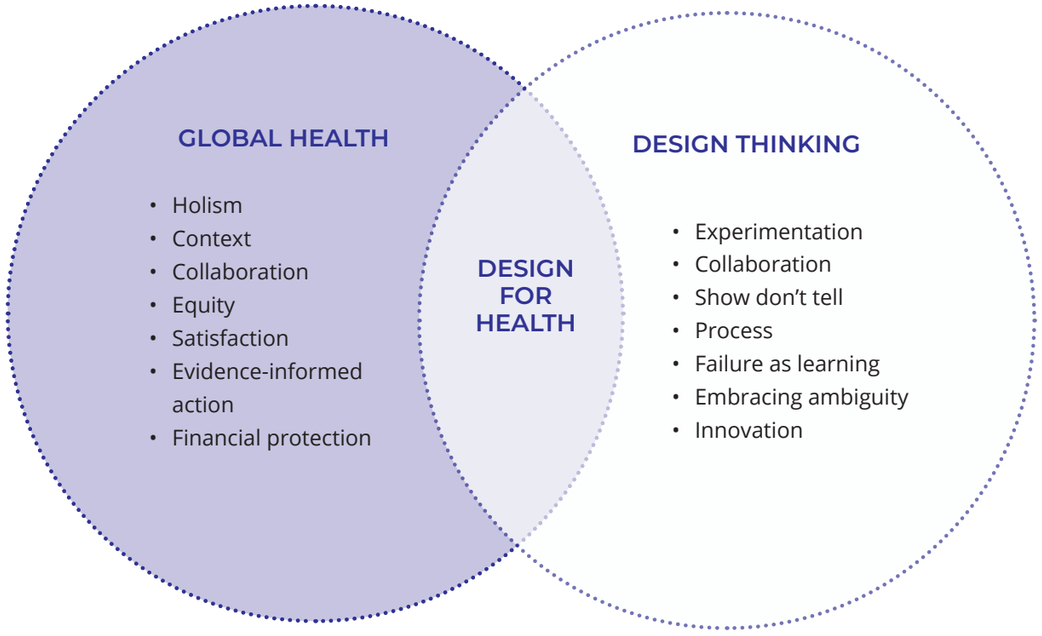


Figure 6. Caballero, (2022). *Comparison of global health and design thinking principles.*

Global health principles: (Yale News, 2010)

Design thinking principles: (Kolko, 2015; Gachago et al., 2017; Brown, 2014; Design Museum, n.d)

COLLABORATION WITH A HOLISTIC VIEW

Considering all aspects of systems, users, stakeholders and how these elements affect each other by establishing a relationship across disciplines. Through this, the discovery of varying experiences and viewpoints can contribute to unraveling underlying issues and create solutions. A good example of this is the collaboration between healthcare professionals and designers to the create flash cards that assist pediatric rehabilitation patients in their recovery (Paulovich, 2015). In this project, the health professionals were involved in the design process and gave feedback on the prototypes after using them with patients, and found they were a good tool to start a conversation about past and future rehab journeys.

BUILDING OFF EXISTING EVIDENCE

Typical design methodologies require an investigation of existing material from health experts and insights from communities and organizations that are potential collaborative partners. By doing this, designers can demystify presumptions about the users. Throughout my research, I collaborated closely with the improvement specialists at the healthcare organisation who oversaw the implementation of the new telehealth booth service into the community. I had access to the telehealth materials and initiatives the organisation had used in the past and had planned to adapt for use in the new service (both patient and clinician-facing), and access to the telehealth booth themselves, where I could conduct user-testing of my prototypes.

INCLUSIVITY AND EMPOWERING USERS

Creating solutions that can be accessed and used by communities that have diverse requirements, especially those who are disadvantaged in accessing the healthcare system. Users can be empowered as equal participants through designing solutions that consider users lives, rather than expecting users to conform to the needs of the health system. With the rise of digital health services, user experience/user interface (UX/UI) has become an important tool to design new services and help understand the patient needs (Goldchmit et al., 2021). The telehealth booth and its use – the context for my research – is a good example of how design can be used in the healthcare context to bring healthcare to the user of health services and empower traditionally disadvantaged communities to navigate healthcare on their terms. My role as a designer working on the UX and communication design surrounding the booth required me to delve into the user's perspective and advocate for their needs when designing resources that support the use of telehealth.

INFORMATION DESIGN IN HEALTHCARE

Information design is a collaboration of different design disciplines, with a goal to present information in a way that is easy to understand. Graphic design in this context contributes through the craft of aesthetic and form by using text and image. The combination of the different elements of graphic design can be used to grab the attention of the reader and maintain the attention enough for the reader to follow instructions. It relies on simplicity and structure to communicate messages (Pettersson, 2014), and can be applied in different forms such as wayfinding systems, and interface design (Goldchmit et al., 2021).

Communication between doctors and patients is a crucial aspect in consultations so that patients can receive the best care (Bacher et al., 2020), and one of the several barriers to this is patient health literacy. In New Zealand, health literacy is defined as being able to make informed health decisions by understanding standard health information (Ministry of Health, 2015). Substandard health literacy often goes unnoticed, creating a barrier for patient-to-doctor communication (Paulovich, 2015) and poses a question on health inequity. Visual aids can be adapted specifically to a patient's situation through different forms of design such as videos and information leaflets. These have proved as successful as patient education tools as verbal consultation (Bacher et al., 2020). In a clinical environment, patients are showing an increasing demand for information which is now accessible through the various platforms on the internet (Goldchmit et al., 2021). The challenge therefore is how to make these different platforms more accessible to diverse users so that future healthcare is received in an equitable way.

RESEARCH AIMS

This research aspired to address healthcare inequity for patients by using a user experience and communication design lens to improve the experience of the telehealth booth. A secondary goal was to address the role of designers in the healthcare industry, particularly the role of communication and UX design in the creation of the telehealth booth service.

The following research question was addressed:

How can information design be used to empower the users of the new telehealth booth service, so they can journey through their telehealth appointment confidently and with minimal assistance?

The specific objectives of this research were to:

1. Understand the experience of a patient journeying through the telehealth appointment using the telehealth booth

2. Design an accessible, user-friendly information resource to support patients so that they can feel empowered to use the telehealth booth service confidently and with minimal assistance.

CONCLUSION

Telehealth booths are a new concept in its infancy, therefore, there is not a lot of literature on the patient needs, experience and accessibility of telehealth booths. While they share some similarities, the use of the telehealth booth differs significantly from the experience of a telehealth appointment. Telehealth booths come with a physical environment and use technology that may be unfamiliar to some patients. There is an opportunity to use UX/interaction design to better understand the patient journey of attending a telehealth appointment using a telehealth booth, and then use information design to improve the patient experience and assist patients when using the telehealth booth for the first time.

METHODOLOGY

METHODOLOGIES

This research focuses on using design-led methodologies and methods to unpack the patient journey of the telehealth booth and create a resource that can assist in the use of the booth. The methods chosen were influenced by the double diamond design process framework that required an exploration of the existing materials, potential diversity of end-users and social contexts within which the booth may be situated, while encouraging an iterative and human-centered approach in design.

ACTION RESEARCH

Action research (AR) is a framework where the researcher can actively participate in their research while pursuing the development of change within social circumstances or an organization (Koshy, 2010; McCurdy, Dykes, and Meyer, 2016). AR has a cyclical sequence of planning, acting, observing, and reflecting (Swann, 2002; Willis and Edward, 2014) (figure 6).

My research uses an AR framework to understand and map out the patient journey and design instructional materials that assist patients in using the telehealth booth. Using this framework was important because this research requires an understanding of the attitudes and needs of users of the telehealth booth in order to design a solution to meet their real needs. The participatory aspect

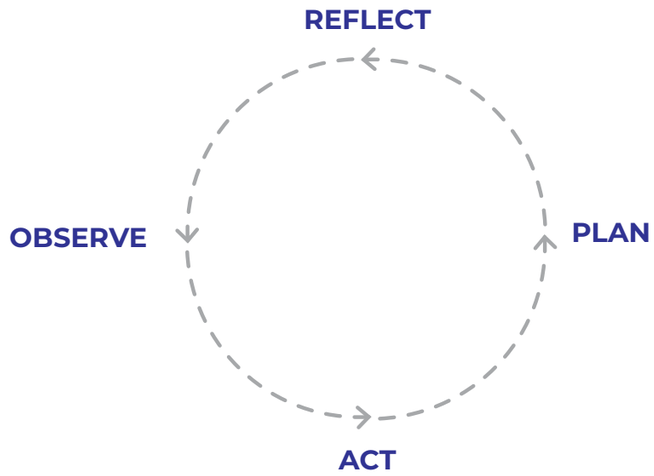


Figure 6: Willis and Edward. (2014). *Action research diagram.*

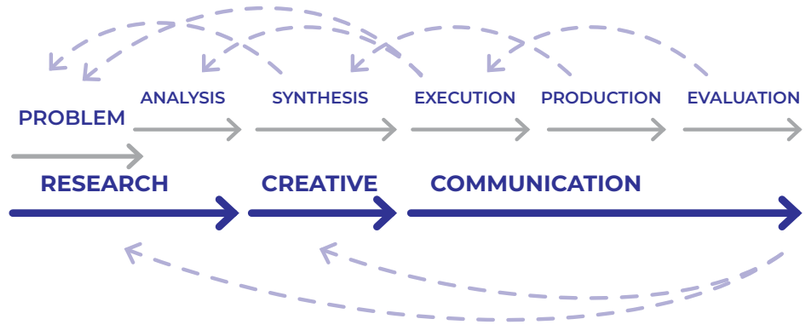


Figure 7. Swann. (2002). *Design process in conjunction with AR.*

of AR (McCurdy, Dykes, and Meyer, 2016) aligned with the need to test assumptions and gain insights from experts in telehealth in order to better understand the context. Typically, AR is a methodology used in a social science context, however, it can also be applied to a design research context due to the iterative nature of the process. The two processes coincide as the flexibility and cyclical nature of AR supports the iterative and reflective design process (see figure 7).

THE DOUBLE DIAMOND DESIGN PROCESS MODEL AND HUMAN CENTERED DESIGN (HCD)

Human-centered design (HCD) keeps end-users central to the design process – this means considering everyone involved and being flexible, iterative, reflective in the process (Jnd.org, 2019). Particularly in healthcare technology (mobile health apps, phones as data storage, etc.) which is a rapidly changing industry under constant development, HCD supports the human factor and the user experience (Harte et al., 2017). This is particularly important in healthcare where there are multiple people involved – patients, clinicians, and the wider health system (Jnd.org, 2019)

In the past, health organizations focused more on training people to use poorly designed technology rather than tailoring the technology to fit their needs (Abugabah and Alfarraj, 2015). HCD uses a variety of activities that test the usability of products, discover the motivations of users, and constantly keep learning throughout the process through feedback. This distinguishes HCD from other traditional design methods, as it is being led by the insights and needs of the users rather than the designer's personal creative methods and speculation (Giacomin, 2014). Working as a designer in healthcare, it is essential to put users first, especially when designing a new service. My research aligns with the principles of HCD as the methods I used that involve participants

Figure 8. Hambeukers. (2019). *The original double diamond process.*

focused on their responses, needs, and abilities to inform design decisions – including interview findings that informed my design brief.

With users at the centre of the process, this research progressed according to the phases described in the double diamond framework (Norman, 2013). The double diamond is a design process model (Design Council, 2015) that describes the design process as a series of shifts between divergent and convergent thinking. At start of the process, the problem is examined broadly (focusing on the 'discovery' of the needs and characteristics of the end-users and their context) and an opportunity for design defined (the first diamond). This is followed by ideating and prototyping multiple solutions that are then tested, refined, and narrowed down to the best concept. The standardized version of this framework (figure 8) can be used as a project guideline but can also be customized to suit project needs (Gustafsson, 2019).

The methods used in this research at different stages of the double diamond process are shown in figure 9. In the ‘discover’ phase, I familiarized myself with the context of my research by using a contextual review, audit of existing booths and similar technology, and expert interviews to understand the context of the booth. I analysed this further through methods such as personas, journey maps and thematic analysis. All the insights gathered from the discovery phase then defined the design brief that I used to develop and test my prototypes.

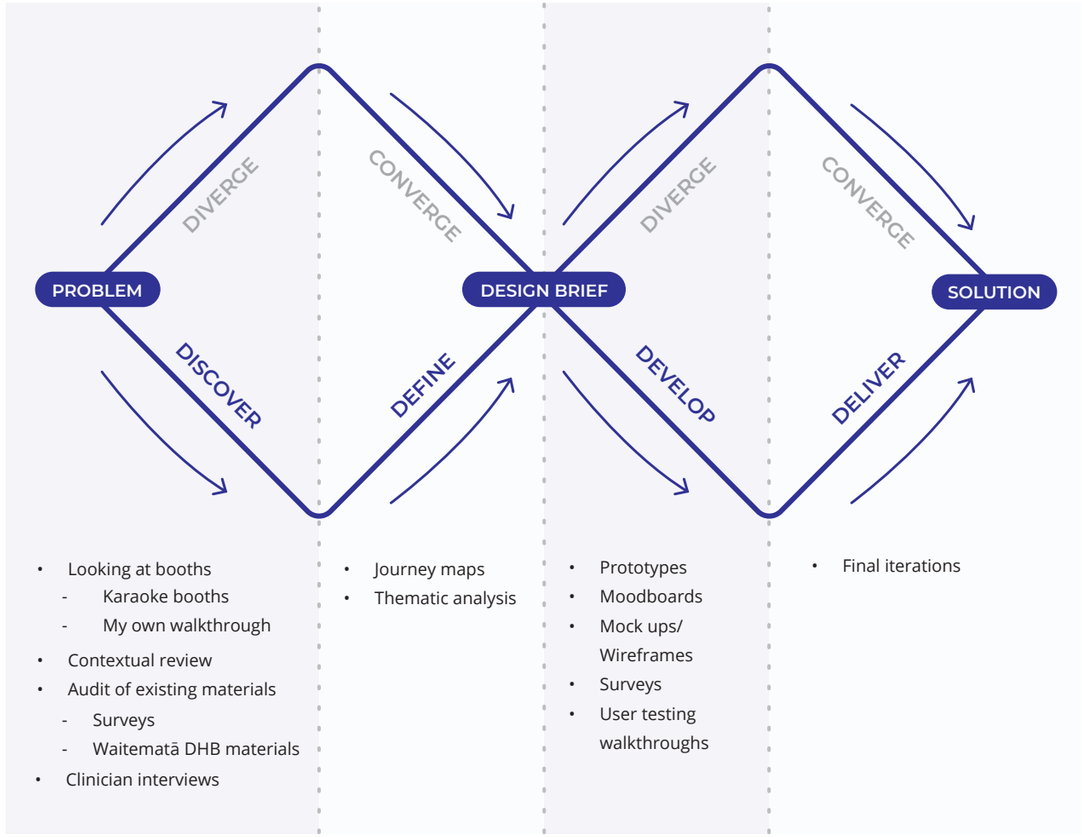


Figure 9. Caballero, (2022). *My research project following the double diamond framework.*

ETHICAL CONSIDERATIONS

Since I used a HCD framework that requires human participation (Giacomin, 2014), my research involved interactions with other people. This was done through interviews with clinicians who talked about their experiences with telehealth, staff from the Institute for Improvement and Innovation (i3) who participated in walkthroughs to draw out key pain points around the use of telehealth booths for outpatient appointments, and telehealth users who took a survey on my prototype to provide feedback so that it could be improved. It was my responsibility to consider the ethical implications my research would have on my participants, myself as the researcher, and other organizations/institutions involved in the research (Polonksy, 2004).

To obtain the ethical requirements of this project, I submitted an application for ethics approval to the AUT Ethics Committee (AUTEC). This contained a research plan detailing the methods I would be using that involved other people. Formal ethical approval was granted under the reference number 21/278. See appendix A for letter of approval.

METHODS

To gain an understanding of the current experiences with telehealth and setting up the telehealth booths, I conducted several data gathering methods to familiarize myself with the concept of the booth. This included walkthroughs, expert interviews, and an audit of similar technologies. To unpack the experience further, I looked at the step-by-step use of the booth for a telehealth appointment through think aloud walkthroughs with staff at i3. These enabled me to map out a patient journey, prototype, and test my designs iteratively. These methods are outlined next:

INVESTIGATION METHODS

CONTEXTUAL REVIEW

A contextual review establishes the context of the project by looking at existing literature and then critically analyzing and finding the area that the research fits into (Mathison, 2005). I used this method to define the social context that my project fits into – the health inequities in New Zealand, formulating solutions to these inequities, establishing the various levels of accessibility in health literacy and physical aspects, research on telehealth and telehealth booths, as well as looking into the design aspects for my final output such as information design, and design in health. Articles and resources were obtained through the AUT library and Google Scholar. The following key words or phrases were used in the searches: telehealth, telemedicine, telehealth pod/booth, health inequity, remote healthcare. The resulting sources were then used to discover new relevant articles. To structure the contextual review I created mind maps that would establish the terrain that I needed to cover, which helped me define what information I needed to add to create the rationale for my project.

EXPERT INTERVIEWS

Semi-structured interviews require pre-planned questions or a list of topics that can be referred to during the interview (Given, 2008). Making the interviews semi-structured allowed for flexibility as I could reframe or ask new questions based on the responses of participants. Additionally, it created a safe environment so that participants could speak openly about their experiences. Other methods such as a survey could have been used to acquire this data, however, more structured methods might have pressured participants into giving responses that the researcher wants to hear (Lewis-Beck et al. 2004). Qualitative semi-structured interviews allow for an open conversation where the researcher is more of a listener and the data that comes from the participants' responses is richer (Warren, 2001). I conducted semi-structured interviews with six clinicians from a range of clinical backgrounds who all had experience with telehealth, the Disability Advisor (DA) of the Waitematā District Health Board (WDHB) and the Telehealth Coordinator (TC) from the Institute for Improvement and Innovation (i3) who was involved in the rollout of telehealth with the Waitematā DHB.

Interviews were conducted with a range of healthcare staff, categorised as follows:

CLINICIANS

Participants were asked about their experiences with telehealth or telehealth booth to gain general information on how the service works and gain insights from a clinical perspective. Participants were also asked about their opinion on patient barriers, challenges, and opportunities in using telehealth and telehealth booths.

TELEHEALTH COORDINATOR

This interview was conducted to gain insights into general knowledge on the use of telehealth and telehealth booths in a hospital context, as well as the technical aspects and logistics around using telehealth and telehealth booths within hospital services.

DISABILITY ADVISOR

The purpose of this interview was to gain an understanding about the access needs of typical patients and healthcare visitors, their health literacy, and what should be considered from an accessibility perspective when designing a new service such as a remote telehealth booth for outpatient appointments.

For the recruitment process, an email was sent out by the DHB's Telehealth Coordinator to potential clinicians who have had experience with telehealth either prior to or since the pandemic began. Clinicians contacted me directly if they were interested in participating.

The interviews were done via video call as New Zealand was in a strict lockdown for most of the early stages of the research, which meant face-to-face interactions were not possible. Each interview was screen recorded, and later transcribed for further analysis. The interviews provided insights into and helped build a picture about patterns/themes across the dataset that allowed me to see and make meaning of the shared expert experience, that were then used to identify and inform potential opportunities for ways to improve the telehealth and telehealth booth experience for patients. These were also used to inform the next step in my research – walkthroughs of the telehealth booth.

Eight interviews in total were conducted via Zoom and were recorded. Each interview took approximately thirty minutes. (See Appendix B, C, and D for the clinician, Telehealth Coordinator and disability advisor interview questions, respectively).

TELEHEALTH BOOTH WALKTHROUGH

The term ‘walkthrough’, also known as ‘roleplay’, is method that requires participants to take on a role and ‘act’ as if their situation was true (Lewis-Beck et al., 2004). The benefits of this method are that it motivates and empowers participants to investigate other avenues of thinking (Chaplowe and Cousins, 2016). I conducted this method in two ways:

PERSONAL WALKTHROUGH

I first did a walkthrough myself to gain a better understanding of the telehealth booth. This was used to help understand the patient journey through the remote appointment and inform the design of a prototype on how to use the telehealth booth. My intention was to get to know the environment of the telehealth booth, the technology, and see what patients would be expecting and were expected to do when using the booth. This was an opportunity to put myself in the shoes of the patient and experience what it was like from the moment they receive the telehealth booth appointment letter, to when the telehealth appointment ends/a person exits the booth.

PARTICIPANT WALKTHROUGHS – USER TESTING

A walkthrough of the telehealth booth was also conducted with participants from the Waitematā DHB innovation and improvement team (i3). The main objective of these walkthroughs was to test the prototype I had made about how to use of the booth (specifically, the technology in the booth), but also to identify pain points or areas that could be improved. The participants were given an appointment scenario and were asked to act as patients who were using the booth for the first time They were then asked to ‘think aloud’ and verbally share everything they were thinking while going through the process. The ‘think aloud’ method calls for participants to give close attention to their thought process while completing a task, and then verbalize it (Güss, 2018; Jaspers et al., 2004).

These were audio-recorded, transcribed, and were analyzed to find key themes. As access to real patients was not possible at the time of my research, this method allowed me to gain an insight into how different users might engage with the booth and observe the differences in their behaviors, thought processes, and feelings (Lewis-Beck et al. 2004) toward the prototype. The insights from the participant walkthroughs helped inform further iterations of the prototype.

SURVEYS

In addition to gaining feedback through walkthroughs and interviews, the intention behind using an online survey was to quickly and in a contactless way gather anonymous feedback from actual patients on the iterated version of the design prototype. The initial plan was to set up a public survey booth where participants can voluntarily answer the survey questions by hand when visiting the outpatient hospital areas and community clinics (See Appendix F for the survey questions). However, due to COVID-related concerns from the WDHB about touching surfaces and loose sheets of paper in the waiting rooms, the survey had to be digitized via Qualtrics.

A brief feedback survey was originally meant to be distributed in paper form to patients in outpatient waiting areas within the Waitematā DHB (see Appendix F for the survey questions). However, due to COVID restrictions imposed at the Waitematā DHB (such as minimising the risk of infection through the use of physical materials and touching surfaces), a physical version of the survey was not possible. There was also concern around putting extra pressure on staff who would have to answer questions regarding the survey. Alternative options to receiving feedback were then considered. The benefits of an internet survey are that participants can work at their own pace and are not pressured by a researcher to provide an answer on the spot (Lewis-Beck et al. 2004). The online version of the survey was distributed digitally to telehealth patients via a link at the end of their Zoom call with a clinician.

UNDERSTANDING METHODS

JOURNEY MAPPING

Journey mapping involves visualizing the process a user goes through (e.g, a patient moving through a health service), commonly in the form of a timeline. This method is helpful in unpacking the different phases of the journey and can be used to identify any behaviors or actions that present as 'pain points' for the user (Gibbons, 2018) and present opportunities to improve their experience. This method was used to visualize the experiences from my personal walkthrough, as a starting point to understand the journey of a patient using the Telehealth booth. I then used this method again after with personas I had created with data from the expert interviews.

PERSONAS

Personas are fictional personalities or characters that symbolize potential users of a product or service that are built on common trends from previous research (Dam and Siang, 2022). Using the data from the expert interviews, I was able to formulate personas to identify and understand what kind of patients would use telehealth and the telehealth booth. My intention with the creation of the personas was to explore a range of different behaviors, ages, access needs, technology skill levels, and backgrounds to test my assumptions around the user journeys. By creating personas,

I was able to step out of my researcher shoes and see the process of a telehealth booth appointment from other perspectives. The personas were then used as a scenario to inform a journey map of using the booth, that would identify the pain points of the user.

DESIGN BRIEF

Design briefs help define the objectives and deliverables of the project. They are typically used to create a relationship between the designer and stakeholder to demonstrate the expectations at the end of the project. There is no set template for design briefs as each project has different needs; however, a common structure is to have a checklist, project overview, goals, deliverables, and a schedule.

I created my own design brief to help me make sense of the data I gathered via multiple research methods (interviews, readings, mood boards). and to set the aims and purpose for my design solution. This also helped me set a very specific set of requirements to ensure any potential design solution would best meet the needs of the user. Creating my own brief made me think about what direction I needed my prototype to go in and critically think about what I found out during the earlier stages of my research. While working on my prototype, the brief served as a guide to what criteria I needed to satisfy to be successful.

MOOD BOARD

Mood boards are a compilation of images and other creative materials that can be used as a tool to generate ideas and inspiration or serve as a basis for consistent style (Mcdonagh and Storer, 2004). These can be made digitally or physically and are generally made at the beginning of the design process to prompt ideation and make sense of the abstract vs factual (Endrissat et al., 2016). For my research, I used mood boards as a way to investigate various instructional designs in general, but also those used in healthcare specifically. This gave me inspiration on how I could manage my content and potential layout design. I made three different mood boards – one for healthcare-specific instructional design, and one for general instructional design. The last mood board looked at how general healthcare information is depicted.

THEMATIC ANALYSIS

Thematic analysis is the process of analyzing and synthesizing data from qualitative research (Maguire and Delahunt, 2017). To help identify a design opportunity based on the data gathered via multiple methods, key themes from the data were established, through a process loosely based on Braun and Clarke's (2014) thematic analysis.

Following the interviews and walkthroughs, I transcribed the audio recordings and used Miro to map out key ideas and compare participants' responses for any similarities. I used the findings from this analysis to inform the criteria for the design brief. The brief then informed the version of the prototype tested in the participant walkthroughs.

MIND MAPS

Mind maps are a less formal, visual tool useful for organising ideas and reflections (Wheeldon and Ahlberg, 2012) . A mind map is typically a diagram with the main topic and sub-ideas branching out from the middle, showing the relationships between each idea (Wheeldon and Ahlberg, 2012). Mind mapping was a large part of my process as I used it to organize my thoughts (both in writing or creatively) and visualise my ideas. Writing down my ideas helped me get into a flow of idea generation, and enabled easy linking of similar or connected ideas using arrows.

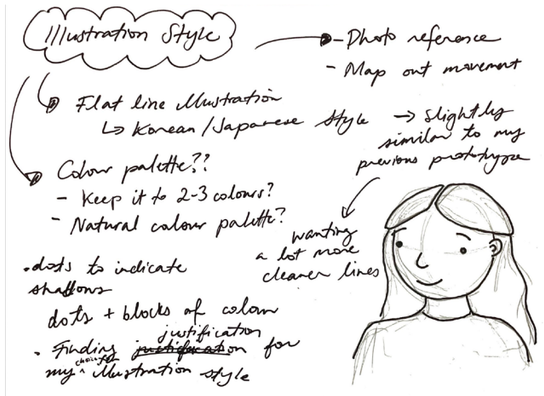


Figure 10. Caballero, (2022). *An example of mind mapping.*

CREATIVE METHODS

SKETCHING

Sketching is a tool for conveying information visually through diagrams and imagery, and can be used to generate ideas (Matthews, 2014). There is a lot of freedom in this method, as sketches do not have to be polished; rather, they served as a landmark for ideas when I needed to refer to them later (Shore and Carfora, 2010). For my process, this involved translating thoughts or ideas to diagrams and mind maps - these were usually rough sketches. I used this method when I analyzed readings and research to interpret information in a visual way that I could understand or as a starting point to unpack problems. I also used sketching as a method to communicate what technology the telehealth booth contained and what it looked like when I was unable to use images.

CONCEPT DEVELOPMENT

Developing concepts is a fundamental part of the design process (Hass, 2015). Typically completed in phases, concepts can start as rough sketches and finish as polished designs, focusing on taking one concept idea and reiterating it until it is refined (Hass, 2015; Santoro and Santoro, 2013) Taking a concept through the development cycle allows for space to iterate and add changes based on testing findings, or can act as an idea generator. For my research, I used this method to improve my prototypes after user testing via walkthroughs. My initial concepts started off as wireframes, which are low-fidelity designs or skeletons of a screen/page. Wireframes establish the basic visual structure design layout before exploring the finer detail of the design (Babich, 2020). My wireframes started off as grey and black shapes to block where text and images would go and were further developed into prototypes that I could test with users. Concept development continued throughout the research even after I had finished testing with users, as I had received further feedback from peers on sections I could change to improve the usability of the prototype.

Another form of concept development I used was thumbnail sketching. It is a form of idea generation that involves traditional tools such as pen and paper, and can be rough sketches (Hoffman, 2019). This method allows designers to quickly produce ideas, materialize them and make continuous improvements (Thumbnail Sketching, n.d.). These sketches can then be used as a reference in the design process to eventually get to the final design (Appiah & Boamah, 2021). In my research, I used thumbnails as a quick way to layout the patient journey of my first prototype. It would also serve as a base for a video prototype, as it resembled a storyboard.

PROTOTYPING

Prototypes are physical forms of ideas – they do not have to be complete products but are rather models to test assumptions and are iterative in nature (Dam and Siang, 2018). Prototyping can be done in two ways: low fidelity and high fidelity (What is Prototyping?, n.d). For my research, my initial prototypes for the telehealth booth instructions were created for the purpose of getting feedback to improve and to iterate. I created these at a high-fidelity as they are more realistic and easier for non-designers to give feedback on (Costa, 2020; Roth et al., 2016) so I could be as accurate as possible when creating the scenario for my walkthroughs. Creating my prototypes at a high fidelity level, and also receive design and content feedback from participants. The iterative nature of prototyping allowed me to refine my ideas after receiving feedback from the walkthroughs. I was able to implement the changes suggested and created a new iteration of my prototype.

DOCUMENTATION OF RESEARCH

UNDERSTANDING TELEHEALTH TO UNDERSTAND THE TELEHEALTH BOOTH

To understand what is needed for users of a telehealth booth, I had to first understand how telehealth worked. The telehealth booth is a new concept in New Zealand, and while there is research on variations of the booths internationally, limited studies show the contribution of design in the creation of this new service. Multiple studies have focused on telehealth and its use during the coronavirus (COVID) pandemic such as investigating the benefits of telehealth in reducing transmission of the disease (Monaghesh & Hajizadeh, 2020), however, telehealth existed long before the pandemic began. First understanding the process and attitudes toward telehealth, then enabled me to discover what I could do as a communication designer to improve the user experience of the telehealth booth.

Figure 11. Caballero, (2021).
Notes and sketches around telehealth.

PATIENT FACING MATERIALS

The analysis of these materials helped to build a better understanding of what information patients receive prior to their appointment, including the key information that patients needed to attend their appointment, i.e. appointment time, date, clinician name, as well as a direct Zoom link to the appointment. It also uncovered the opportunities to improve patient-facing materials through design. This subsequently informed the telehealth instructions prototype, and served as a template for which key information needed to be included from a logistical and technical perspective. Adjustments have been made to the email invitation for the appointment so that patients no longer need to log into Zoom, and instead can use the meeting ID provided. Patients are required to join meeting, type in the meeting ID and should be taken to their appointment.

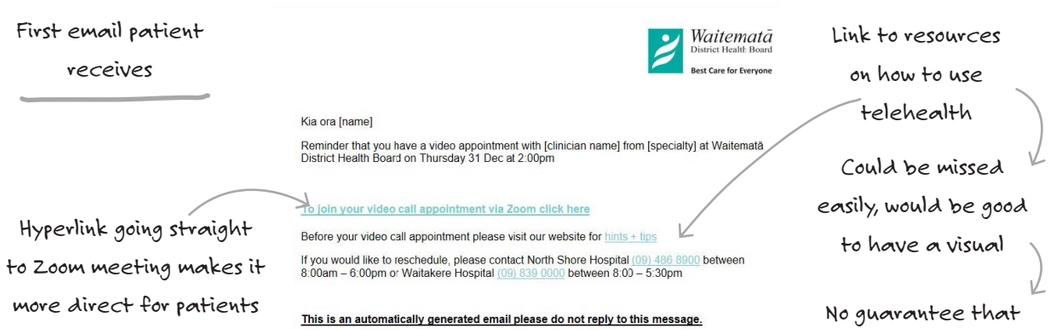


Figure 12. Waitematā DHB, (2021).

Initial email patient receives as part of the video booking.

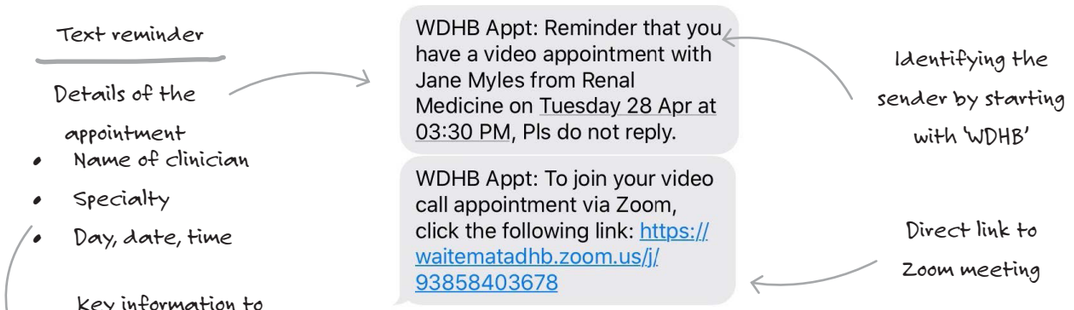


Figure 13. Waitematā DHB ,(2021).

Text patient receives as part of the video booking.

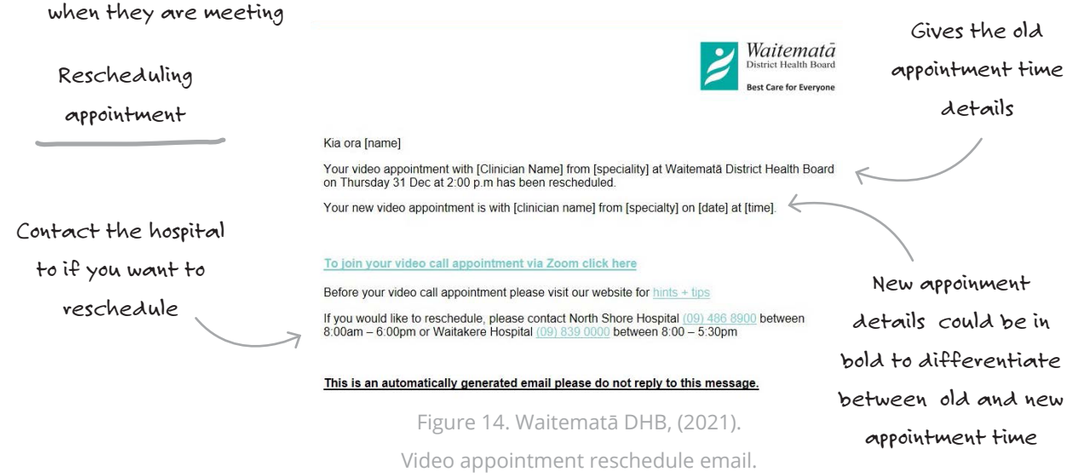


Figure 14. Waitematā DHB, (2021).

Video appointment reschedule email.

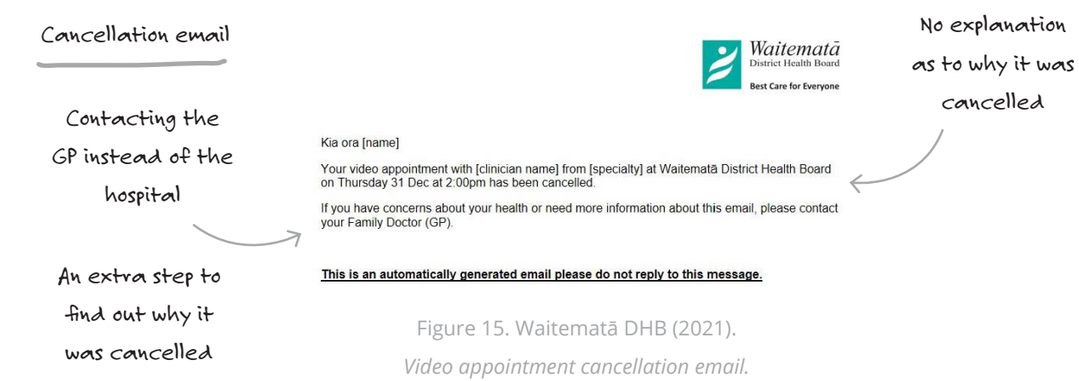


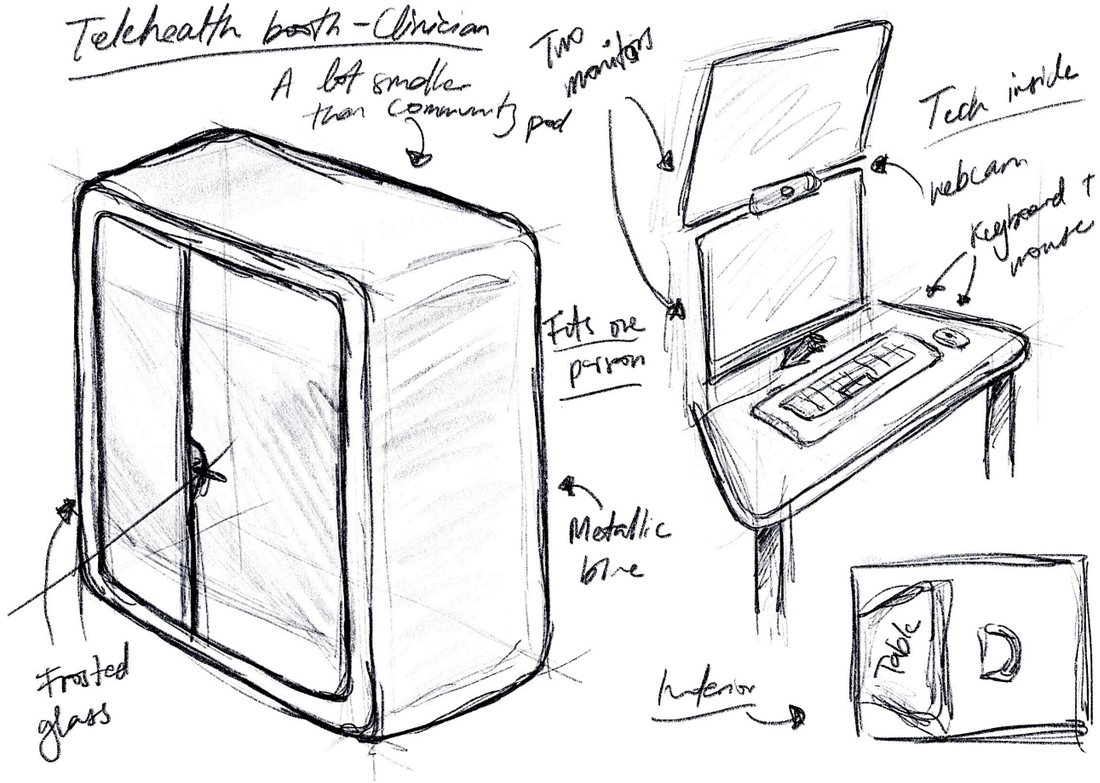
Figure 15. Waitematā DHB (2021).

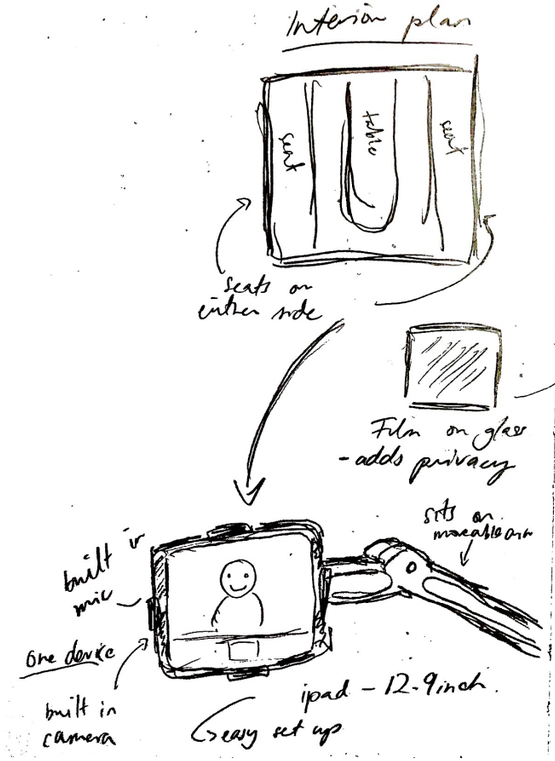
Video appointment cancellation email.

VISITING THE EXISTING TELEHEALTH BOOTHS

At the beginning of my research (March 2021), I visited the North Shore Hospital to gain an overview of what telehealth and the telehealth booths were about after having no prior knowledge of either. This was my first contact with the telehealth coordinator (TC), who explained what the booths were and how the DHB intended to use them. This was also the beginning of establishing the relationship between me as the designer and the DHB as the 'client' or 'collaborator'. The TC stated that the DHB was interested in looking at the use of the booths in the community for patients, but this was a first for them. My opportunity was to share what I could offer as a designer, by looking at the UX surrounding the use of the booth and formulating creative solutions to enhance the patient experience for the future implementation of the booths in the community.

One of the booths was being trialled in the Physiotherapy department by clinicians to conduct outpatient appointments (The Clinician Booth). The other larger capacity booth, eventually intended to be used as a community-facing booth, was being used as a meeting room in the i3 office space (The Community Booth). These booths had different manufacturers – the clinician booth only had a single person capacity and had poor build quality and acoustic properties. The community booth was of a better build quality and enhanced acoustic properties, and because of the larger size, the technology set up was improved. See Table 1 for the observations of physical characteristics of the two booths.





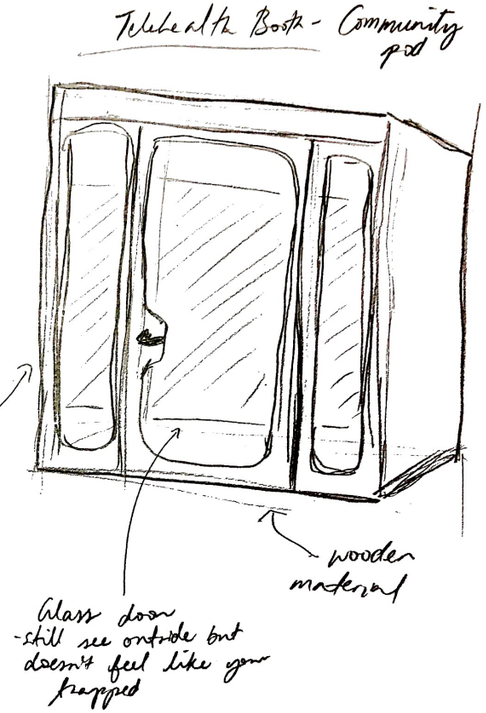


Figure 16. Caballero, (2022). *Reflection sketches from visiting the booth.*

	CLINICIAN BOOTH	COMMUNITY BOOTH
MANUFACTURER/MODEL	‘Model M’ Silence Booth by Soundbox	Busypod Large
IMAGE		
MAX. SEATING CAPACITY	Two	Four
PHYSICAL CHARACTERISTICS	Dark blue made with a more metallic material, looked thin and did not look soundproof. Had a frosted film installed for privacy. Table and chair retrospectively fitted.	Exterior was orange with a pine border with the interior lined with felt and cloth seating. Table built into the pod, and seats were fitted.
TECHNOLOGY	Two monitors, one computer, keyboard + mouse, and webcam	12-inch iPad Pro mounted on a swiveling arm

Table 1. Caballero, (2022). *Unpacking the physical characteristics of the two booths.*

COMMUNITY BOOTH

Needed a bigger booth to accomodate for whānau or support people

Pine exterior

Orange matches Waitematā DHB corporate colours

Thickness of exterior makes booth more soundproof/sturdy

Warm, inviting colours, furniture and lighting

Entrance + interior of booth not wheelchair accessible

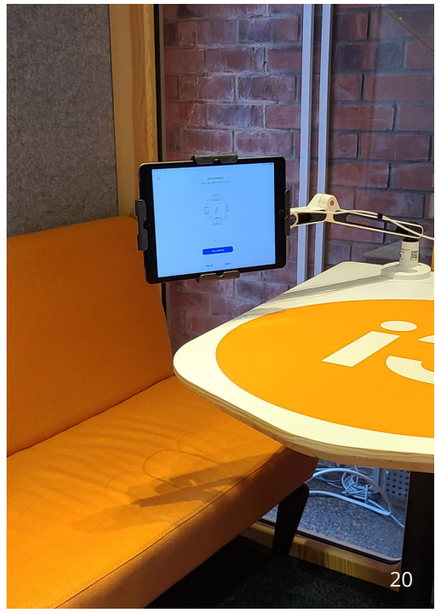
Figure 17. Waitematā DHB, (2021). *Community booth.*

Figure 18. Waitematā DHB, (2021). *Booth in an office environment.*

Figure 19. Waitematā DHB, (2021). *Booth being used as a meeting space.*

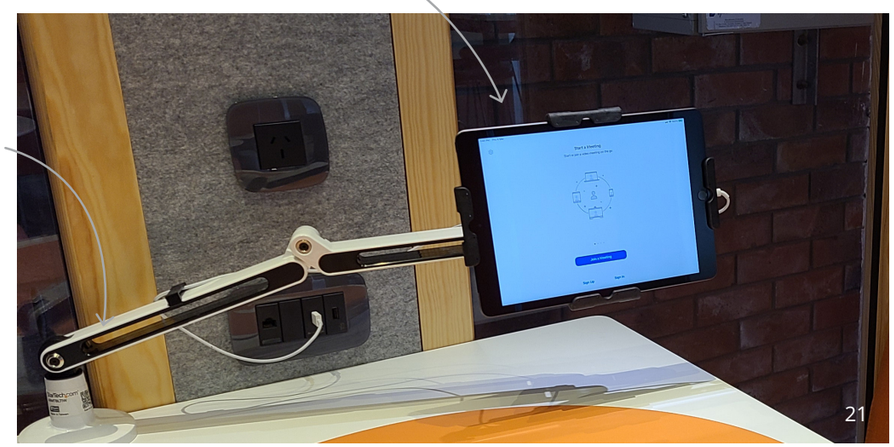
INTERIOR OF COMMUNITY BOOTH

Cloth seats - how would this be cleaned in between patients?



12.9' iPad Pro with a built in mic and camera
All relevant software already installed

Arm attached to table that can swivel to suit users preference



Interior lighting - multiple small lights

Could use additional lighting

Felt ceiling + walls

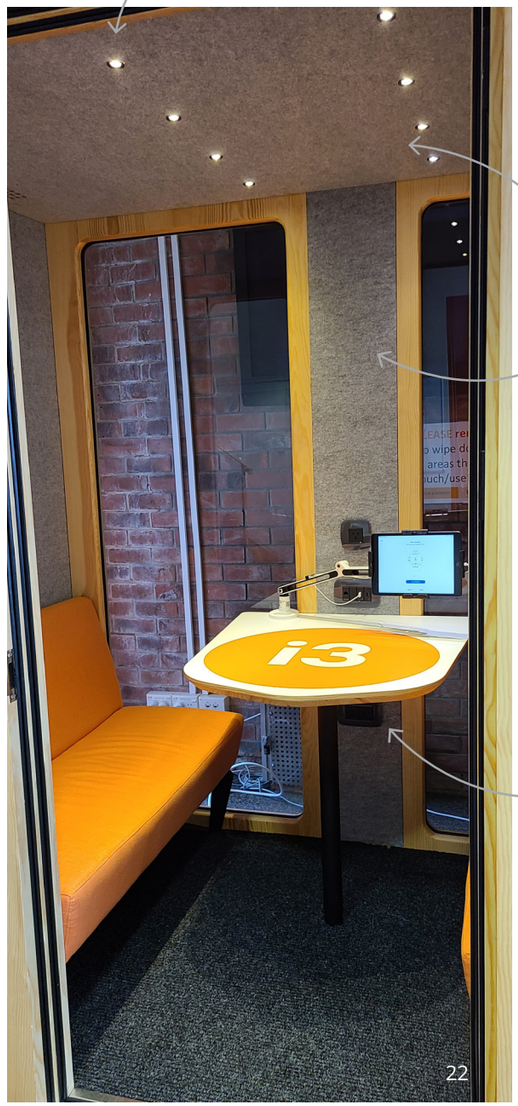


Table takes up more space than it looks
Might want to think about using a smaller table

Figure 20, 21 & 22. Waitematā DHB, (2021). *Community booth interior.*

CLINICIAN BOOTH

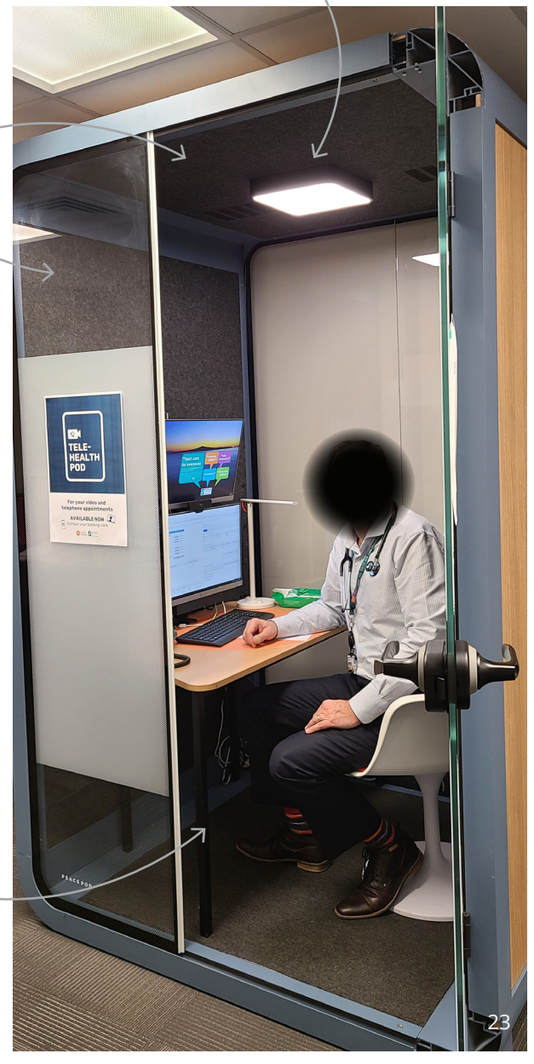
Interior light - single large light

Felt ceiling + walls

Functionally, booth works well

Can fit two people max., but realistically can fit one person comfortably

Clinician using booth



23

Exterior - dark blue, metallic

Feels cold, less inviting

Metal looks thinner, therefore less secure. May make users think privacy/confidentiality is compromised

Frosted film added for privacy

Originally did not come with film and was just clear glass

24

Figure 23. Waitematā DHB, (2021). *Clinician using the booth.*

Figure 24. Waitematā DHB, (2021). *Exterior of the booth.*

OTHER BOOTHS UX:
MY OWN WALKTHROUGH

Since I only had experience with telehealth booths from my first visit, I wanted to look at existing booths in various contexts and how they are being used. This led me to 'Coin Karaoke Booths', which are karaoke rooms condensed to a booth format so that users have more control of their time and money. Although the karaoke and telehealth booths had completely different purposes, their biggest similarities were that they were both a self-service booth that required the user to operate technology on their own.

The main purpose of my visit was to experience using the booth as a first-time user. I considered this to be conducting my own walkthrough to experience first-hand how users interact with the booth and how they learn how to use the technology included. I took notes, photos, and videos as I went along to record my progress.

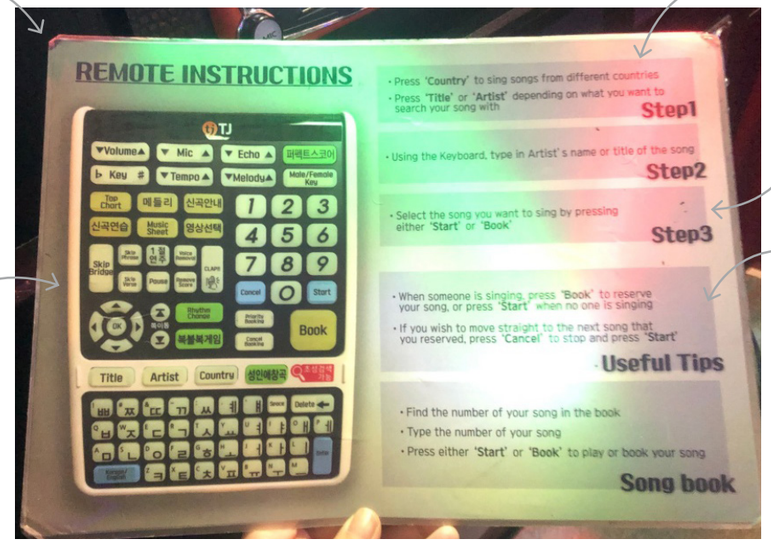


Figure 25. Caballero, (2021).
English instructions on how to use the karaoke booth technology.

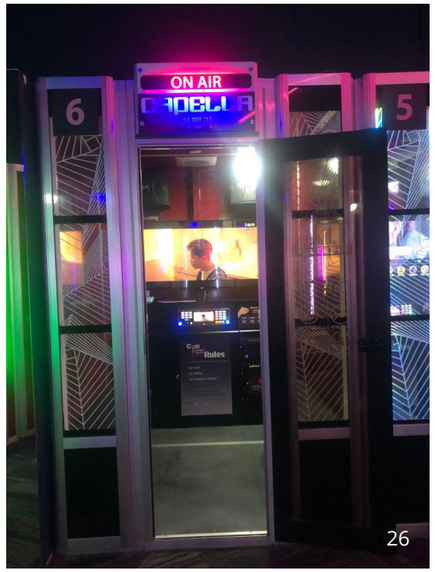


Figure 26 & 27. Caballero, (2021). Exterior of the karaoke booth.

WHAT WAS INSIDE:

As someone who has had previous experience with typical karaoke rooms, I was interested to see how this would translate to a smaller space. I noticed that not all booths were identical – there were different interior layouts and could seat varied amounts of people. Although the employee offered to instruct me on how to use the booth, there were written instructions on how to use the karaoke technology, with imagery and step-by-step instructions. The instructions were available both in English and Korean since the technology was Korean.

PHYSICAL ASPECTS:

The karaoke booths were of a similar size to the telehealth booth; however, the karaoke booths were made of much thinner material and included a large amount of glass that had a simple pattern which I assumed was for a bit of privacy. Each booth was coloured and brightly lit up. This affected the privacy of the user as people outside the booth could hear and see what was going on inside, although it did allow people to know that the booth was in use.

Figure 28. Caballero, (2021). *Storyboard of the karaoke booth experience.*

CREATING A JOURNEY MAP AND STORYBOARD:

Following my visit to the booths, I took the time to lay out my experience as a first-time user and created a journey map that recalls the steps I took to get to the end of the walkthrough. From this journey map, I created a visual that reflected how I was feeling during each step of the process (see figure 28).

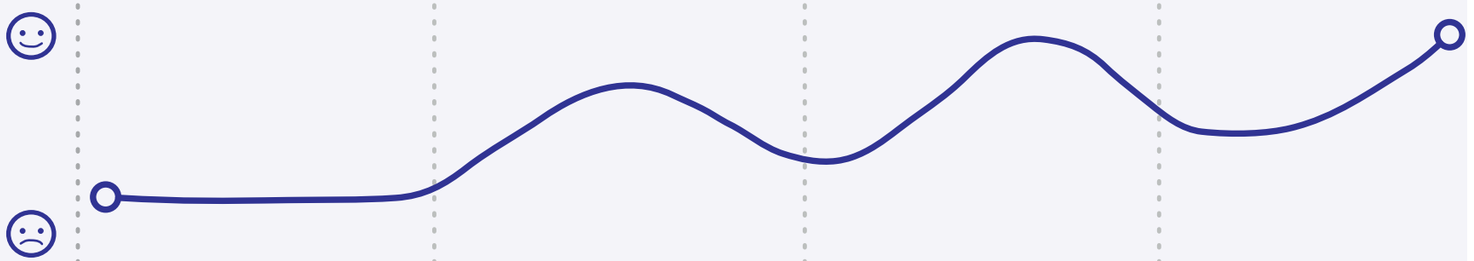
STAGES	PLANNING	PRE-EVENTS	DURING EVENT	POST-EVENT
USER JOURNEY	• Wanting to go to the booth for the first time	• Enter store • Greeted by employee • Payment needs to be done upfront • Employee leads user to the booth	• Demonstrating how to use the technology • Start looking for songs • Sing songs	• Leave booth as it was found
THINKING	• I wonder what this will be like?	• Wow it's really bright • Not a lot of people today • I guess we pay before hand? • We had to move booths since the first one wasn't clean	• If it wasn't busy would the employee still help me? • Seems easy enough to use • Fun! • Can they hear me from outside?	• That was pretty easy to use • Would probably come back again
FEELING				

Figure 29. Caballero, (2021). *Journey map of the karaoke booth experience.*

SPECULATING THE FUTURE OF TELEHEALTH BOOTHS

There were some aspects from the karaoke booth that could be transferrable to the telehealth booth such as the “On-air” sign. Having an indication that lets users know that the booth is in use is an essential feature to include in telehealth booths so that other patients do not walk in while someone is in the middle of an appointment. Similarly, to the karaoke booth store, the future of telehealth booths could be multiple booths in one community area that are numbered so that users know which booth to use. Another aspect to consider is having the support material available in different languages to allow access to different communities, since patients can come from various physical abilities and cultural backgrounds. As for physical details, community telehealth booths could vary in size and layout to accommodate different amounts of people and different accessibility needs.

REFLECTION

Using the karaoke booth was relatively easy with the assistance of the employee and written instructions and was overall a helpful way to consider how users might react when using a telehealth booth for the first time. In terms of privacy, the thin, metallic material of the karaoke booth already indicated that privacy would be an issue, and it was. Anyone outside the karaoke booth was able to hear whatever was going on inside, especially since karaoke is typically a loud activity. For telehealth booths, security is an important issue as patients will be dealing with personal medical information. The material and structure of telehealth booths should be a reassuring factor that the booth is a secure place. Since I visited the booth in an off-peak time, it made me contemplate whether I would still get one-on-one help from the employee compared to if the store was busy. Ideally, in a working scenario of the telehealth booth, there would be someone to assist the user if they are confused with the technology, however, this may prove to be a problem depending on where the booth will be located – it may put unnecessary pressure on the staff of the booth location as the booth is supposed to be autonomous. This would mean a full-time employee would have to support the space, but however, if there were multiple booths next to each other in the way the karaoke booths were set out, having one employee would have more value compared to one employee to one booth.

EXPERT INTERVIEWS

Eight expert interviews were conducted with the following experts to gain a comprehensive understanding about telehealth and the telehealth booth:

- Telehealth Coordinator
- Six Clinicians with previous experience of using telehealth
- Disability Advisor

See Appendix B, C, and D for the clinician, Telehealth Coordinator and disability advisor, interview questions, respectively.

The following section reports on the findings of the interviews.

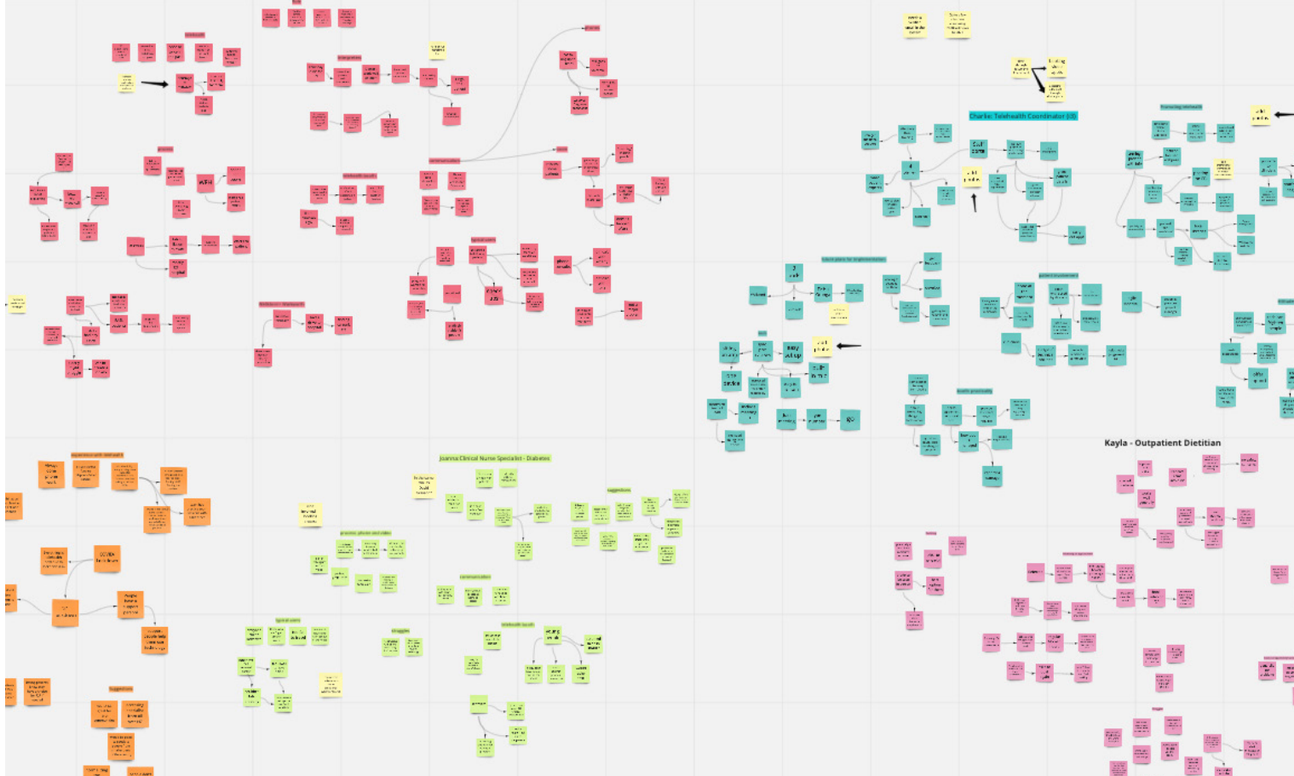


Figure 30. Caballero, (2021). *Sample of expert interview analysis.*

ANALYZING THE INTERVIEW DATA

I transcribed each interview and took the key information and placed each new idea on post-it notes in Miro. Typically, I would do this process in-person with paper as the tangible aspect of moving the post-its around helps me think. As New Zealand was in a lockdown at the time and I had no access to materials, I found that Miro was the best alternative tool to use. I chose this method as it is easier to look at and organize my thoughts. The digital platform allowed me to easily move items around, while also adding links and images to support my thinking.

In figure 30, each colour represents a different interviewee, which helped distinguish the different themes and compare answers between the participants.

INTERVIEW FINDINGS

TELEHEALTH COORDINATOR

The Telehealth Coordinator oversees the technical and logistical aspects of telehealth and the telehealth booth within Waitematā DHB. He identified several issues related to implementation, support and promotion of telehealth booths.

PLANS OF IMPLEMENTATION

At the time of this interview, there were plans to implement telehealth booths at three different sites: Wellsford, Helensville, and Te Ha Oranga (Māori/Pasifika community), all located in rural North Auckland in the most remote areas of the DHB's domain that may have been underserved in the past. The plan was to get the booths out in the community so that the DHB could get feedback from patients and develop the booth further. COVID lockdowns halted these plans as there were delays in delivering the booth (from overseas) and because contractors could not access the site to set up the booths. In the meantime, the focus remained on getting the technology ready.

ATTITUDES TOWARD TELEHEALTH AND PATIENT INVOLVEMENT

The coordinator reflected on how, while the integration of technology in everyday life has been normalized, there is still some anxiety around the use of technology for older generations. The TC believed technology can be frightening to some, but this can be eased by giving patients reassurance and offering support by getting them to think about telehealth in the same way as they would about video calls to family via Skype or Facetime.

SUPPORT FOR CLINICIANS

The coordinator reflected on how, while the integration of technology in everyday life has been normalized, there is still some anxiety around the use of technology for older generations. The TC believed technology can be frightening to some, but this can be eased by giving patients reassurance and offering support by getting them to think about telehealth in the same way as they would about video calls to family via Skype or Facetime.

PROMOTIONS OF TELEHEALTH

While telehealth was predominantly used during the lockdowns in New Zealand, Waitematā DHB has been wanting to develop a patient-centred process, where the patient requests a telehealth appointment from their clinician, rather than relying on the DHB or clinician to offer telehealth as an option. For this to happen, it is essential to empower patients through providing them with easily accessible and relevant information regarding their appointment (e.g., available on a patient-focused webpage).
The DHB currently uses two approaches to promote telehealth:
1) through social media (e.g., Waitematā DHB Facebook), and
2) through community-based promotion (such as a 'road show' across local libraries – which was put on hold due to Covid). The former approach is more commonly used. The idea is to try and reach out to a wide range of demographics and settings.

CLINICIANS

Six clinicians who had experience with telehealth appointments were interviewed from a local DHB. They came from various disciplines (e.g., physiotherapy, nutrition, diabetes management, etc.), and therefore, each clinician had different requirements for interacting with their patients. For example, one clinician shared that they required their patient to weigh themselves during the telehealth appointment, however, this presented challenges in some cases where patients did not have their own scale. Clinicians were asked about their experiences with telehealth or the telehealth booth to gain an understanding of how the service works and gain insights from a clinical perspective. Participants were also asked about their opinion on patient barriers, challenges, and opportunities in using telehealth and telehealth booths. They were also invited to share any other suggestions or comments they had about their experiences.

BACKGROUND

Most clinicians commented on the introduction of Zoom and telehealth from the very first New Zealand COVID-19 lockdown in March 2020. During the time of the interviews, New Zealand was in its third lockdown, meaning that clinicians were required to conduct their appointments via Telehealth. Compared to the first New Zealand lockdown (March 2020), most patients were familiar with Zoom as it had become a part of everyday life – whether it was used for work or school. Since then, New Zealand had gone through multiple lockdowns that required most of the country to work or learn from home. This meant that patients were more likely to know how to use the software, taking away the ambiguity of learning how to use new software and lessening the need for technical support.

Not every clinician was involved in the booking process. Most clinicians had booking clerks who handled the administrative side of the Telehealth appointment, so some clinicians could not comment on whether this process was difficult or not. For those who were a part of the booking process, clinicians would call to screen the patient by reviewing the patient's notes and would decide whether their appointment is fit for telehealth. This decision was based on a combination of what was clinically the best option and what the patient wants. If the patient wanted a video appointment but needed to be seen in person, this would be discussed. One clinician noted that in their profession there was not a need for physical, hand-on examinations, which was often the cause of safety concerns from a clinical perspective, therefore telehealth was a good option for their patients. I found there were three common themes across the clinicians' answers: Having support, technology struggles, and clarity with appointments/ communication.

THEMES FROM CLINICIAN INTERVIEWS

HAVING SUPPORT

Most patients had a family member or support person at home (particularly during the time of the COVID lockdowns) who was more familiar with technology and could help them troubleshoot any technical issues with Zoom. Some clinicians found that if the patient couldn't figure it out on their own, a separate phone call had to be made to help fix the video appointment. This extra time spent setting up the call meant cutting into the appointment time, causing further delays and less time for actual care/treatment.

TECHNOLOGY STRUGGLES

Since most patients had a support person at home or were already familiar with Zoom, there were not a lot of technology struggles. In the cases where technology was an issue, the microphone was usually turned off when patients joined the video call, and they did not know that they were muted. Generally, this would be solved by talking through the issue, taking it step by step. If there were issues with coming into the call, clinicians had to troubleshoot themselves, even if this meant being on a separate phone call to prepare for the video appointment.

CLARITY WITH APPOINTMENT TIMES/COMMUNICATION

Generally, there were no problems with the clarity of appointment times. Video appointments were considered to have an advantage over the old booking system that did not send a reminder for face-to-face appointments, with Zoom having an automated feature that gives a reminder and time. If the patient cannot make that day or time, they must contact the booking clerk/clinician to change. A concern was expressed around the limitations of booking through Microsoft Outlook – once you accept the invite, it disappears from the inbox.

EXTRA SUPPORT – INTERPRETERS

For patients that required an interpreter in the call, there were logistical issues as the clinician, patient, and interpreter did not arrive at the same time therefore the interpreter had to move on to the next meeting before the appointment was over. This meant that the appointment would be cut short, and therefore information would be left out. This theme made me think of other accessibility issues, which prompted further investigation by interviewing the Disability Advisor.

OTHER FINDINGS

Some clinicians had suggestions for telehealth appointments from home. A QR code could be used on the letter or email that patients receive which notified them of their appointment. This could offer a direct way to the Zoom call and might make it easier for young people. Another clinician suggested that a co-design approach where designers collaborate with users of the booth would be ideal to identify the community we are designing for before designing something that may not even be used.

DISABILITY ADVISOR

When working through the clinician interviews, some clinicians brought up issues with interpreters, and that brought up the accessibility aspect of designing a new service for patients. This prompted a lot of questions about inclusive design and making sure that the service is accessible to patients from different backgrounds. To gain a better perspective on this, I interviewed the Disability Advisor for Waitematā DHB to understand what I should consider when designing for patients with accessibility needs. I asked questions about physical accessibility, health literacy, and what to consider when designing a new service.

From my observation, the concept of telehealth challenges ideas of health inequity by supposedly offering access to those who may find it difficult to attend an appointment in person. However, the service is also based on the assumption that patients have the knowledge, technology, and internet required to receive a telehealth appointment, which means that in a sense, telehealth is still not completely equitable – including the extra layer of accessibility - those with different impairments and difficulties.

The main themes from this interview were equipping patients with information and how this information would be presented in an accessible way.

EQUIPPING PATIENTS WITH INFORMATION

For those who need assistance with this, information needs to be accessible (for example, having telehealth-specific resources sent with appointment information, or making information easy to find on a website). The health system can be intimidating and emotionally draining as it is, so providing the right support is a key factor for patients when moving their care into an online setting.

Some of the key concerns covered were information on telehealth, catering to different groups, and having support if needed. A large part of this is making sure people know what telehealth is. As it is a relatively new service, how do patients get access to information about telehealth and how easy is it - starting with what to expect from the appointment and looking at what is currently available on the Waitematā DHB website. Support should be provided before and during the telehealth appointment to manage expectations, whether it be an email to contact or a number that people can text.

PRESENTING INFORMATION

When presenting content, health literacy is a key component to consider so as to make sure patients can follow the information easily. This can be achieved through using plain English, in addition to clear pictorial instructions. It was suggested that receiving information from a video was preferable over written instructions, since this can easily cater to the Deaf community through visuals/ subtitles, and the Blind community through audio. It would also be easier to translate in other languages through subtitles.

INTERVIEW REFLECTIONS

After analysing the main themes from expert interviews, I was able to identify some issues that could be addressed using communication design – namely reducing the need to solve technical problems, therefore allowing more appointment time and improving the overall quality of healthcare delivery. Older persons, however, may have some anxieties around using telehealth as some perceive it as an inadequate substitute for in-person care (Gavin, 2020). This changed the way I looked at the booth. Since telehealth is a service done remotely, patients with access issues need as much assistance to be empowered to attend their appointment independently or without assistance. Another visit to the booth would be beneficial to be more mindful of the technology and user experience of the booth. A large part of this solution is not just providing enough information, but also clearly communicating what needs to be done. Communication design can help solve this issue through the creation of a resource that contains all the details required for common technology issues and clarification of appointment times.

'Equipping patients with information' and then 'presenting information effectively' were two themes from these interviews that presented a good design opportunity. Using the knowledge I gained from interviews and contextual research, how could I use this to decide the content and the medium (e.g. video vs. written) the information would be presented in? If a video resource was not attainable due to financial and logistical constraints, a written, pictorial version of the instructions would be the next best thing.

The main opportunities for design were:

- Creating a resource that clearly communicates how to use the telehealth booth service
- Giving patients the right amount of information – making sure they are not overwhelmed with text but also not providing too little information that they would not understand how to use the service.

FURTHER EXPLORATIONS: TELEHEALTH RESOURCES

PROMOTING TELEHEALTH VIA SOCIAL MEDIA

Following the interview with the TC, I investigated what resources were already available to the New Zealand public.

There were limited promotional materials for telehealth on social media and the Waitematā DHB's website. For example, on the Waitematā DHB's Facebook page there were advertisements on the benefits of telehealth using stock images and quoting previous telehealth patients. While these adverts promote the benefits of telehealth, there was no information on what telehealth is or what a telehealth appointment would entail. I feel that including this information would be vital when promoting telehealth as a new service so that potential users can feel well equipped to give the service a try.

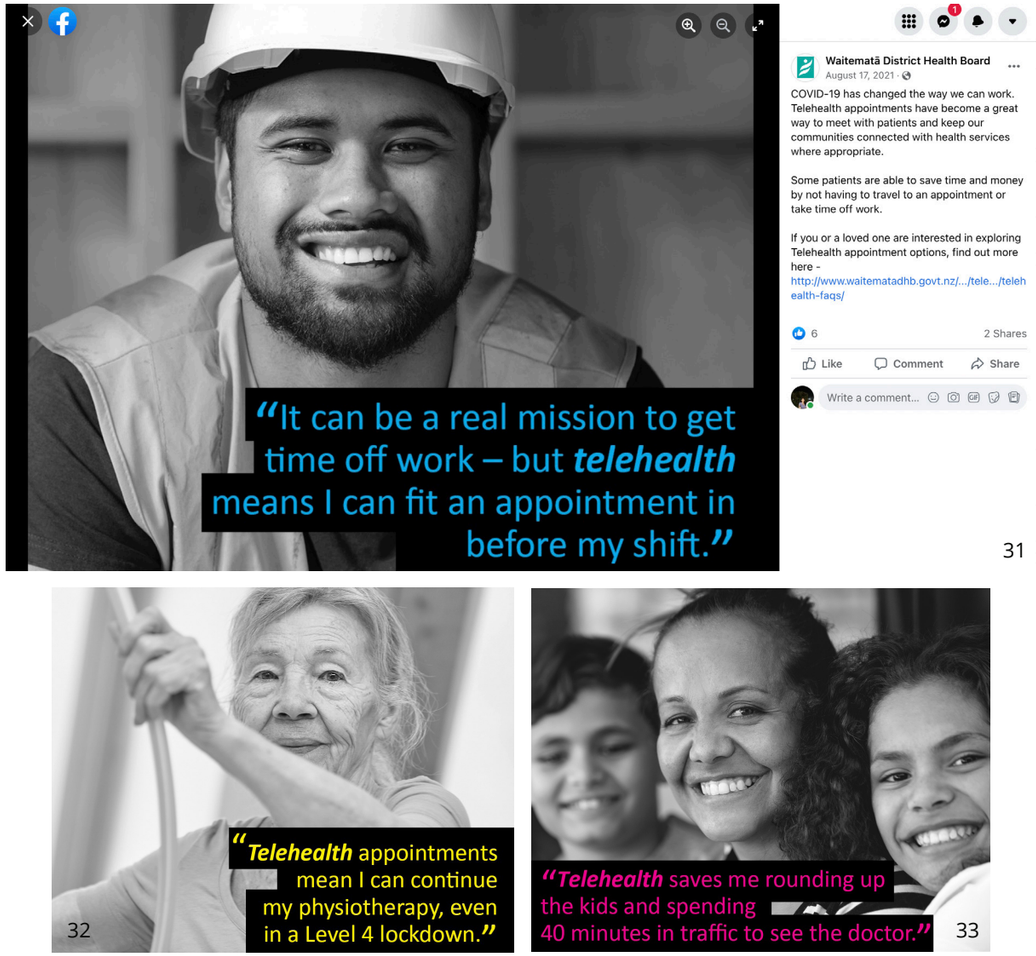


Figure 31, 32 & 33. Waitematā DHB, (2021).
Telehealth adverts taken from Waitematā. DHB's Facebook page.

ACCESSING INFORMATION ABOUT TELEHEALTH

On the Waitematā DHB website, there was no direct link to telehealth information from the home page, even during the time of the New Zealand lockdown when telehealth appointments were supposedly prominent. I had to use the search bar on the website and separately search up “telehealth” to receive results on FAQs on the service. The FAQ page contained questions about technology and using telehealth, however the information was text-heavy. This could have been presented better and made more appealing with design so that users might find it more comfortable to use and not feel overwhelmed.

Figure 34. Waitematā DHB, (2021). *Waitematā DHB website landing page.*

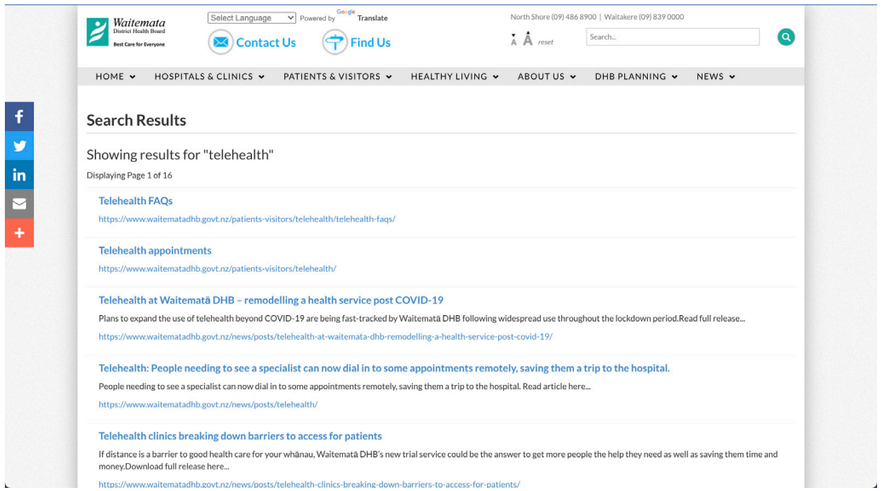


Figure 35. Waitematā DHB, (2021). *Results page after searching “telehealth”.*

The second search result led to information and three video resources for patients. These videos gave an overview of what to expect during the appointment and how to prepare for it. There was also a video specifically for those who require interpreters.

While this was helpful, it was hard to find. For someone who may not be familiar with navigating websites, it would be difficult to access help with telehealth when needed. For future situations, especially in pandemic lockdowns when telehealth is the only option for some patients, the information to use the service should be easily accessible and more visible. For example, the information could be made more prominent on the landing page of the Waitematā DHB website or the videos could be posted as promotional material on social media.

Figure 36. Waitematā DHB, (2020).

Screenshots of "What you will need for a telehealth appointment."

PERSONAS

Personas and journey mapping worked hand in hand to make sense of the data I gathered from interviews, observations, personal walkthroughs. I developed two personas based on likely users, each with different technology backgrounds and scenarios. I used one persona to then inform a journey map, where I could step into the user's shoes and try identifying how they would feel throughout the process of using the telehealth booth. This was a good tool to unpack the different feelings a user may have when trying out a booth in the community.

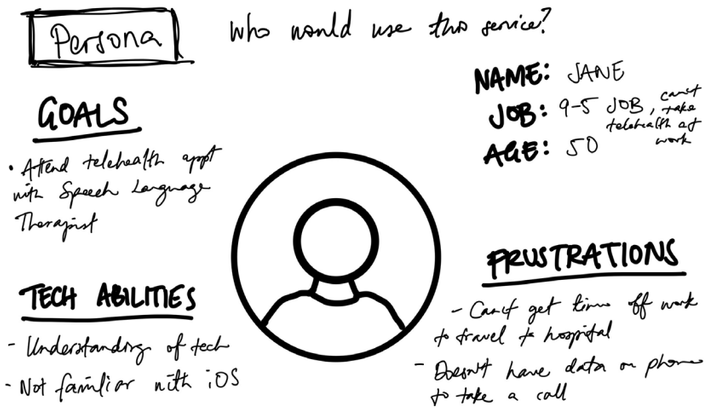


Figure 37. Caballero, (2021).

Personas based on findings from interviews, observations and personal walkthroughs.

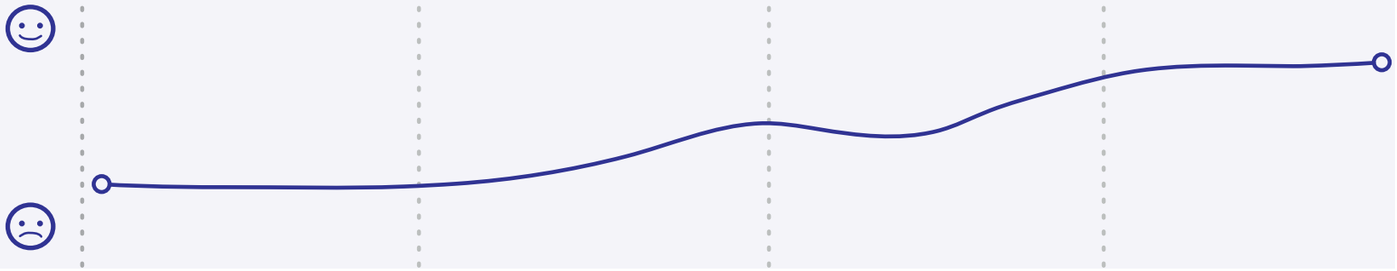
STAGES	PLANNING	PRE-EVENTS	DURING EVENT	POST-EVENT
USER JOURNEY	• Discussing with clinician about a telehealth booth option	• Individual can go to local GP • Travel to destination • Can bring a support person	• Patient arrives at GP • Looks for booth • Put in log-in and meeting details • Enters Zoom meeting and meets clinician	• Offers another telehealth appointment • Has the opportunity to review the service - like or dislike
THINKING	• Never heard of the booth before	• How do I know where to go? • Will there be help?	• Can I just walk up to the booth? • What if there's someone in there? • I wrote down my meeting details	• That wasn't so bad
FEELING				

Figure 38. Caballero, (2022). *Journey map of a telehealth booth appointment based on a persona.*

THE BOOTH AND UX

Another visit to the NSH booths was conducted following the expert interviews. The focus of this visit was on observing the physical and practical aspects of the booth, particularly looking at accessibility and using the technology. A goal for this visit was to be more reflective in my walkthrough as the interview changed the way I wanted to observe and inspect the booth. I wanted to be more observant of the physical space and how to use the technology to identify issues users could potentially have. I was able to spend more time inside the booth, looking for the small nuances that a user might experience.

VOLUME/SOUND:

To investigate the privacy and sound proofing of the booth, I wanted to test out the different volume levels to see if the sound could be heard from outside. The interior already had some background noise from the air ventilation, but it was not loud enough to disrupt a call. I naturally looked for the volume button, however the thickness of the iPad case did not allow me to use the volume buttons – instead, I had to swipe down in the top right-hand corner of the screen to access the control panel (see figure 39) and adjust the volume button from there. Since I am familiar with iPad technology I knew where to find this, however for someone who is not used to iPad or Apple technology it would be difficult to find.

ENVIRONMENT/PHYSICAL SPACE:

The door to the booth was heavy and needed some strength to open, like bathroom doors that need to slide to close. The entrance was slightly raised from ground level, but there was no ramp for wheelchair access. When inside the booth there is limited space for movement because of the built-in table which presents accessibility issues for wheelchair users. The seats were comfortable, however they looked hard to clean which would be concerning for ensuring good hygiene was maintained in between patient appointments. Hand sanitizer was provided which was placed on the table. The table was built into the booth itself and took up a lot of space in the booth, making it hard to move around.

TECHNOLOGY/INTERFACE:

The iPad screen was large (12.9 inch), which is good for readability, however, the writing is still the standard size which could be difficult for vision impaired to read. My instinct was to look for the physical power button to wake the iPad, however there was a sticker on the bottom of the iPad case stating to double-tap the screen and swipe up. I felt anxious when I could not find the passcode as I thought it would open straight away just like in technology stores, but I was able to locate the passcode on a sticker at the top of the iPad case. I found that the swiveling function of the arm that held the iPad was useful as I could adjust it to frame myself in the camera in Zoom. I was able to navigate the technology easily as I had previous experience with iPads, however this could potentially be difficult for a patient who had less familiarity with the technology than I did.

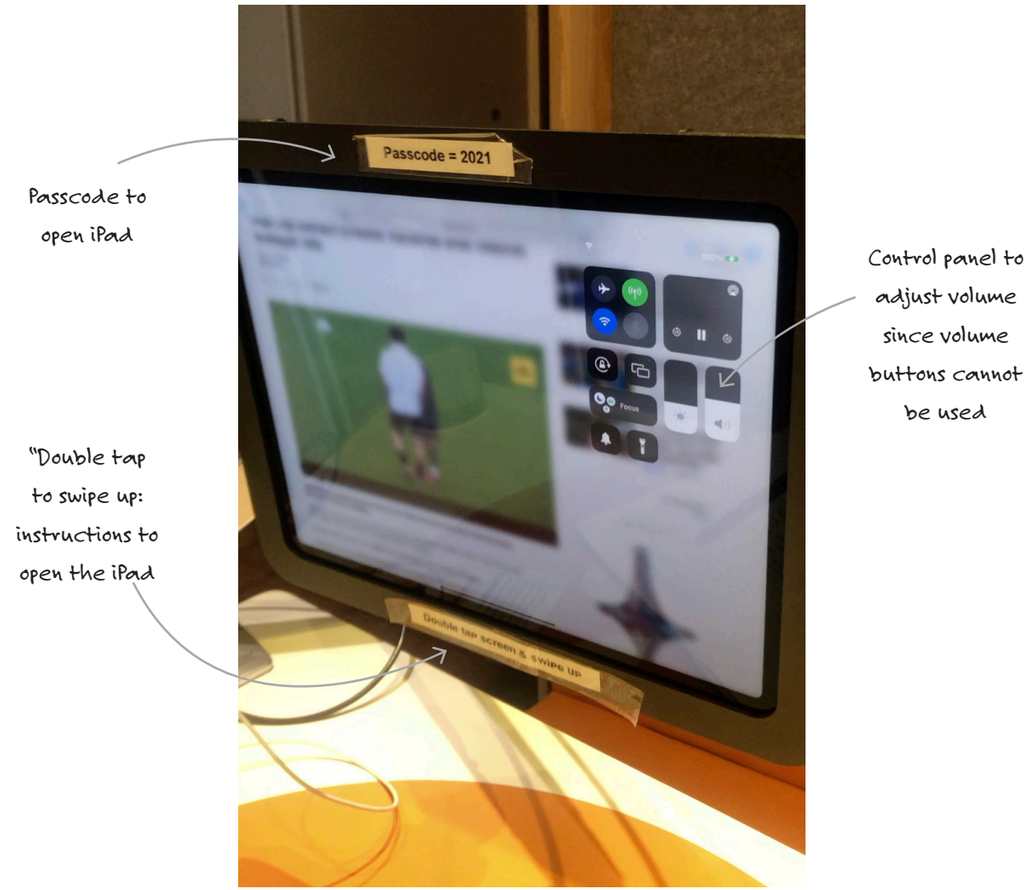


Figure 39. Caballero, (2021). *iPad inside the telehealth booth.*

REFLECTION

Following the interviews and audit, I identified that information was a vital aspect of using the telehealth booth. My findings from the expert interviews indicated that time could be saved from troubleshooting the technical issues in a virtual appointment if the patient knew how to use the technology. Since this issue is present in telehealth appointments taken from home, conducting a telehealth appointment in a different environment with unfamiliar technology would present different issues. The interview findings suggested arming the patient with the correct information would help ease the use of the service. The review of existing promotional materials showed that the information on what telehealth was in the first place was lacking. Making this sort of information available to patients in an easy-to-understand, accessible way would empower them to have the confidence and be motivated to use the technology with minimal assistance. I realized that, as a designer, I had the opportunity to educate patients on what this service would entail, containing all the relevant information related to the purpose of the booth and how to use it, and presenting it in a way that is easy to follow. Consequently, I concluded that I needed to create a comprehensive information resource for patients using the telehealth booth.

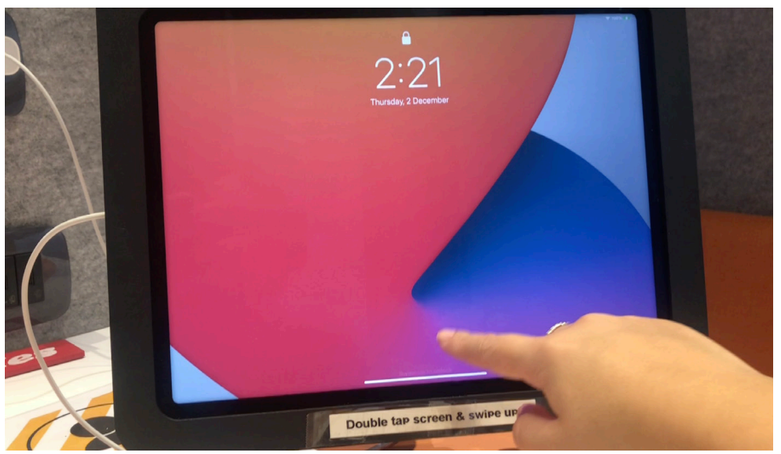


Figure 40. Caballero, (2021). *Swiping up to open iPad.*

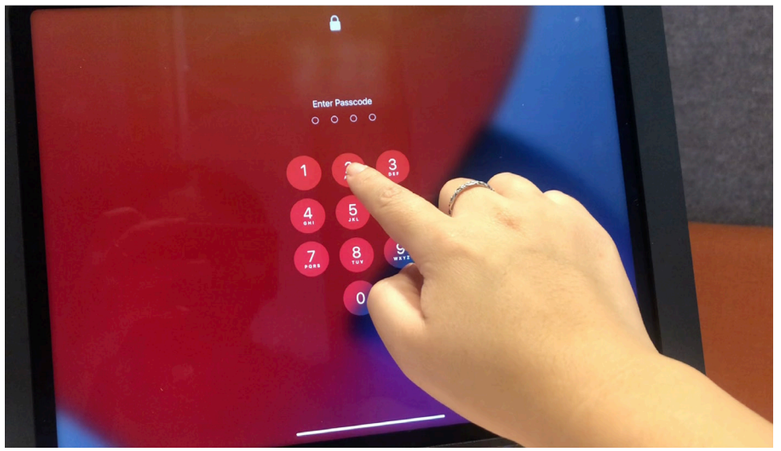


Figure 41. Caballero, (2021). *Putting in the passcode.*

IDEATION & PROTOTYPING

EXISTING MATERIAL - MOOD BOARD

Based on the insights described above, I decided to focus on instructional design to help make the telehealth booth more accessible and easier to use for future users. I started the prototyping process by creating a mood board of existing instructional design to gain inspiration on illustration style, layout, typography, and the management of content. Mood boards were a good tool for generating ideas and gave me a perspective on what works for the healthcare industry and in other contexts. My assumptions for healthcare instructions were that they were typically wordy documents that followed a corporate template. For example, figure 42. is an information pamphlet for patients having a gastroscopy procedure.

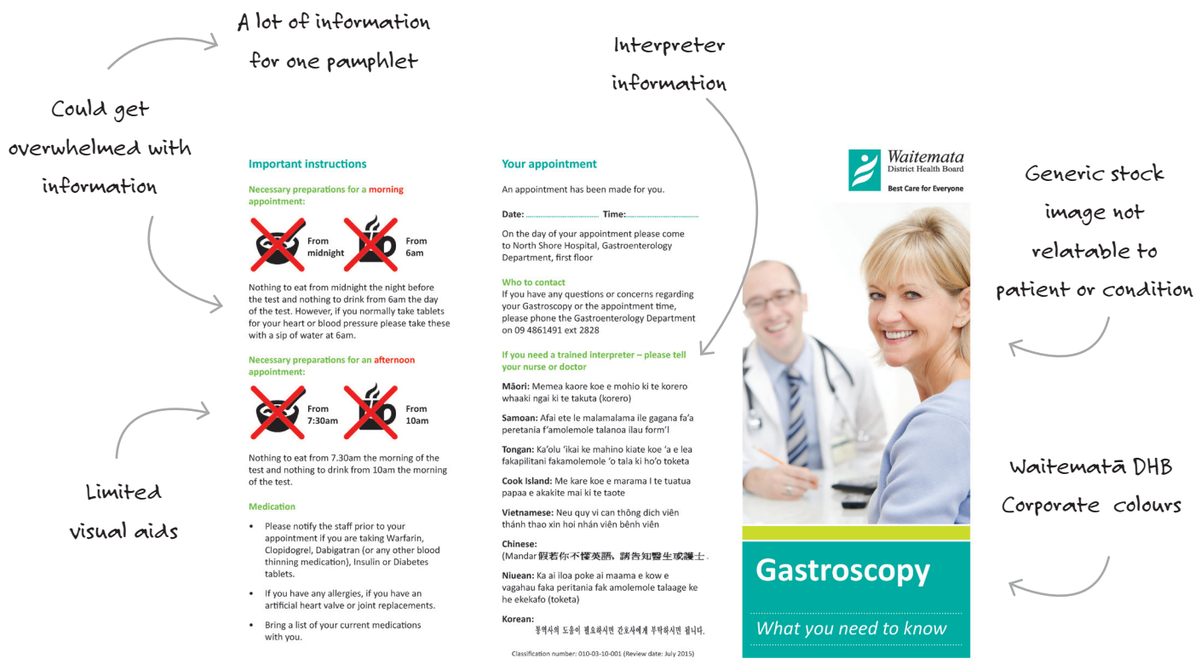
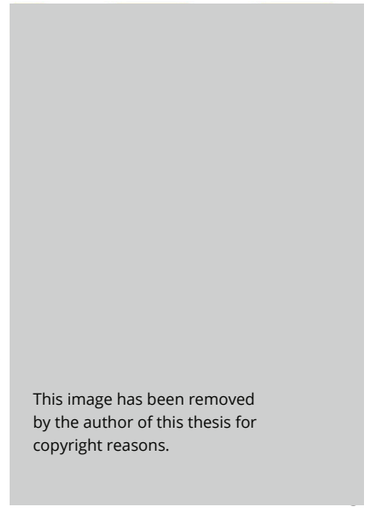
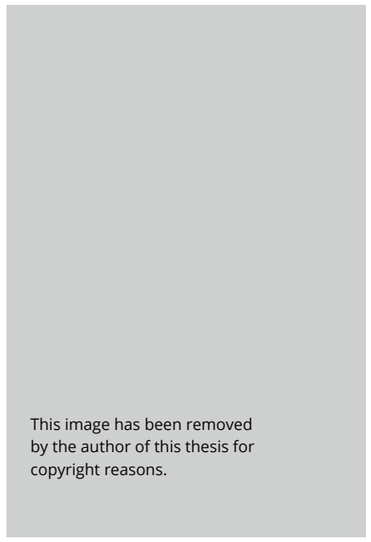


Figure 42. Waitematā DHB, (2015). *Example of wordy healthcare design.*

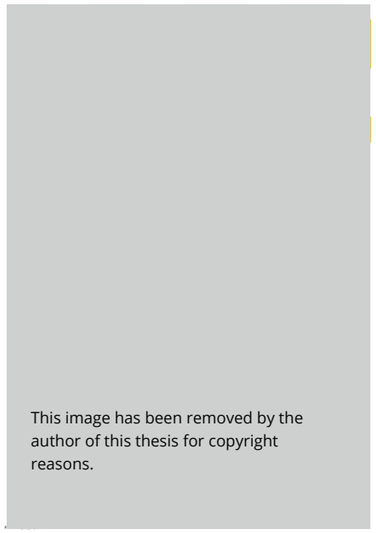
Line illustrations all sectioned off

Numbered sequence, easy to follow

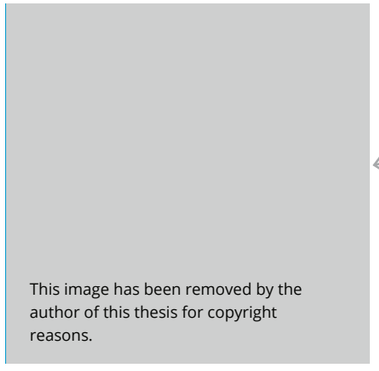




Text to support graphics, giving extra information



Limited colour palette

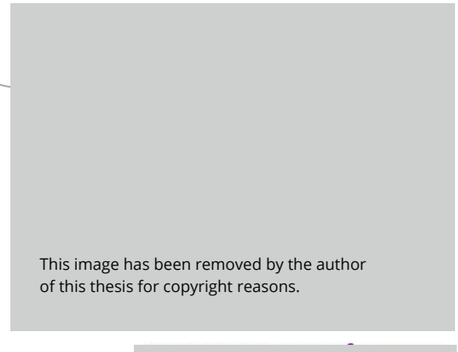


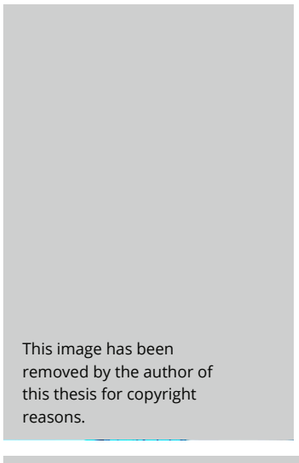
More focused on the text

Figure 43. Unite Against COVID-19. (2021); 44. Unite Against COVID-19. (2021); 45. How to wash your hands. (n.d) 46. World Health Organization. (2021). *Examples of well-designed public health information.*

No supporting text, but shows movement through arrows

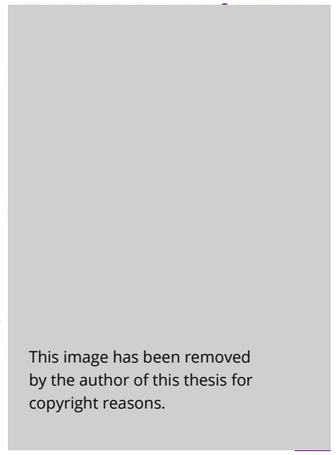
Blue - commonly used in medical illustrations



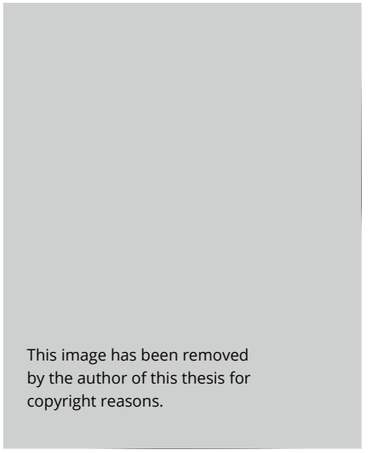


Different format size

Limited colour palette



Sectioned off steps that are numbered



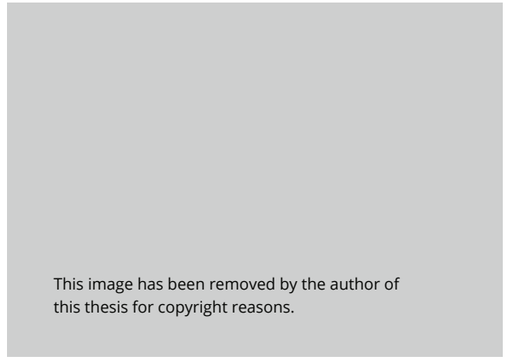
Graphic design based instructions

Figure 47. Ford Illustration. (n.d); 48. Co-motion Studio. (2017); 49. Segglen. (2010); 50. Botong Lab. (n.d). *Good medical design examples.*

Clearly numbered steps

Recipes are typically a sequenced list of instructions

Imagery of ingredients/ instructions adds more depth



Showing movement through arrows

More informal compared to other instructional design

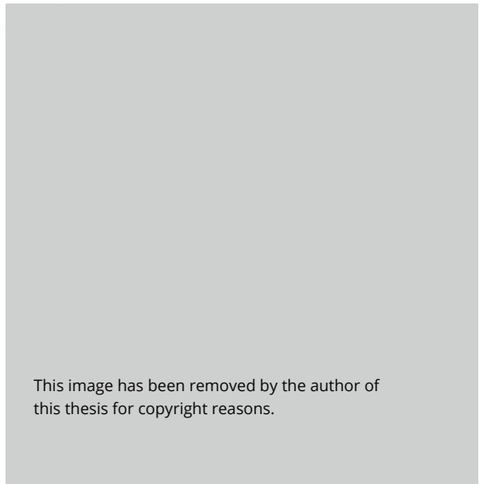
Playful, vibrant

Sectioned off between ingredients

Figure 51. Shakeorange. (2014); 52. Pervomai, (n.d). 53. Pervomai, (n.d). *Pictorial recipe illustrations.*

Using imagery to direct

One of the most iconic instructional designs



Manages to give direction/instruction without using any words

Not the most ideal way to deliver health-related instructions

Black and white - no colour. Good for simplicity

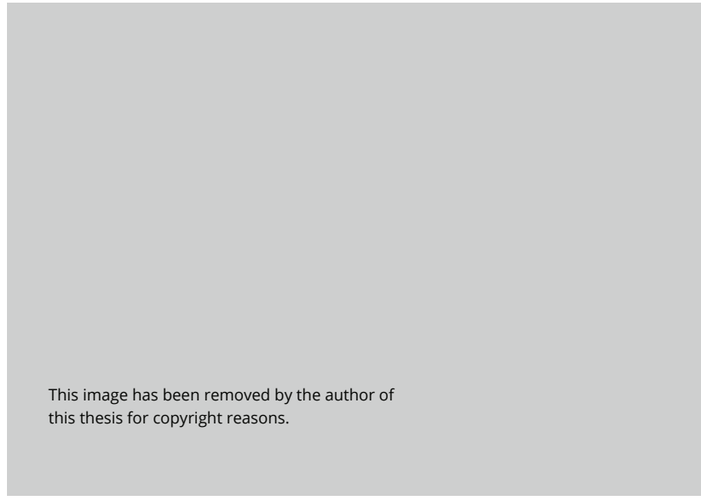


Figure 54. IKEA. (n.d). *IKEA instruction manuals.*

Although there were bad design examples like this (see figure 55), I found that there were also well-designed instructions for health-related procedures (for example, figure 47,48,49 & 50). Good information design requires the ability to arrange elements to allow users to navigate complex information (Black and Walker, 2016). I noticed that these good examples all incorporated simple line illustrations and followed a numbered step-by-step format, where each instruction was contained in a box or grid shape. Most examples I found needed text giving short explanations to support the graphics.

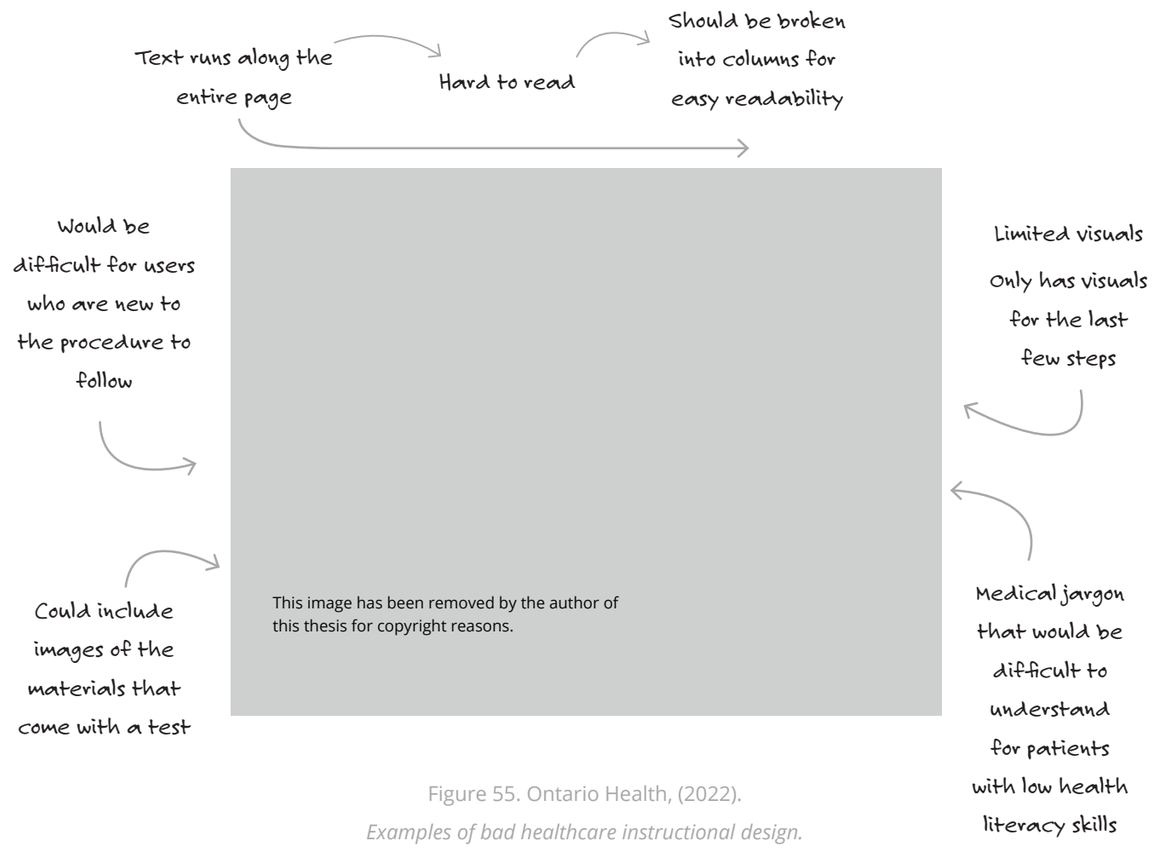


Figure 55. Ontario Health, (2022).
Examples of bad healthcare instructional design.

MOCK-UP DESIGNS

Following on from my investigations of existing instructional materials, I decided to use instructional design principles to create a visual representation of the process that can show all the nuances of using the booth. This was a print version of the prototype, with the aim being to have this material given to the patient before or during their telehealth booth appointment.

Similar to the reviewed examples of instructional design these mock-up designs followed the step-by-step format, where I explored the different ways steps could be presented by playing around with placeholder shapes through wireframes. Wireframes were used to establish the basic visual structure design layout before creating a polished version (Babich, 2020). This gave me the chance to test different layouts and consider spacing and content placement.

Since I did not know how much content I would include at this point I was often held back by the thought of how many 'steps' I could include in the mock-up; however, I did not want this to hinder me in my explorations. I had to consider that both text and imagery would be included in the prototype, and how that would affect the spacing allocation for each step.

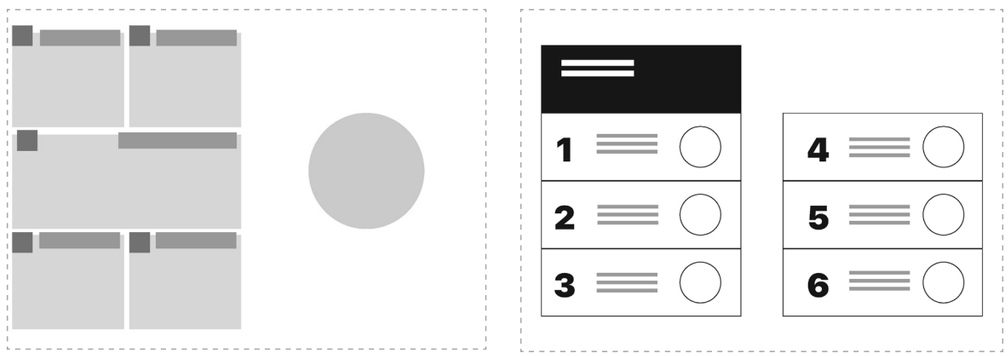


Figure 56. Caballero, (2022) *Wireframes of possible layout design.*

CREATING PROTOTYPE #1

While I was conducting my own research on telehealth booths, i3 was starting to implement a working version of telehealth booths in conjunction with Helensville District Health Trust (HDHT). This was intended to be the first telehealth booth available to the public, and therefore would need its own patient-facing instructional material. I was given an opportunity to help create graphics for telehealth booth instructions. The DHB client requested this be done in a comic format, in a similar style to a clinician-facing resource (screensaver - see figure 57) that had been done previously in i3 to promote the use of telehealth. While this was a task outside of my project, this was an opportunity to work with the telehealth coordinator and show how design could be used to create a resource that would help patients. It later informed my subsequent prototypes and next round of data collection by giving me a better understanding of the logistical process.

I was given a list of steps that patients would have to follow to conduct their telehealth appointment in the booth, and I turned these steps into a flowchart visual to make it easier to follow. The steps in this flowchart became the basis for my illustrations. One of my struggles with this prototype was using the comic-style format that included multiple steps.

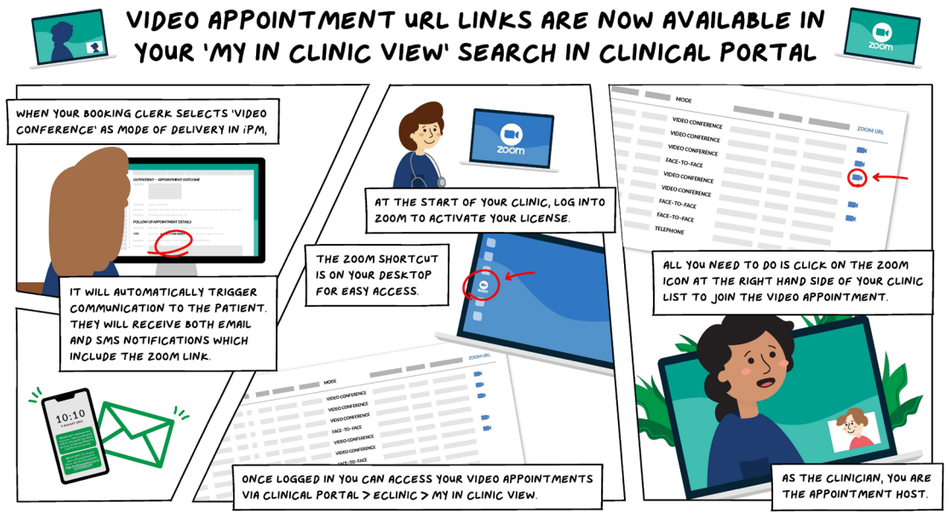


Figure 57. Waitematā DHB. (n.d) Clinician-facing screensaver promotion on telehealth appointments.

I created the illustrations using digital drawing, because of the hand-drawn, textured nature of comics I was familiar with. Seeing the illustrations laid out in their sequence made me reconsider the style I had chosen as it reminded me of children's picture books. I felt that this was not the appropriate style for these instructions as it did not reflect the users of the booth who would be over the age of 18. Given sufficient time, more exploration of different illustration styles would have been beneficial in establishing a more appropriate style for this first prototype.

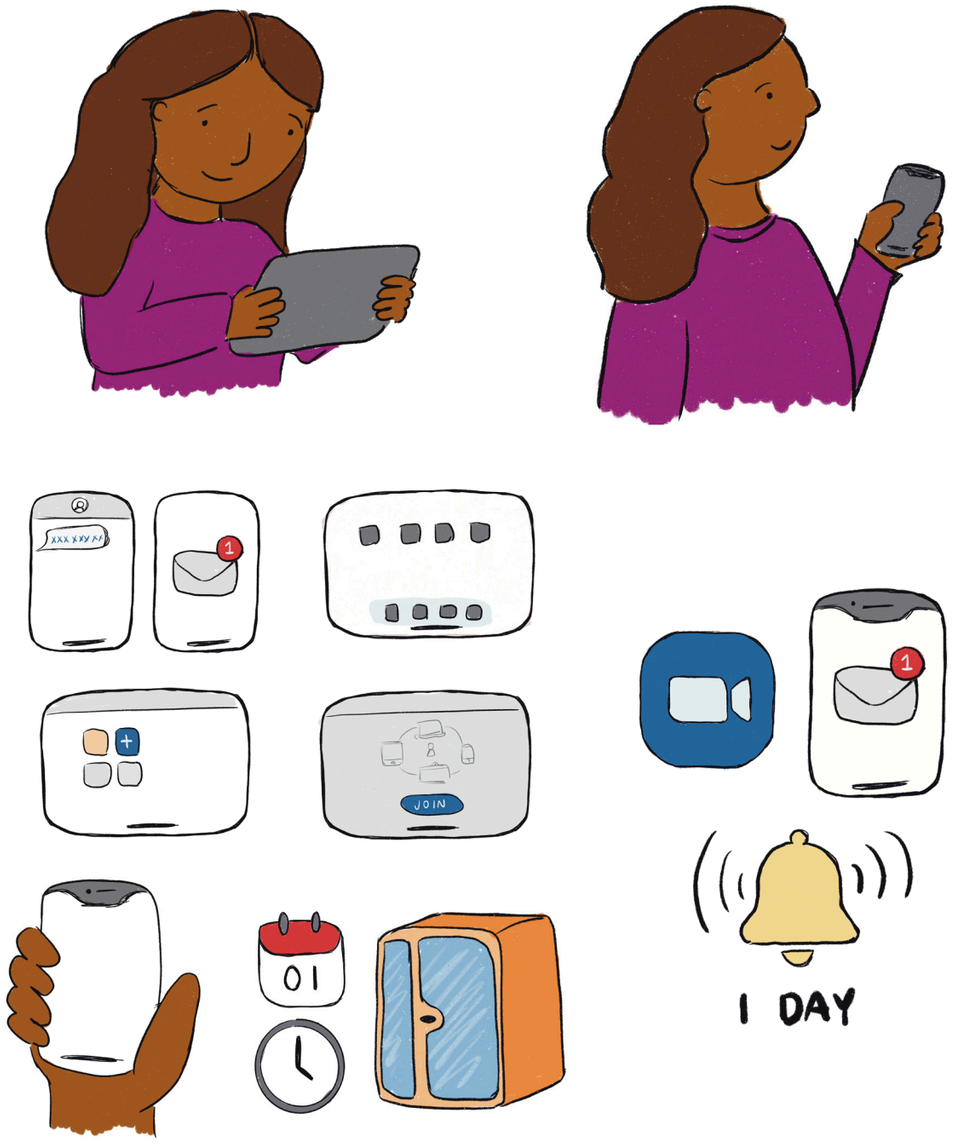


Figure 58. Caballero, (2022). *Illustration style of Prototype 1.*

ITERATIONS:

For each iteration of my prototype, I received feedback from my supervisors, peers, TC, or clinical staff at the rural site. Receiving feedback was essential to the prototyping process as I needed to check if I was going in the right direction regarding the design and layout.

For prototype 1.1 I was not too focused on the content of the instructions as the steps had been given to me. I created this instructional leaflet in landscape orientation as I was following the example I was given and felt that the content was easier to manage with this layout. I imagined that the informational resource would be a fold out paper and would eventually include additional information (e.g., DHB logo) on the front cover. I was advised to change from a landscape to portrait orientation as it would be more accessible than a folding booklet.

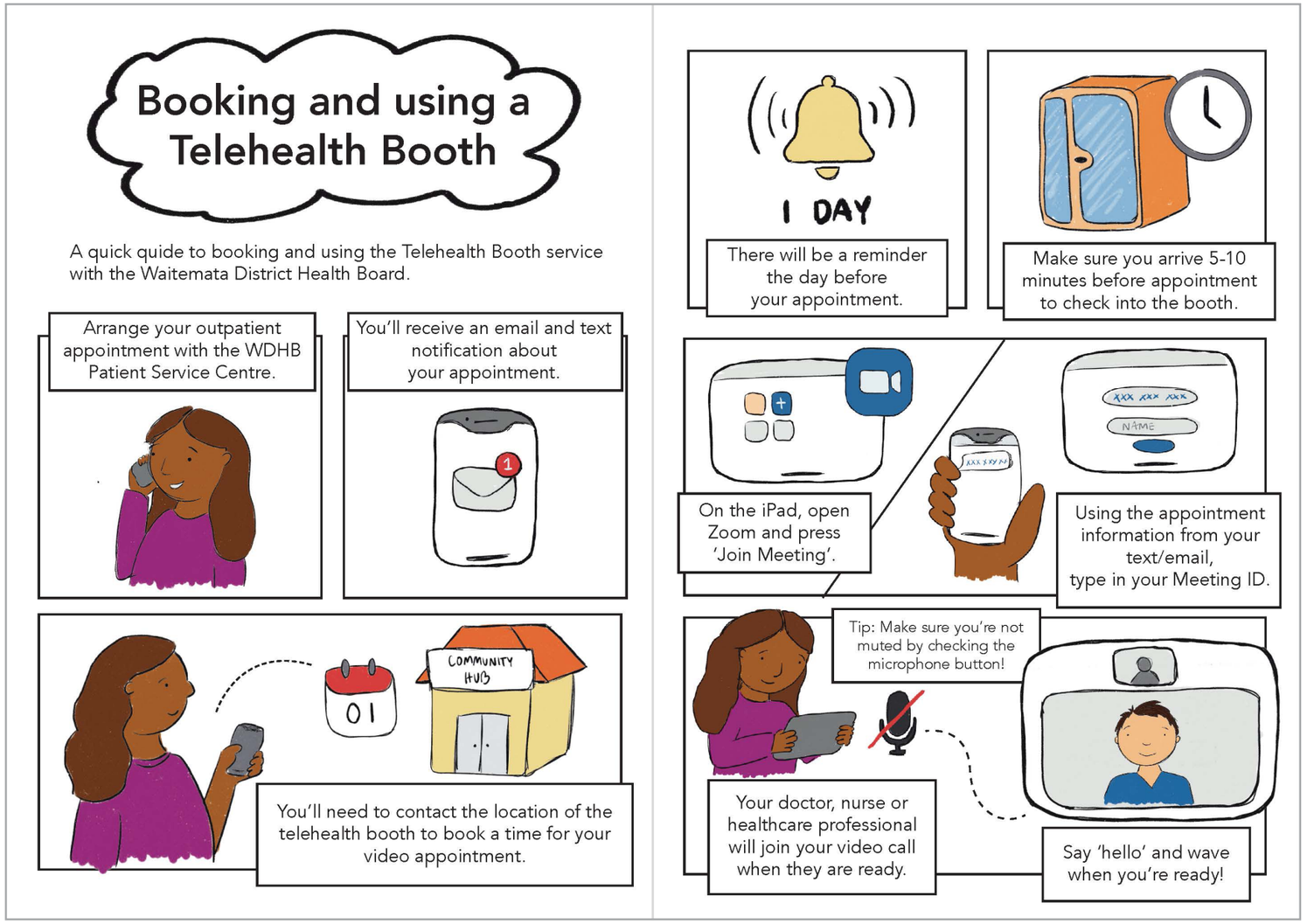


Figure 59. Caballero, (2022). *First iteration: Prototype 1.1.*

I made these changes for prototype 1.2 and added a blue background to make the storyline more prominent against the other colours. A staff member from the community site requested that I change the “01” on the calendar symbol to “1st” as it was confusing to the eye and looked like a phone charger (see figure 60). This made me think about the clarity of the illustrations and symbolism I used and made me consider if I had chosen the correct illustration style for this resource.

Figure 60. Caballero, (2022).

Example of a design change made based on feedback.

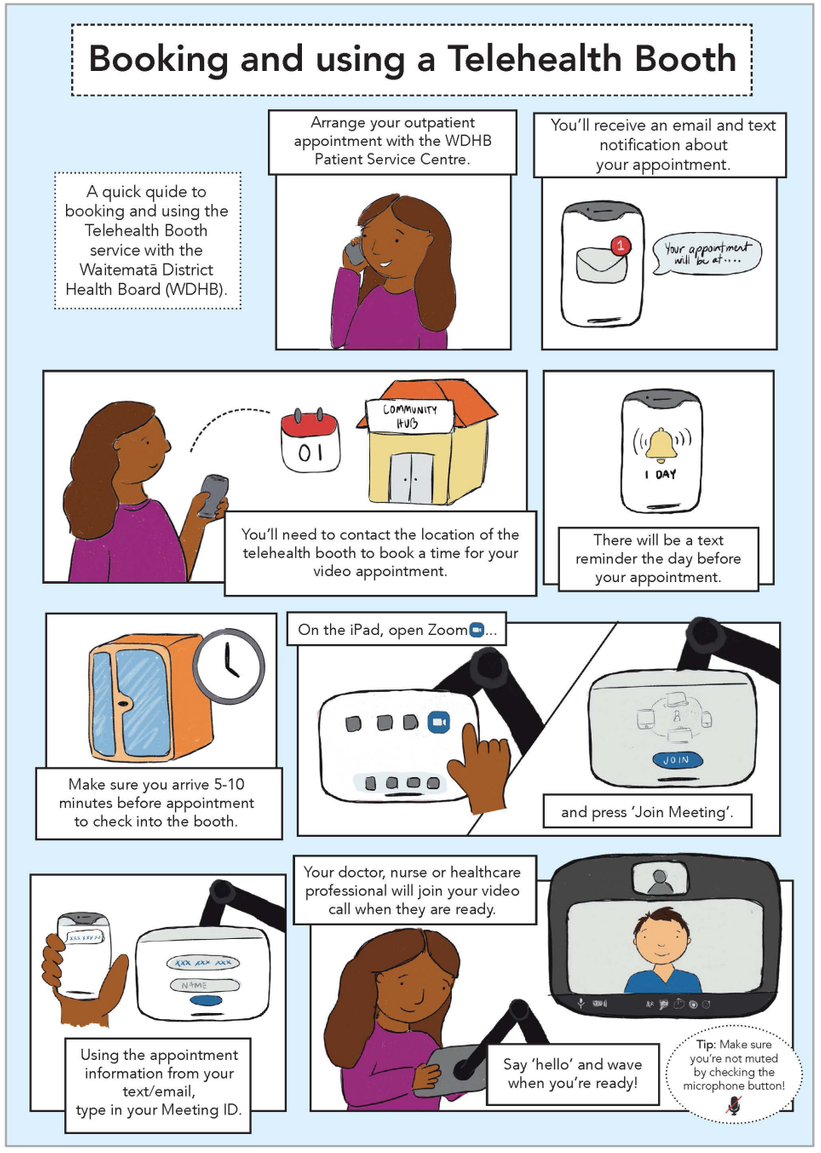


Figure 61. Caballero, (2022). *Second iteration: Prototype 1.2*

For prototype 1.3, I made the first change to the wording of the prototype to include key information about contacting the receptionist at the location of the telehealth booth. I also had to change the background back from blue (as in prototype 1.2) to the original white background (prototype 1.1) – this was prompted by feedback about the practicality of producing the instructions. One of my learning curves with this process was experiencing first-hand and understanding the limitations of the organisation I was working with. The decision about having a white background was based on the feedback that the resource was most likely to be printed via the standard office printer, and therefore would cut off the blue background, leaving a white frame, and would most likely be printed in black and white to save costs. Therefore, a white background would be better for the contrast and readability of the resource. This made me think about the constraints of working with the DHB – the production and implementation of my design were out of my hands and would only be made with the resources available. I received additional feedback from peers for prototype 1.3. Generally, they found it difficult to understand the flow of the instructions and suggested the prototype would benefit from having numbered steps or consistency of text box placement. There were no comments on the style of the illustrations, but more on how hierarchy was built through the use of colour. More attention was drawn to larger blocks of dark colour (such as the drawing of the iPad) and they felt this would disrupt the flow of the instructions. I was not able to incorporate these changes into this version of the prototype as it had already been sent out to patients by the DHB. Instead, I made these changes in subsequent iterations as discussed below.

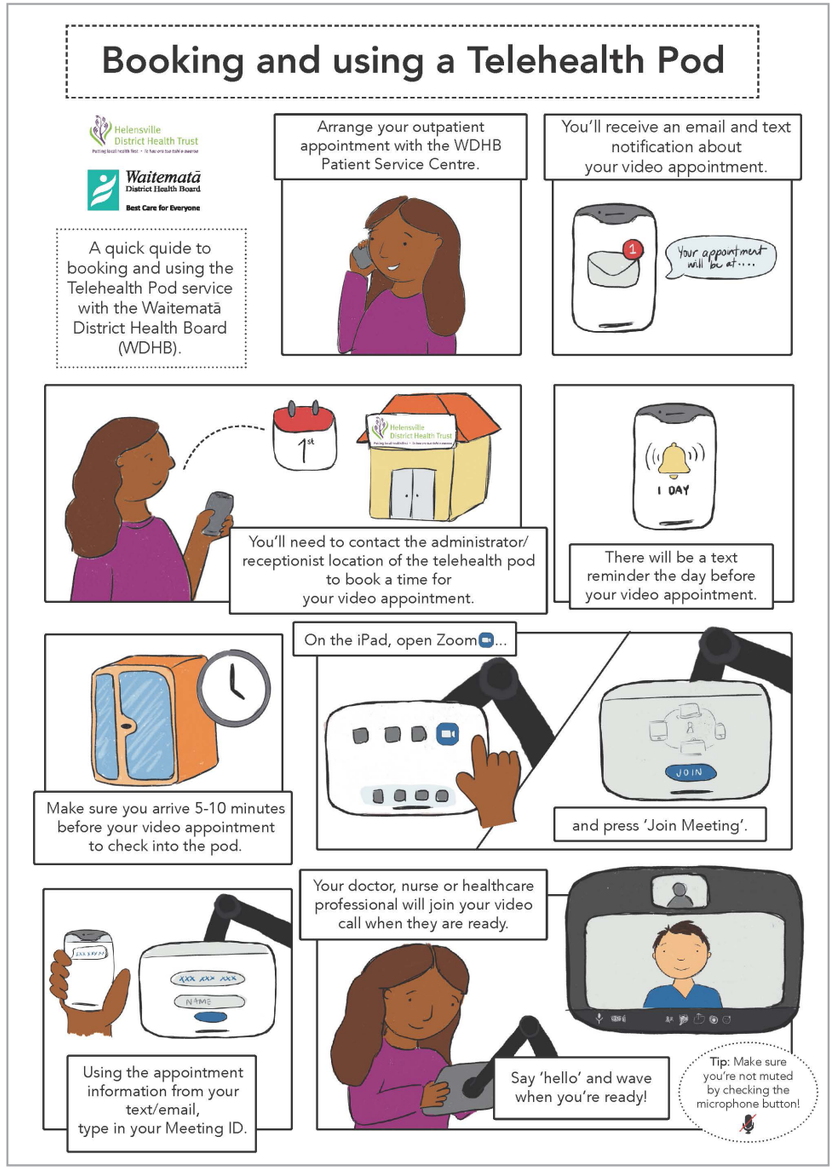


Figure 62. Caballero, (2022). *Third Iteration: Prototype 1.3*

REFLECTION

Reflecting on this experience, I feel that I could have created something that was easier to follow and overall created a better design. Despite my earlier enquiry into existing instructional design and designing my own mock-ups, I was constrained by the requirements of the DHB and did not get the opportunity to apply my learnings with this version of the prototype.

However, being tasked with creating this resource prompted me to think about the role of design in healthcare. The idea of using the comic format alone challenged how instructions are normally given in the healthcare industry (compared to text-heavy word documents). I believe this was only requested because the comic format had been used once before with the clinician-facing instructions. In hindsight, I could have been more confident as a designer to challenge the 'norm' of what this patient resource could look like, and use this as an opportunity to show what is possible with design, instead of giving them something they are used to or what they think patients wanted.

VIDEO PROTOTYPE

THUMBNAILS

Following the interviews, particularly with the Disability Advisor, I decided to explore an animated version of the instructions, as this was highlighted as an alternative medium to support patients with different accessibility needs. An animated video would enable the instructions to also be communicated through sound and audio, as opposed to only written and visual. This started with rough thumbnails and rough sketches of what the animatic would look like. The content for this video was based on Prototype #1, where I tried to be as detailed as possible, resulting in one step of the process being stretched across 3-4 frames (see figure 63).

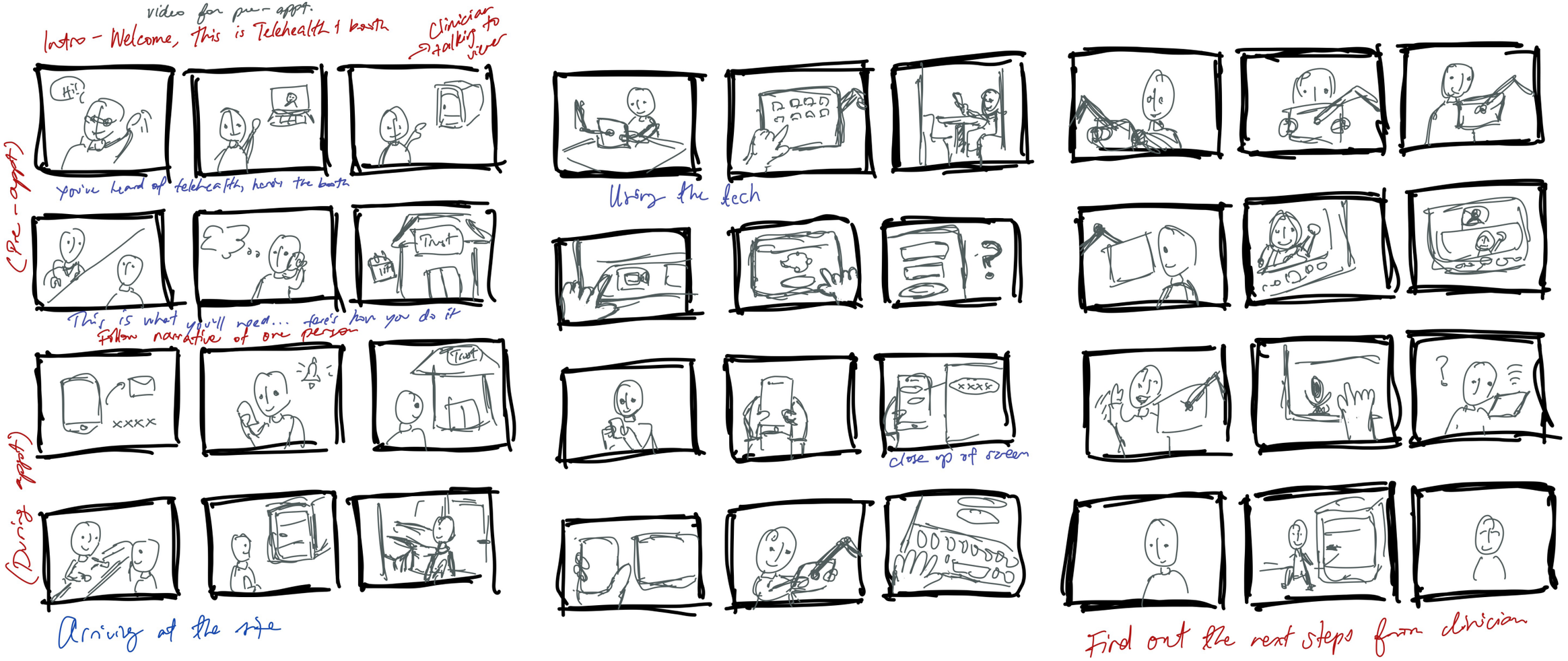


Figure 63. Caballero, (2022). *Thumbnail sketches of a telehealth booth appointment.*

ANIMATIC

The animatic I created was based on the thumbnails shown in figure 63. Animatics are images played in sequence, essentially being an animated storyboard (A/V A to Z: An Encyclopedic Dictionary of Media, Entertainment, n.d.). The animatic did not require too much detail, hence the simple illustration style and grey colour palette. It did, however, need to have enough detail to establish movement and shadow. I added a simple royalty-free soundtrack to the finished animatic. The narrative of the animatic started with an explanation of the differences between telehealth and the telehealth booth, and continued on to how to book and conduct a telehealth appointment at a booth. See figure 64 for frames of the animatic.

Creating a video version of the instructions was a good way to explore how to display information in a different medium, but I chose not to pursue this direction and stick with the written instructions instead, having in mind the purpose of having telehealth booths in the first place, i.e., to reach out to the populations who may not have access to technology. Considering the concept of the telehealth booth is new, in the first instance, I felt the potential remote users would benefit more from gaining confidence through printed materials that could be sent out to them prior to their appointment – rather than having to have access to the internet to watch a video ahead of their appointment. If I were to develop the concept of a video further, however, I would add narration and subtitles to accompany the visuals. While there is value in having multiple mediums to reach diverse audiences, it would be worth considering a video as an alternative to my paper document in the future.

Figure 64. Caballero, (2022). *Frames from the instructional animatic.*

THE DESIGN BRIEF

Taking my learnings from my initial prototypes and explorations, I created a design brief (See appendix E.) to clearly define what design output I would be working towards for my project. Design briefs help establish the objectives and deliverables of the project, and creating my own brief made me think critically about how my previous research (interviews, readings, mood boards) contributed to identifying the requirements for my prototype. I identified that my outcome would be easy-to-use instructional support documents for a wide range of patients using the telehealth booth.

After consolidating all my research insights, I was able to identify three key objectives to meet for the final prototype:

LOGISTICAL

Ensuring the experience of using a telehealth booth is as smooth as possible, while helping patients learn how to use a new service.

EMOTIONAL - BUILDING/MAINTAINING TRUST

Justifying the reason why patients' care has been moved to a virtual format and reassuring that they will get the same quality care as they would in person in a healthcare facility.

PATIENT EMPOWERMENT

Giving patients control of their experience through an accessible resource that will allow them to feel confident in navigating the appointment with minimal assistance.

Design brief draft: Print prototypes

Project overview:
Why am I doing this?

This research hopes to address healthcare inequity for patients by using a communication design lens to improve the experience of the Telehealth booth. One avenue to improve this experience is through designing a form of support for patients who are using the telehealth booth for the first time.

Currently, hospital resources such as brochures and booklets follow corporate templates that look indistinguishable from one another and are text heavy. The brief for this project is to challenge the way hospitals portray information by shifting away from corporate design and show what's possible with design. Designing this resource should not only look at the overall design aesthetic but also should consider the wording, language and tone of the content and emotional implications on patients.

What: Building instructional material to aid outpatients in using the telehealth booth.
Design problem: Using a creative flair to communicate to all types of patients h
telehealth booth in a clear concise way, while acknowledging patient
empower them to use telehealth.
Assets at the end: Instructional material

Goals and objectives
Goal: overall

- Will be using my resource when they're asked to take telehealth appointments and need to come into the center and take the call - receive this before or during appointments

Project deliverables
What is expected at the end?
Printed resource

Usability
- Visuals MUST include graphics
- **Messaging:** think about how tone of the content will be. It should be positive, catering to different digital and health literacy levels by using simple language.
- **Chronological:** Emulate every step of the process as accurately as possible for patients to easily follow
- **Content:** This resource should be accessible to patients from all backgrounds: think about how font-size/layout/line spacing/colour/contrast/types of imagery etc. affects legibility and visibility

Accessibility
Physical
Entering the physical booth

Figure 65. Caballero, (2022). *The design brief.*

CREATING PROTOTYPE 2: THE INFORMATION PACK

The concept of a telehealth booth is new in New Zealand. Prior to this research, there were no resources available for patients that would introduce them to the concept of this new way of attending appointments remotely. Therefore, my approach to introduce the idea of this new service to patients was to first provide information about the service by explaining what it is and what to expect. Thinking about the content of the prototype required me to think about the people I am designing for. Future users of the booth are likely to come from diverse ethnic communities and have different literacy and accessibility needs. Designing for such diverse users therefore meant I had to find a balance between simplicity and providing enough information to empower people to use the booth independently.

To meet the criteria set in my design brief, I knew that I had to create something that would assist users throughout the duration of the appointment, but also inform them about the service beforehand.

I decided on creating two documents:

1) Introduction to telehealth and remote health appointments, and
2) Instructions on how to use the Telehealth booth.

DESIGN DECISIONS

The symbols I used in my previous prototype were not intuitive enough – the illustration style I chose was too child-like and it was hard to see detail. I conducted more research on illustration styles that were similar to the previous styles commonly used in medical illustrations and instructional design. Through this research, I came across Japanese-inspired flat line illustrations that were simple enough to look clean, but not simple enough to lack key information. I referred to Sena Doi, a Japanese illustrator who specializes in flat-line illustrations. I was drawn to the simplicity of her illustrations and the use of a limited colour palette, but also the usability and appropriateness for the patients I identified through my personas. Using this style would enhance the readability and clarity of the resource so that it would be easy to follow for those with physical disabilities or lower health literacy levels.

Figure 66. Doi, (2021). *Sena Doi illustration examples.*

From the previous prototype (see prototype 1.3 in figure 63), I struggled to make the illustrations flow sequentially and not just be images floating across the page. Taking that into account, for my next iteration I wanted the sequence of the images to be easier to follow. For this prototype I decided to make use of the insights I gained through the instructional design mood boards. Based on previous feedback, using numbered steps was easier to follow compared to the comic style where the reader's eyes have no direct steps to follow. By using visual hierarchy to organise my content, I would be able to influence the order in which users would view my design (Kingston, 2020).

What I observed from creating my own illustrations in this style is that depth is created by using perspective instead of shadows. I found that creating depth was essential to not make the design look so flat and more realistic, making it easier for patients to understand as it would reflect how it would look in real life.

More on what happened here to arrive at the prototypes figure 68. on page 180.

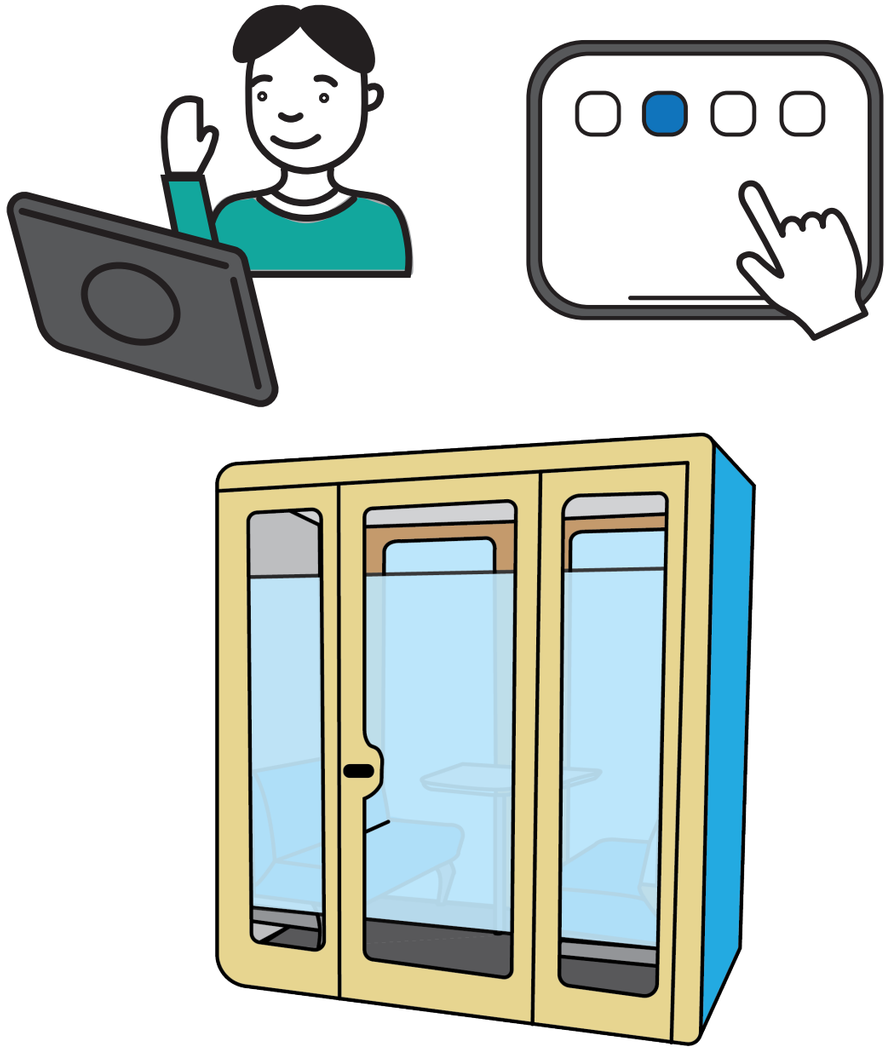
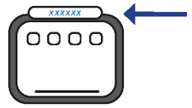
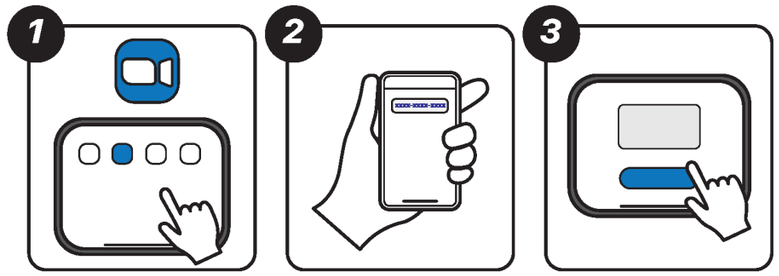


Figure 67. Caballero, (2022). *Illustration style for Prototype 2.*

Using the Telehealth Booth

When you enter the telehealth booth, the passcode to open the iPad is located on a sticker alongside the topside of the iPad.

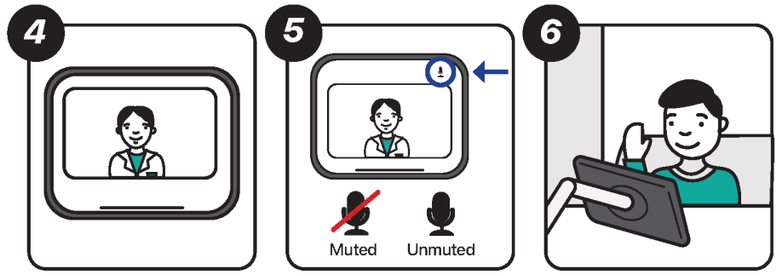




On the iPad, look for the Zoom app. When you open this, it should lead you to a log-in page.

You will need your email or text reminder that contains your meeting ID.

Use this meeting ID to log-in and tap 'Join'.



Your doctor, nurse or healthcare professional will join your video call when they're ready.

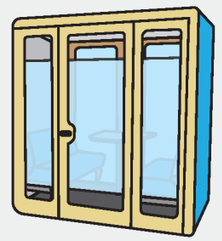
In the meantime, check if your microphone is muted. The mute button is located at the top right corner of the screen.

Say "Hello" and wave when you're connected!

What is the difference?

Telehealth

Telehealth is healthcare delivered remotely through digital technology - this can be done through phone calls or video calls. Telehealth requires a stable Wi-fi connection, and a device to take a phone and/or video call.



Telehealth Booth

A Telehealth booth is an assigned space that has the technology to take a telehealth call. These will be located within your local community areas for easy access.

Why choose Telehealth?

The benefits

Telehealth is a convenient way to receive healthcare while still receiving the same quality of treatment as you would in-person: by having care closer to home and reducing time and costs by not having to travel to an appointment.

Figure 68. Caballero, (2022).

The two support documents: 1) How to use the technology in the telehealth booth; 2) Showing the difference between telehealth and the telehealth booth.

PROTOTYPE #2
USER TESTING WALKTHROUGHS

Following the creation of the prototypes, I conducted walkthroughs with three staff from the innovation and improvement (i3) team at North Shore Hospital. All participants were already familiar with technology in some form, whether through work or personal use. I had originally planned to conduct these before creating a prototype, but I had no access to the booth or staff during the New Zealand COVID restrictions. I ended up using the walkthroughs as a way to test the effectiveness of my prototype in guiding a potential patient through a telehealth booth appointment. I could not test these on actual patients due to ethical constraints, therefore I had to work with staff who 'acted' as patients. The most ideal situation would be to include participants with a range of technological abilities. Another purpose of these walkthroughs was to map out the patient journey to draw out key pain points around the use of telehealth booths for outpatient appointments as the primary purpose was to test the effectiveness of my prototype. The data gathered was used to identify and inform potential opportunities to improve the telehealth patient journey and test the current version of the prototype.

The key things of interest were:

- Observing the 'patient'-service interactions, nuances of using the service, pinpointing awkward, confusing or difficult moments

- Testing out the prototype – what is working well with this design? Looking for any comments on the layout/design/imagery/typeface and whether it is easy to follow

PREPARING FOR THE WALKTHROUGH

For the walkthrough, participants were sent an email that included the following scenario to set the context for the walkthrough:

"You have just found out that you need to attend a specialist appointment at the hospital. You can't afford to take time off work, and the closest hospital to you is a 40-minute drive. However, as an alternative, you have been invited to attend your healthcare appointment at your local Telehealth booth. You've never had a Telehealth appointment before, let alone an appointment at a Telehealth booth. However, you decide to accept the Telehealth consultation after discovering the nearest Telehealth booth is a 5-minute walk from your office."

The walkthrough was conducted in three parts to mimic what a patient might typically expect out of a telehealth appointment:

PART A: AN EMAIL NOTIFICATION OF THE APPOINTMENT

This email contained the appointment information such as the date, time, and location of the booth appointment. The format of this email was based on the template of what was being used by the Waitematā DHB for existing telehealth appointments; however, I altered this to fit the situation of the in-booth appointment. In addition to the email, I included a supporting document with imagery that explained the difference between telehealth and the telehealth booth. This also included the instructions that would be placed in the booth so patients could have an overview of the appointment process.

PART B: IN-PERSON WALKTHROUGH AT THE BOOTH

Upon arriving at the telehealth booth site, participants, received a brief introduction on what was expected during the walkthrough. The participants were required to go through the telehealth appointment via the booth and navigate their way to the end of the appointment. The instructions were left in the booth, and participants could choose to use this if needed. Participants were required to think aloud, stating what they are thinking/feeling when going through the different steps or when encountering a challenging point in the journey.

PART C: POST-WALKTHROUGH DEBRIEF

A short debrief was held after the participant had completed all the steps of the walkthrough. This debrief was conducted to reflect on how the process went and was a chance for the participants to bring up any other comments or concerns they had. The debrief was also audio recorded.

FINDINGS

Data from audio recordings and note-taking during walkthrough observations was analysed and grouped into common themes. These were captured on post-it notes (see figure 69).

Figure 69. Caballero, (2022). Analysis of a walkthrough participant.

TECHNOLOGY/EQUIPMENT

Two out of three participants were not familiar with iPad technology, while the other participant had little experience with iPads. While for most participants it was not their first time in the booth, it was their first time using the technology. It was beneficial to observe the interactions people (who had no prior experience) had with the technology, since it provided insight into potential struggles real patients might have. A common issue was their struggle to find out how to turn on the iPad, where each participant spent time looking for an 'ON' button by feeling around the sides of the case. Since the iPad is attached to a moveable arm, the device is housed in a thick, secure case that blocks the power button; therefore, the iPad can only be turned on by tapping the screen (see figure 40 from second booth visit). All participants eventually figured out how to do this, but only after playing around with the device for a while. Upon opening the iPad, one participant also got confused between the Zoom app icon and the telehealth app icon, but eventually chose Zoom after referring to instructions. The telehealth app is a direct link to a browser with information about telehealth, whereas the Zoom app is where the telehealth appointment is conducted. This is not evident at a glance, and, since the prototype information resource did not account for their being another icon on the screen, it is not surprising that this caused confusion for some users.

SECURITY CONCERNS

All participants brought up issues of security, whether it was concerns regarding the physical space or the appointment software. In terms of the physical space, there was concern around the privacy of the booth, considering what the area surrounding the booth would be like, with potential risks such as another patient walking in during the middle of the appointment, or people outside hearing what was going on inside. As for the software used for the appointment, a participant brought up concerns about using Zoom as the video appointment platform and whether it was secure enough to be discussing personal medical information.

DESIGN FEEDBACK

Generally, there were positive comments on the design of the prototype. All participants found it useful to have the instructions next to them when going through the process and would constantly refer back to the instructions as they went through the steps. There was no feedback on changes that could be made to the look and feel of the information materials as participants were satisfied with the clarity of the images. There were, however, suggestions that content could be added in addition to what was already included in the prototype – for example, a "What you will need" section to remind patients they will need to bring their meeting ID and passcode to the appointment.

REFLECTION

After identifying the key themes generated from user testing walkthroughs, I noticed the issues around the use of the technology affected the flow of the user experience. People with no previous experience with iPads would still struggle to use the service since there is no support on how to use this type of technology. Additional material to educate users on how to navigate the iPad (e.g. turning on the device, changing the volume, navigating back to the home screen) would be something to think about for the next iteration. Once again, equipping patients with information on what to expect during the appointment was an essential aspect identified early in the creation of the prototype – however, a section missing from this was information on the security/privacy of conducting a virtual appointment. Adding a short paragraph reassuring patients of the security of both the booth and the software would further empower patients to use the service, knowing their health data is safe.

FINAL PROTOTYPE

The next iteration of the prototype was informed by the feedback from the booth walkthroughs and maintains the same illustration style. This prototype aimed to tackle the smaller UX interventions of using the telehealth booth. This meant adding an additional page to my existing information pack. It includes the information on what patients will need prior to their telehealth appointment, such as bringing the meeting details to the appointment. Additional information on the technology, such as how to turn on the iPad, was also included, as well as the information on the security/privacy of the appointment.

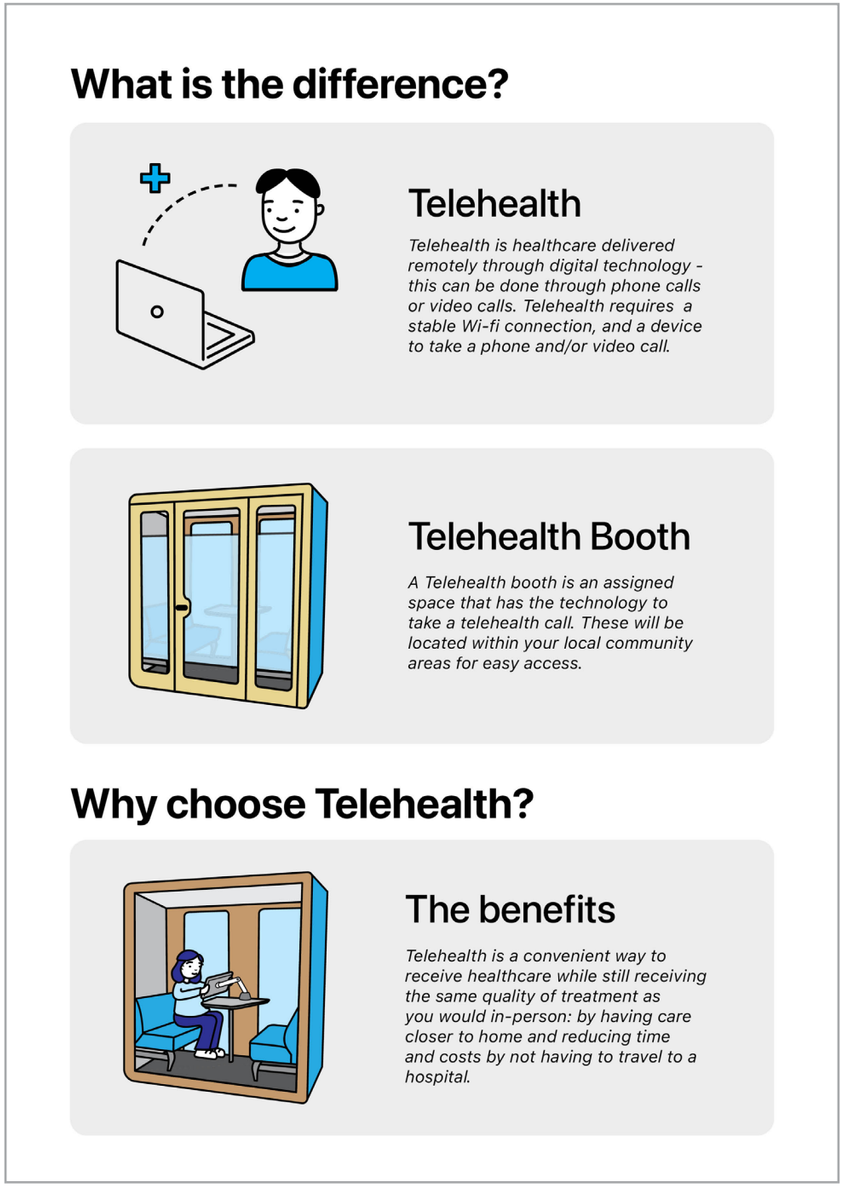
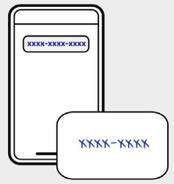


Figure 70. Caballero, (2022). *Updated wording of Prototype 2.*

What you need to know before your telehealth booth appointment:

What you need to bring:

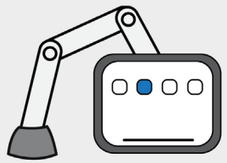
Your meeting ID and password from your appointment email or text reminder. You can take a screenshot of this or write down the meeting ID details. You will need this to log into your telehealth appointment via the Zoom app.



Technology in the booth:

The telehealth booth contains a 12.9 inch iPad Pro. This will be attached to a moving arm so that you can position the iPad in a way that is most comfortable to you.

This will already have all the relevant software downloaded, and a stable Wi-Fi connection. If you are unsure of how to use the technology, please refer to the instructions provided.



Security and privacy:

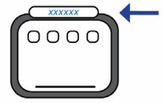
The telehealth booth is a soundproof and secure space that won't compromise your patient data. You will be asked to put your name into Zoom, but this will only be seen by you and your clinician.

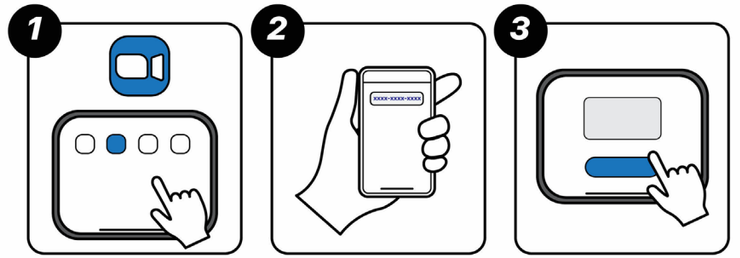
Figure 71. Caballero, (2022). *Additional sheet of Protoype 2 that includes information on what patients need to know before they attend their appointment.*

Using the Telehealth Booth

Inside the telehealth booth, the iPad will be on a moveable arm that you can adjust to your liking. Double tap the screen to wake the iPad.

The passcode to open the iPad is located on a sticker alongside the top-side of the iPad.

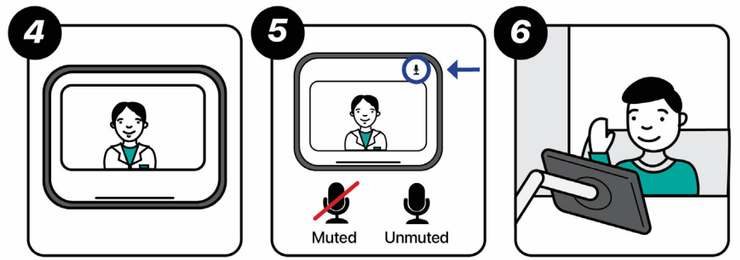




On the iPad, look for the Zoom app. When you open this, it should lead you to a log-in page.

You will need your email or text reminder that contains your meeting ID.

Use this meeting ID to log-in and tap 'Join'.



Your doctor, nurse or healthcare professional will join your video call when they're ready.

In the meantime, check if your microphone is muted. The mute button is located at the top right corner of the screen.

Say "Hello" and wave when you're connected!

Figure 72. Caballero, (2022). *Updated version of instructions on how to use the technology in the booth. Additional tip on how to turn on the iPad is included.*

FEEDBACK SURVEY

At the time of the submission of this exegesis, plans were being set in motion to gain feedback on the design and clarity of the final version of the information pack prototype from Waitematā DHB patients themselves (see appendix F for survey questions). Consultations with the telehealth coordinator and the DHB's Patient Experience team showed that the most appropriate way to seek patient feedback would be via a digital survey distributed to current telehealth patients as a link at the end of their Zoom appointment. The outcome of the survey will be shared in the examination.

DISCUSSION

From the earliest known telehealth communication in the 1960s (Nesbitt and Katz-bell, n.d), through its proliferation in clinical settings and remote-based care (Nesbitt, 2012; Gajarawala and Pelkowski, 2021), to the COVID pandemic, telehealth has seen exponential growth in parallel to the uptake of digital health services. The literature review and audit of existing telehealth materials demonstrated the usefulness of telehealth, especially amidst the COVID pandemic. However, healthcare inequities and the digital divide still hinder patients from lower socio-economic backgrounds, ethnic minorities, and those with less educational background (Courtelyou-Ward et al., 2020) from fairly accessing healthcare in this way. The telehealth booth is one possible solution to addressing these inequities by providing the technology, equipment and space to take a telehealth appointment without having to travel far to receive healthcare. While there seems to be an abundance of literature on the use of telehealth, there is a gap in research on the contribution of design to the use of telehealth and the telehealth booth, specifically. Prior to this research, I had no knowledge of the telehealth booth or why it was needed. As someone who is well resourced with technology and had easy access to healthcare by living in the city, this project challenged my assumptions about access to healthcare in New Zealand. While there is still a large number of people who can handle taking a telehealth appointment from home, this research specifically focused on helping those users of healthcare who do not have the equipment or environment suitable for conducting a telehealth appointment from their own home.

The aim of my research was to explore how UX/interaction design could be used to better understand the patient journey of using the telehealth booth, and then use these findings to inform the design of a resource that could assist patients using the telehealth booth for the first time. I set out to do this research to explore being a designer in healthcare. I took this project as an opportunity to find the best way to use my skills as a user experience designer but use communication design as an output. I was motivated to do this as I am most interested in the initial ‘discovery’ research stages, but I still had a chance to use my creative skills. My hope for this research was to highlight the importance of using design-led methodologies and methods to unpack and understand potential user experiences and communicate information effectively when implementing a new service in the community. The divergent way of thinking from the double diamond framework allowed me to explore all aspects of telehealth and the telehealth booth through the analysis of interviews, literature, walkthroughs and an audit of existing materials. I was able to gain a holistic view of the use of the telehealth booth before I narrowed down my insights to define a design brief that would inform my creative thinking.

INTERPRETATION OF FINDINGS

Throughout my research I was challenged in my critical and creative thinking. I discovered that user experience design is critical to understanding patients and their needs when using the telehealth booth service. Through interviews with clinicians and other healthcare staff, and user testing walkthroughs, I was able to understand some of the thoughts and feelings future patients might have around using the booth. This helped me identify what patients would need to assist them in using the booth with minimal help. The biggest concerns identified were the use of technology and communication prior to and during the telehealth booth appointment; this informed the next step of my research – using communication design to address these concerns by creating an information resource to clarify these issues.
Creating a user-friendly information resource for the use of the technology in the telehealth booth had a positive response. The findings from participant walkthroughs identified that the information resource was heavily referred to by all participants to help them navigate the use of technology in the booth. The response to the imagery and simplicity of the instructions in the resource was positive, with participants finding the visual aid and simplicity helpful, proving successful as all participants were able to make it to the end of the walkthrough with minimal assistance.

Despite the constraints surrounding this research, the user testing through walkthroughs of the booth confirmed that the resulting information resource prototype has the potential to make the appointment journey easier to follow for future users. The user walkthroughs proved to be a useful method to uncover the gaps in the information provided and highlighted the smaller user issues that would not have been identified otherwise. An issue such as not knowing how to turn on the iPad was a small detail that was significant enough to affect the rest of the appointment. This was an opportunity for further improvement of the prototype, such as adding the information around how to prepare for an appointment.

If we are to challenge the existing norms of design in healthcare, more exploration is needed into how manipulating communication design elements (such as illustration styles and typefaces) can enable a more user-center approach in creating resources and new services. There have been some recent attempts to use illustrations and more playful styles in delivering health-related content, such as comics as a communication or education tool for COVID (Williams, n.d; Jaggers, 2020). However, this is still a novelty and not widely accepted in healthcare.

This project uncovered issues directly affecting patient experience which could be tackled with design research and outputs. There is still plenty of work to be done around telehealth and especially the telehealth booth, and the ideal time is now — while the concept is still in its infancy. My research highlighted the need to investigate the user experience of patients and how they interact with the service, before taking steps to implement a new service in the community. This is the value a human-centred design approach brings to healthcare – discovering the needs and wants of the end-users to guide the ideation and development of multiple possible solutions to their problems, in small, incremental, and iterative steps until refined to their needs (Jnd.org, 2019) rather than creating an (often costly) solution that users then need to adapt to (Liu et al., 2022).

DESIGNING FOR HEALTHCARE

Being a designer relatively new to healthcare, I was curious to see how I contribute to this endeavour to reduce healthcare inequities. To tackle an issue as big as health inequity, I first had to focus on one aspect, which for me, was access to healthcare. This is important as the use of digital technology will only be expanded in one of the five system shifts for New Zealand's new healthcare system restructuring (Health NZ, 2022).

UX has become an important tool to design new services in the rise of digital health services (Goldchmit et al., 2021). Throughout this project, I learnt that being a designer in a traditionally bureaucratic system, that is set in its own ways, risk-averse, and resistant to change, meant I had to advocate for the innovation that design could bring to create a better patient experience. Design and health are disciplines that have been intertwined for decades in areas such as developing medical products and the refinement of designed spaces; yet, design still remains underutilized in gaining a deeper understanding of patients and attaining greater clinical results (Kim et al., 2017). Design is typically seen as a 'nice-to-have' in the healthcare industry (Nakarada-Kordic, et al., 2020) and the differences between the two disciplines means designers often face various challenges

working in the health contexts. Health is an evidence-based practice while design is explorative (Chamberlain et al., 2017). Groeneveld et al. (2018) investigated some of the challenges that design researchers face when working in healthcare. They found that designers were particularly affected by the difficulties around conducting fieldwork in healthcare settings, where designers are often limited by ethical considerations and availability of the healthcare staff. Groeneveld et al. (2018) also suggested that the reservations healthcare workers have towards design and the design process (where the outcomes are often not pre-determined) can be overcome by communicating the value of design and encouraging more health researchers to advocate for design. It is important for designers to continue to challenge this as we bring an empathetic, human-centered approach that can be implemented at the beginning of the solution-finding process, before investing time and resources (Cherney et al., 2019).

I was fortunate to have been given the opportunity to have creative freedom with my prototypes and demonstrate to the healthcare providers how understanding the user through human-centered design could inform an information resource and how communication design could be used as a tool to create the resource – given that visual aids have proven successful as patient education tools in the past (Bacher et al., 2020). One of my learning curves with this process was experiencing first-hand and understanding the limitations of the organisation I was working with: whatever a designer in healthcare creates may not get past the prototype stage and that implementation is outside of my control. Even if the design does go past the prototype stage, the final product may not be produced in the way the designer intended; therefore, I had to adjust to the capabilities of the DHB. For example, for my first comic instruction prototype, I had to consider the feasibility of a coloured background from a contrast standpoint as the DHB would most likely print the prototype in black and white.

Despite this, and in the absence of similar design explorations within this new way of interacting with patients, my research and its outcomes serve as a starting point in imagining more person-centred resources for patients when starting a new service and continuing the conversation about the benefits design can bring to healthcare.

LIMITATIONS

THE IMPACT OF COVID

COVID had a significant impact on my research, not only affecting my personal wellbeing, but also limiting access to resources and sites, delaying data collection, access to participants, and the work on final design outputs. At different stages of my project, I was unable to access both the university and the North Shore Hospital (NSH) campus where the telehealth booths were located. Not having access to AUT meant that peer critique sessions had to be held online and I had to adjust to a full-time work-from-home environment, which greatly affected my working style and therefore the output rate of my work. Catching COVID after the lockdowns affected me greatly as the illness meant I could not work, and the isolation period caused delays to the rollout of my walkthroughs and surveys. I had to reschedule multiple participants which set me back in my writing, final prototype and surveys.

SCOPE AND RESEARCH DESIGN

There were multiple limitations that I identified throughout my research that could have changed the trajectory of my project had I been able to do them. Firstly, ethical constraints mean that I could not directly interview telehealth patients to ask them about their experiences using the service and whether they had any difficulties with the technology. I countered this limitation by instead proxy interviewing, by gathering information from an expert on the subject without directly talking to the main subjects involved (Eaton and Kessler, 2012). Clinicians that had experience with telehealth were able to inform me about their observations of patients' experiences. While using clinicians as a proxy was still valuable, it did not capture any emotional nuances or smaller details that a patient could tell me directly. Secondly, I would have interviewed patients who used the booths in the community. COVID significantly delayed the delivery and implementation of the patient facing booths. The booths were expected to arrive in early 2021 and ended up being rescheduled twice. These operational factors were out of my control and are commonly seen in healthcare (Ray, 2022).

The logistical process of receiving a telehealth appointment in the telehealth booth was also a topic that was out of the scope of my study. The intention for the community booth was for the patients to book the booth themselves. As I had to resort to using the in-hospital booth for user-testing in my research the scenario presented to the participants did not include the booking process and the 'patient' went straight to the booth if they received an invitation from their clinician. I acknowledge though that having to manage the process themselves (i.e., sorting out the time to see the clinician, as well as booking the booth itself) could add stress for patients using the community booth, and that this aspect is something that should be carefully considered for a better patient experience. This would have an impact on future iterations of the instructional information provided to patients and would need to consider how the information provided might be affected by pre-appointment logistics.

It is hard to know how the instructions and the process around how to go about the walkthrough may have impacted the participants' feedback about the prototype as they may have been conscious of the fact that they were role-playing and not attending an actual health appointment. Consequently, they may have not used the information with the same focus as a 'real' patient would. Participants may have also been conscious of being observed while thinking aloud, so they may have provided feedback they thought the researcher wanted to hear - otherwise known as the Hawthorne effect (McCambridge et al., 2014). On the other hand, this behaviour may be indicative of what future users of the booth may be like – in which case, the information surrounding the appointment and its delivery may need to be reconsidered in future iterations that incorporate patient feedback.

As for moving the survey to an online format, a physical tangible resource mailed out to patients in remote areas would be more appropriate as physical resources are how they would receive health appointment-related information if they did not have access to the internet. Although I understand the need to move the survey to an online format due to COVID concerns, there are both advantages and disadvantages to this mode of delivery. The disadvantage of having the prototype reviewed online, is that participants will be able to zoom in and out on the resource, which may affect the feedback on the readability and clarity of images in the resource. A possible advantage of the prototype and the survey being distributed online is that it allows access to a larger pool and potentially more diverse audience. However, it is still possible that the survey would not reach those potential future users of the telehealth boot service who are likely to be uncomfortable with, or have access to technology – the groups who the service is intended for in the first place.

RECOMMENDATIONS FOR FUTURE RESEARCH

My research demonstrated the benefits of communication design in the context of healthcare and how it can improve not only the look and feel, but also the usability of a patient-facing resource. Throughout my research, I also identified areas of improvement that could be used as a basis for future research. These are described below:

PHYSICAL ENVIRONMENT OF THE BOOTH:

While my research investigated the user experience of the booth, I came across physical issues that were out of the scope of my project, but could be examined in the future, such as interior lighting, table space, colour, and material of the interior and exterior. Explorations could be done into the emotional impact these characteristics might have on patients, and whether adjusting these physical features would improve comfort and encourage more patients to use the service. While my research considers accessibility from a communication design perspective, more work should be done from the physical accessibility perspective. For example, at the moment, the booth is not wheelchair accessible and therefore potentially excludes an entire group of patients from using the service.

IMPLEMENTATION IN DIFFERENT PUBLIC SPACES

While my research primarily focused on the implementation of the booth within general healthcare locations (hospital and the community clinic), a more speculative approach could be taken to imagine what the implementation of telehealth booths would look like in public spaces such as malls, supermarkets, and libraries to allow for an even greater access of various communities to healthcare. Since telehealth booths in the community are a new concept, there is plenty of room to speculate how this service would work if there were multiple booths in more general public areas. For example, the original intention for Busypods (the model used for telehealth booths) was to be a portable meeting space within open-plan office environments as a substitute to building meeting rooms (See figure 73). Future research could look into how these booths are being arranged and how they affect the environment around them, so that a similar configuration could be used in the context of healthcare appointments.

In New Zealand, other healthcare services such as mobile dental vans, breast screening vans, and the Mobile Health surgical unit have already explored bringing their services directly to patients in different regions so that communities do not miss out (Northland DHB, 2019). These services travel to their users and can be found at schools, libraries, and rural areas to give patients an opportunity to access the service at a location fitting for them. Although the telehealth booth differs slightly as it is currently expected that patients will use the service unassisted, these examples could be used as a foundation for the exploration of other potentially unforeseen factors that could make telehealth booths in community settings successful.

Ultimately, my hope for any future work in this area is for a wide-spread adoption of design-led methodologies in healthcare to encourage more user-centered approaches to design of health services, environments, and technologies, to showcase the innovation and solutions that design can enable and push the boundaries of healthcare.

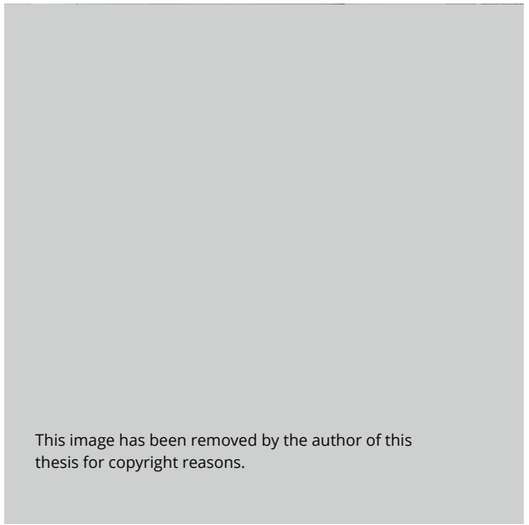


Figure 73. Peacepod, (n.d).

Busybods used in an office environment.

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APPENDICES

APPENDICES TABLE OF CONTENT

APPENDIX A
ETHICS APPLICATION 21/278

Auckland University of Technology Ethics Committee (AUTEC)

Auckland University of Technology
D-88, Private Bag 92006, Auckland 1142, NZ
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

19 August 2021

Ivana Nakarada-Kordic
Faculty of Design and Creative Technologies

Dear Ivana

Ethics Application: **21/278 Designing Healthcare Outside of the Hospital: The Telehealth Booth**

Thank you for submitting your application for ethical review. We are pleased to advise that the Auckland University of Technology Ethics Committee (AUTEC) approved your ethics application at their meeting on 16 August 2021, subject to:

The committee noted that this research would fall under the broad definition of Health and Disability Research.

1. Provision of a clearer definition of Telehealth and an explanation of what a Telehealth Booth is. Include these in the Information Sheet along with an illustration of the latter if this would be helpful;
2. Provision of an observation protocol as per A.5.1;
3. Revision of the recruitment outlined for improvement specialists in C.3.5.2. Instead, request the manager to forward the invitation to potential participants who can then contact the researcher directly if they are interested in taking part;
4. Reconsideration of the term 'role play' in this context; 'mapping the outpatient journey', as used in the EA1, may provide a clearer sense of what participants are being asked to do;
5. Reconsideration of the use of a sign-up sheet as this will impact on participant confidentiality. Instead, ask potential participants to email the researcher directly with their time preferences;
6. Clarification of whether online interviews will be screen-recorded and how participant confidentiality will be safeguarded in this situation. If the recording is for transcription purposes, then include advice about this in the Information Sheet and explain that the video will be deleted once transcription has occurred;
7. Inclusion of the AUT logo on the advertisement and survey;
8. Amendment of the Information Sheet (expert) as follows;
    a. Replacement of the word 'anonymous' with 'confidential' in the privacy section;
    b. Inclusion of the location of interviews;
    c. Inclusion of the option for online interviews, and how consent will be evidenced in these cases;
9. Amendment of the Information Sheet (anonymous survey) as follows:
    a. Inclusion of a url for participants to access results rather than asking them to contact the researcher;
    b. Inclusion of a statement noting that participants can withdraw from the survey at any point until their responses have been submitted but that once this has occurred their data cannot be identified or withdrawn;
10. Inclusion of the location for the role play in the Information Sheet for that group of participants.

AUTEC observes that the size and scope of this research is overly large for the level and weighting of the research output involved.

Please provide us with a response to the points raised in these conditions, indicating either how you have satisfied these points or proposing an alternative approach. AUTEC also requires copies of any altered documents, such as Information Sheets, surveys etc. You are not required to resubmit the application form again. Any changes to responses in the form required by the committee in their conditions may be included in a supporting memorandum.

Please note that the Committee is always willing to discuss with applicants the points that have been made. There may be information that has not been made available to the Committee, or aspects of the research may not have been fully understood.

Once your response is received and confirmed as satisfying the Committee's points, you will be notified of the full approval of your ethics application. Full approval is not effective until all the conditions have been met. Data collection may not commence until full approval has been confirmed. If these conditions are not met within six months, your application may be closed and a new application will be required if you wish to continue with this research.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

We look forward to hearing from you,

(This is a computer-generated letter for which no signature is required)

The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Cc: Yqy5635@autuni.ac.nz; cassandra.khoo@aut.ac.nz

APPENDIX B
EXPERT INTERVIEW QUESTIONS

CLINICIANS

- How long have you been using Telehealth? How has it worked for you?
- What is the process of an outpatient receiving a Telehealth appointment?
- Have you consulted a patient via Telehealth through using a Telehealth booth? If so, what were your thoughts on the booth itself?
- What's the communication process like between clinicians and patients?
- Are there any issues with clarity of appointment times, or communication in general?
- Could you please describe who the typical users of Telehealth are?
- Have you noticed patients struggling to use this service? Any technology issues?
- What are the common reasons for patients declining a Telehealth appointment?
- How has lockdown had an effect on your use of Telehealth?

APPENDIX C

TELEHEALTH COORDINATOR

- How do people receive information about Telehealth or what it's about?
- Is there any public and patient-facing information on Telehealth or the Telehealth booth that you could share?
- Are there any future plans for the implementation of the Telehealth booth in the community?
- What are some of the barriers for people using Telehealth booths?
- Is there any patient involvement? why/why not?
- Tell me about the rollout of the booths
- Promoting Telehealth?
- Has there been any involvement from clinicians?
- What was the use of telehealth like during lockdown?
- Attitudes in both sides - clinicians/patients: any reluctance?
- Practicality - assistance with booths?
- Choice for telehealth? do people say no?
- Do clinicians know what to do?
- Challenges around setting telehealth/booth up?
- What kind of technology is used in booth?

APPENDIX D

DISABILITY ADVISOR

- Introduce yourself
- What do you know about the Telehealth booth/Telehealth - have you used it before?
- How can we make telehealth more accessible?
- What kind of information is given to patients?
- For patients with accessibility needs, how do you contact them?
- What are some other kinds of barriers from an accessibility stand?
- Technology standpoint?
- Health literacy?
- What do you look for in terms of accessibility when it comes to designing new services?
- I interviewed some clinicians who use telehealth - some mentioned work with interpreters. Could you please explain how the interpreter service works?
- Does this differ to in-person?
- How do you know if the patient needs an interpreter?

APPENDIX E

DESIGN BRIEF

A. Caballero

DES BRIEF!!

Design brief draft: Print prototypes

Project overview:
Why am I doing this?

This research hopes to address healthcare inequity for patients by using a communication design lens to improve the experience of the Telehealth booth. One avenue to improve this experience is through designing a form of support for patients who are using the telehealth booth for the first time.

Currently, hospital resources such as brochures and booklets follow corporate templates that look indistinguishable from one another and are text heavy. The brief for this project is to challenge the way hospitals portray information by shifting away from corporate design and show what's possible with design. Designing this resource should not only look at the overall design aesthetic but also should consider the wording, language and tone of the content and emotional implications on patients.

What: Building instructional material to aid outpatients in using the telehealth booth.
Design problem: Using a creative flair to communicate to all types of patients how to use a telehealth booth in a clear concise way, while acknowledging patients' emotional needs to empower them to use telehealth.
Assets at the end: Instructional material

Goals and objectives:
Goal: overall purpose of the project

Gaining trust through enough info

- **Logistical:** Ensuring the experience of using a telehealth booth is as smooth as possible, while helping patients learn how to use a new service
- **Emotional – building/maintaining trust:** Justifying the reason why patients' care has been moved to a virtual format and reassuring that they will get the same quality care as they would in person.

through content?

- **Patient empowerment:** Giving patients control of their experience through an accessible resource that will allow them to feel confident in navigating the appointment with minimal assistance.

How can I incorporate all these aspects into one prototype?

Objectives: a concrete measure of success
Create a resource that can assist with the use of the telehealth booth

Target market/audience

- Outpatients of WDHB who've been given a telehealth appointment or who are interested/are thinking of using telehealth
- 18 years old and above
- Different tech abilities and health literacy levels
- Limited access to at-home technology/the Internet?

- Will be using my resource when they're asked to take telehealth appointments and need to come into the center and take the call - receive this before or during appointments

Schedule - Need to refine this^ ***Make this a separate document***

Project deliverables
What is expected at the end?
Printed resource

Usability

- Visuals MUST include graphics
- **Messaging:** think about how tone of the content will be. It should be positive, catering to different digital and health literacy levels by using simple language.
- **Chronological:** Emulate every step of the process as accurately as possible for patients to easily follow
- **Content:** This resource should be accessible to patients from all backgrounds: think about how font-size/layout/line spacing/colour/contrast/types of imagery etc. affects legibility and visibility

cultures / languages / abilities

Accessibility
Physical → locating the booth

- Entering the physical booth
- Ramp access

Information

- Make the information easy to find so the patient can refer back to it easily
- Providing enough information:
  - Equipping patients with what they need throughout every part of the journey – before, during, after appointment.
  - **Digital troubleshooting:** providing assistance with using the technology involved with the appointment
  - **Emotional:** Helping patients understand the concept of telehealth, giving reassurance that there is support available to build some trust in the healthcare system.

Design:

- Must include imagery
- **Text:** should be legible and not text-heavy. Font size should reflect the various abilities of audience.
- **Suitable for patients**: easy to follow
- **Creative freedom:** explore different graphic design styles that challenges the standard corporate hospital design, showing the importance of design in a health context.

APPENDIX F

FEEDBACK SURVEY QUESTIONS

- How confident would you be using the Telehealth booth given this information?
- Can you see yourself using Telehealth in the future?
- How easy was the information to understand?
- Does anything seem out of place or unnecessary?
- Was there anything that surprised you in the process? If yes, what?
- What do you think we could do better?