

Inclusive Communication Platform for Immigrant Pregnant Women

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Abstract

Canada is a country with a significant multicultural population, and with social issues of significance arising from this diversity. Linguistic and cultural barriers in healthcare are one of the social problems that immigrant people in Canada, especially people with Low English Proficiency (LEP), struggle with. Among them, immigrant pregnant women are a group that has been little studied. This research study focuses on Korean immigrant women and their experience of maternity care in the Toronto area.

The study used an online survey and co-design process to discover if and how women's maternity care was impacted by LEP and to examine whether the web-based information design could improve from a user experience perspective. The findings suggest that potential solutions for improved user experience can be designed, by integrating user codesign strategies with existing web-based technologies currently in use in healthcare fields.

Acknowledgements

Under the COVID-19 situation, it was not easy to conduct this project as per the original plan and schedule. I had plenty of support from my advisors, colleagues, participants, and my family.

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Abstract

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Chapter 1 Introduction

My wife and I landed in Toronto, Canada as immigrants in 2012. My English level was a little higher than the average of South Korean immigrant in my estimation; however, I can say that my wife was within the group of people with Low English Proficiency (LEP). There were some moments that she felt linguistic obstacles due to her English skill in daily situations. However, she started to experience huge language barriers during her pregnancy. I witnessed how my wife was struggling during this time, and her experience was the starting point of my consideration of the importance of better communication for immigrant women during pregnancy and birth.

1.1 Background

Canada is one of the most multicultural countries in the world. Over 20% of the total population is foreign-born, the highest proportion among the G8 countries. The 2011 National Household Survey (NHS) reported more than 200 ethnic origins. Moreover, 19.1% of the total population identified themselves as a member of a visible minority group (Immigration and Ethnocultural Diversity in Canada, n.d.).

There is a growing awareness that the health care system in Canada is underserving certain population groups (Bowen & Canada. Health Canada., 2001). My literature review showed that studies related to obstetrics and gynecology indicate that some women are disadvantaged due

to language barriers. For example, a recent study showed that anxiety, depression, and stress during pregnancy are commonly seen in women, and that anxiety and stress have a substantial negative impact on both mother and baby (Hasanzadeh & Faramarzi, 2017). Miszkurka et al. (2010) reported that immigrant women had a higher prevalence of depressive symptomatology regardless of the length of time since their immigration. Immigration effects on mental health may be powerful during pregnancy, a period of increased vulnerability to depression (Author et al., 2010).

1.2 Problem Statement

The field of physical problems during pregnancy has been advanced scientifically (Hasanzadeh & Faramarzi, 2017), however, the effect of mental problems on the health of pregnant women is still considered an important issue that needs further research. Immigrant women are at risk for depression, and pregnant immigrant women may be at exceptionally high risk. A study of a community sample of pregnant immigrant women found that these women were at high risk for depression, with 42% scoring above the cut-off point on the EPDS (Edinburgh Postnatal Depression Scale), which was used to measure depressive symptomatology (Zelkowitz et al., 2004).

Shahhosseini et al. (2015) indicated that pregnancy is one of the most stressful events in a woman's life and can lead to emotional crisis that, if not adequately managed and controlled, could become a prolonged problem, with many undesirable consequences for the mother and

her baby. A mother's anxiety during pregnancy can be linked to her child's wellbeing, including emotional problems, hyperactivity disorder, and disturbance in the cognitive development of children (Shahhosseini et al., 2015).

Language barriers might be contributing to adverse effects on patients, such as anxiety and stress. A few studies have examined health care satisfaction among non-English speakers in the United States; these studies have shown the negative impact of language barriers and lack of proper communication on patients' satisfaction (Mahmoud & Hou, 2012).

1.3 COVID-19 and Post-Pandemic

The pandemic situation of COVID-19 has been impacting our social lives seriously. According to Statistic Canada (2020), outbreaks of infectious diseases can be associated with a great deal of fear of contracting the disease, which, in turn, can lead to feelings of anxiety and mistrust within the general public. A study at the beginning of the pandemic lockdown found that immigrants were more likely to be concerned about both the health and social impacts of the pandemic (Hango, 2020). 29% of immigrants were afraid of being the target of unwanted behaviours, compared to 17% of Canadian-born. This means that my research topic became a more significant public issue during my study because of the pandemic effect.

For this project, I considered the following research questions:

1. How do language barriers and cultural differences impact pregnant newcomers with Low English Proficiency (LEP)?

2. How could immigrant pregnant women's emotions and mental health be improved during pregnancy?
3. Are there design studies that experiment with how language barriers could be overcome for immigrant pregnant women?
4. What new (and existing) visualization methods and inclusive technologies could make communication more accessible between pregnant women with Low English Proficiency (LEP) and healthcare service providers such as doctors, nurses, and staff?

Chapter 2: Literature Review

I used four main strategies for my literature review: 1) a search of academic research journals and peer-reviewed articles using keywords PubMed/PubMed Central, OCAD Library, Jstor, Google Scholar, SagePub, and ResearchGate; 2) a search of grey literature using keywords Statistics Canada, the Government of Canada, IRPP (Institute for Research on Public Policy), and The Change Foundation; 3) a search of articles and information using keywords online medical platforms for distance communication; 4) viewing and analysis of Toronto GTA hospital websites including St. Michael's Hospital, Major Mackenzie Hospital, SickKids, and North York General Hospital to find out if they had done research or addressed the issues of my research project.

I found 47 articles that met my search criteria, and 16 articles were found most relevant for my scoping review. 31 of the articles did not specifically address maternity care and/or did not have enough relevance for a study of immigrant experiences related to language barriers.

My study focused on South Korean immigrants in the GTA, due to the limited timeframe (one academic year), and because I am a Korean immigrant myself and would be able to use my knowledge of both English and Korean languages within the study. This means that I could communicate with the participants without an interpreter – an important factor in this COVID-19 time. This study's research process and findings will be able to be applied to future research that could potentially include other immigrant groups and provinces in Canada.

As a fifth strategy, I searched for case studies that could have value for my project related to communications with Low English Proficiency (LEP) healthcare service users. I compared two different articles to determine what design challenges have been conducted and what kinds of practical technologies and ideas can be considered for overcoming language barriers in healthcare. The case studies were valuable in considering the potential solutions discussed in Chapter 5. They were studies of: 1) a cross-lingual mobile medical communication system prototype for foreigners and subjects with speech, hearing, and mental disabilities based on pictograms (Wołk, Wołk, & Glinkowski, 2017); and 2) an iconic language for the graphical representation of medical concepts (Lamy, Duclos, Bar-Hen, Ouvrard, & Venot, 2008).

2.1 Limitations

There would be some populations of immigrant people who are comfortable with using English. My research scope did not include this group since they might not have severe linguistic issues as found within the group that I focused on.

My research project did not focus on immigrants with a particular disability, such as low vision, the visually impaired, or people with hearing loss. It is another important area of study; however, this is beyond the scope of this study.

It should be noted that midwifery practice is concerned with a holistic approach that includes the psychological and emotional aspects of birth. Midwifery practices might take care of each woman's specific psyche and bio-social needs more than obstetrics and gynecology.

Considering this, further studies should consider the differences between these two models of care for immigrant women. Based on searching the literature, there are not enough design research studies exploring visual communication challenges for overcoming language barriers using visualisations, symbols/diagrams, and images.

2.2 Knowledge Gaps

The Ontario government's discussion paper, "Patients First", outlines the next set of reforms being proposed to deal with some of the challenges of the health care system, in order to create a more 'responsive' healthcare system (The Change Foundation , 2016). With the need for accessible diversity in healthcare, language barriers and how they affect immigrant experience within healthcare systems are serious problems that we cannot ignore. They should be included in further efforts to develop responsive and inclusive care.

Based on my literature review, there is a gap in the current knowledge and practice related to the immigrant population's discomfort with healthcare during pregnancy and childbirth. As mentioned earlier, immigrant pregnant women tend to feel isolated from healthcare environments due to their linguistic and cultural barriers, and since pregnancy can be a stressful experience, it is important to pay more attention to increased support for this group during maternity care (Shahhosseini et al., 2015). A study by Ford and Anne (1994) discussed immigrants and refugees in Toronto, Ottawa and Kingston who expressed emotionally charged views of unjust or culturally problematic care during pregnancy and childbirth in the Ontario healthcare system. Further contemporary study is much needed, and this project contributes to this effort.

My design research project focused on the main knowledge gaps that I found: 1) how do immigrant women feel about communication with healthcare system/providers during their maternity care? and 2) what kinds of strategies, if any, are being used to improve communication with immigrants during pregnancy and childbirth? Through the online survey (Phase 1) and online co-design session (Phase 2), the project explored the potential for using visual communication design as an inclusive design approach to alleviating stress for Ontario's immigrant women engaging in childbirth. This study included the interrelationship between emotional perspectives and user experience, since the ability to express and recognize emotions are central to human communication, and linked to behaviour (Sharp et al., 2019). With online communication largely replacing direct human interface, further study about

emotional aspects of user experience would be valuable for further practical solution development.

Chapter 3: Research Methodology

My research topic focused on a social and human problem related to language barriers and healthcare fields. I utilized two primary methods based on a qualitative research approach: online survey (Phase 1) and online co-design exercise (Phase 2). This methodology offered flexibility, as it could evolve contextually in response to the lived experience encountered during the processes of the study (Creswell, 2008).

Through the analysis of Phase 1 and 2 data, I believed I could have a specific hypothesis and pattern for the design solutions. In a 2009 study, Ryan et al. (2009) found that interview techniques were important to maximizing results. For my study, an online survey method was needed, due to the pandemic, and the survey questions were carefully designed to both gather specific information and encourage deeper reflection and a more personal/emotional response.

The invited participants were limited to Korean immigrant groups in GTA as the main stakeholders. Here are the stakeholders:

- Korean immigrant women who have given birth in Canada
- Korean immigrant women who are currently pregnant

- Korean immigrants who have had the experience of language or cultural barriers in healthcare facilities in Canada

I created an invitation advertising poster (PDF) and website to recruit potential participants.

Due to COVID-19, it was impossible to meet people or visit somewhere directly, so I used online recruitment methods such as email, phone calls, and posting SNS. Here are the online groups and NGOs that I contacted:

- Toronto's Korean Mothers Online Group of Naver (Naver is a Korean SNS platform)
- Love Toronto
- KCCA (Korean Canadian Cultural Association of Metropolitan Toronto)
- KPWA (Korean Professional Women's Association)
- KCWA (Korean Canadian Women's Association)

To make the participation simple and straightforward, it was one continuous online process from invitation advertising to participation. From the invitation advertising poster (PDF) or website, people could read the summary of my study. Then, they could open the consent form website from the invitation poster or website. The consent form website showed all the necessary information that participants should know and understand. There was a screening question section that filtered whether the person was suitable for this research or not. If the person was distinguished as a suitable participant, it showed a link to the Phase 1 online survey website. Figure 1 shows the entire flow of how participants join this research.

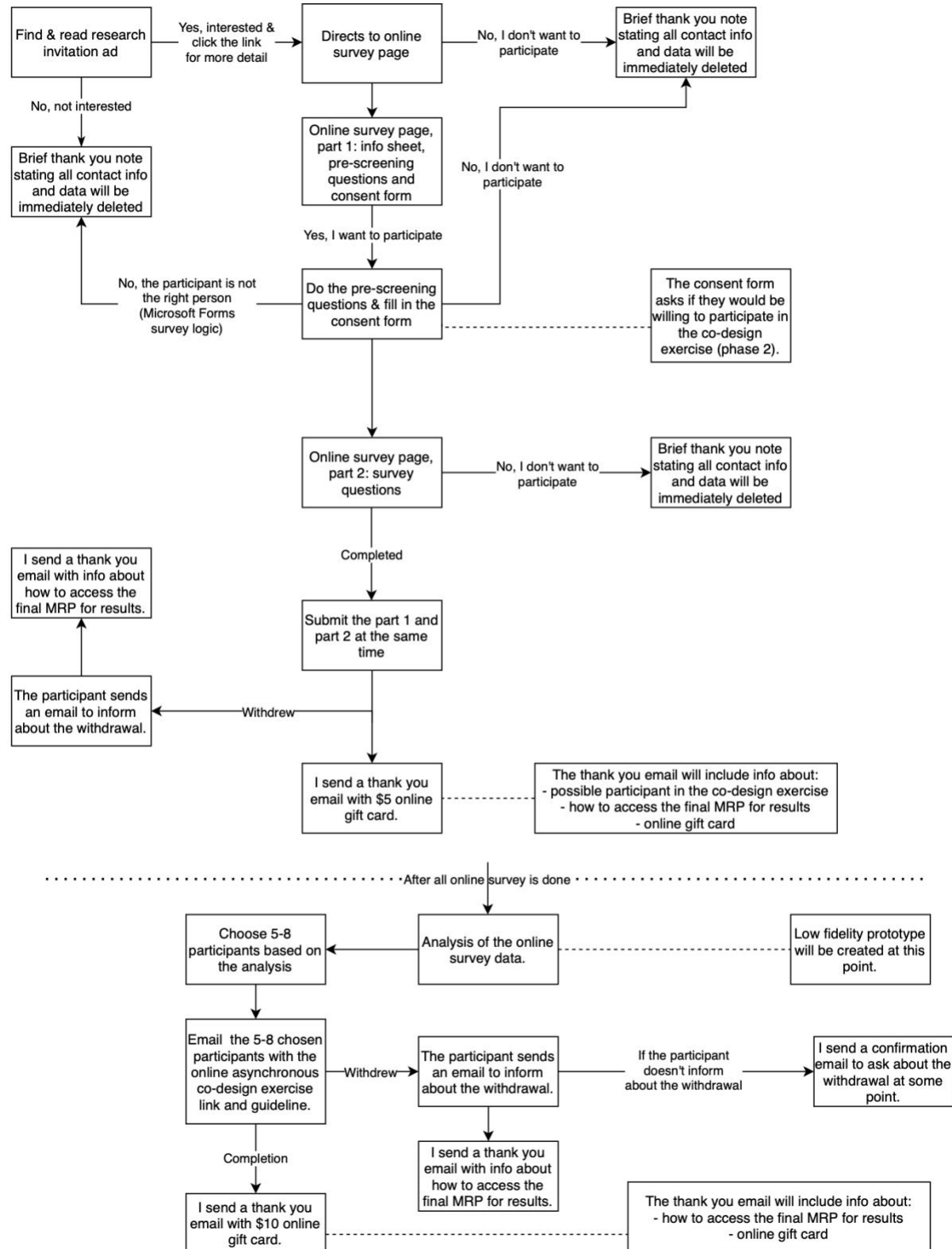


Figure 1: User Flow from Invitation to Participation

The Phase 1 online survey was opened to anyone eligible for the screening questions. However, due to constraints of the project, only six women could participate in Phase 2. The six participants were selected based on the analysis of online survey data – selection criteria were based on subjects providing more specific information, showing more interest in the problem, and providing diversity of considerations/problems.

Also, all documents and contents, including invitation letter, consent form, online survey, and co-design exercise, were prepared digitally in English and Korean. The participants could choose the language that they preferred. The provided documents – including the invitation letter, consent form, and questionnaire contents of the online survey and co-design session – are attached in the Appendix section.

3.1: Online Survey

Through the online survey I received initial asynchronous feedback from participants about my topics and ideas. As a result of the invitation advertising poster (PDF) and website, I had a total of 35 participants who understood and agreed with my research and passed the screening questions. Among them, 27 participants agreed to join the future research if there is a further study, and 21 participants positively answered to participate in the Phase 2 online co-design session if selected. The survey questions were aimed at gathering data about participants' experience and their emotional motivations about language barriers.

3.2: Online Co-Design Session

Due to COVID-19 restrictions, the co-design session was conducted as a web-based session asynchronously and individually. Through the online whiteboard tool, MIRO, I set ten online exercises using some interactive materials like visual images, audios symbols and metaphors. I expected to find out more about how these representative stakeholders felt about their ability to find out information, and communicate with caregivers, during pregnancy and childbirth.

Also, this phase was designed to define key problems so that possible design solutions could be part of the outcomes of the study. Based on the analysis of Phase 1 online survey data, I invited six diverse participants to continue to the online co-design session.

3.3 OCAD's Research Ethics Board

My research included human subjects, immigrant pregnant women, and this could be considered to be a vulnerable group and topic, including both emotional sensitivity and privacy concerns. This study has been reviewed and received ethics clearance through the Research Ethics Board at OCAD University. The REB number is 2020-87.

Chapter 4: Results

The gathered data from Phase 1 and 2 provided opportunity to understand what women experience and what they desired as LEP users of maternity services/care. The data helped me to confirm and modify my understandings that could inform design directions for improved services for LEP healthcare user groups. My final results do not provide a completed design prototype output; however, clear and logical design directions emerged from analysis of the data, as discussed below.

4.1 Phase 1: Online Survey

Background and English Level

The 35 participants of the online survey were all immigrant women from South Korea, aged 26 to 41. 11 participants arrived alone, and 23 participants arrived with their husband. 60% (21 participants) arrived in Canada as a landed immigrants with permanent resident visa status. Their English level as self-assessed was varied. Their answer to my survey question about English level showed that they felt more comfortable with reading and listening than speaking, writing and comprehension.

- **6 participants** answered that they feel difficulty with using English.
- **6 participants** answered that their English level is for only simple conversation in daily situations.
- **1 participant** answered that she has academic experience at a college in Canada.
- **1 participant** answered that she feels a feeling of fear with English.

The data shows that participants are not comfortable with using English in situations other than in daily ones. I believe that a higher English level is required for conversations about pregnancy and childbirth, and LEP would make them feel more anxious.

Pregnancy and Birth

For the caregiver choice of pregnancy and childbirth, OBGYN and midwife were the most selected options (Table 1).

Caregiver Options for Your Pregnancy Care	
OBGYN	21
Nurse/Practitioner	0
Midwife	18
Doula	1
Other	0
Caregiver Options for Your Childbirth Care	
OBGYN	22
Nurse/Practitioner	1
Midwife	19
Doula	1
Other	0

Table 1: Caregiver Options

83% (29 participants) experienced childbirth in Canada from 2018 to 2020, and three participants expected their birth in 2021 (Table 2). Only 1 person answered as home birth, and the others answered as birth in hospital.

Childbirth in 2018	8 Participants	Before 2019: The participants who have experienced their pregnancy and/or childbirth before 2018 would not have COVID-19 experience in Canada.
Childbirth in 2019	9 Participants	After 2019: The participants who have experienced their pregnancy and/or childbirth after 2019 would have COVID-19 experience in Canada.
Childbirth in 2020	12 Participants	Officially COVID-19 in Canada: First presumptive case in Canada on January 25 th , 2020.

Table 2: Childbirth between 2018 and 2020

Here are the places of birth:

- North York General Hospital
- St. Michael's Hospital
- Grand River Hospital
- Oakville Trafalgar Memorial Hospital – Halton Healthcare
- Royal Victoria Regional Health Centre
- Scarborough Health Network – General Hospital
- The Ottawa Hospital Civic Campus
- St. Catharines General Hospital
- William Osler Health System – Brampton Civic Hospital
- Regina General Hospital
- Lasalle General Hospital
- IWK Health Centre
- Sunnybrook Hospital
- Victoria Hospital

- Michael Garron Hospital – Toronto East Health Network
- Home Birth

20 participants gave birth before 2020, and 15 gave birth in 2020. 3 participated during their pregnancies (in 2020). 2020 group experienced pregnancy and birth during the COVID-19 pandemic, which would be very different and more difficult than the pre-COVID group's experience.

Impact of COVID-19

During this pandemic, the main communication approaches were both distance methods and physical meetings in person. 11 participants answered that phone calls were the primary communication method, and 12 answered that they had meetings/conversations in person.

Here are essential quotes from some participants:

- The face-to-face meeting is still needed for some treatments and consultations such as blood tests, ultrasound, regular check-ups, or injections.
- I had some phone consultations instead of visiting in person.
- The usual consultation term is once a month, but it became every 6-7 weeks due to the COVID-19 restrictions.

Many participants mentioned their difficulties in a pandemic situation. The difficulties are varied but mainly about the confusion of the hospital's COVID-19 restrictions, delays, and conversation on the phone (Table 3).

6 participants	The process and waiting time for tests and treatments were too late and complex. The tests were delayed several times due to COVID-19.
5 participants	They needed to visit the healthcare facilities without their husbands because only patients are allowed to enter facilities. Even after giving birth, they had to care for their newborn babies on their own without anybody at the hospital.
2 participants	They found language difficulties from the conversation by phone.
2 participants	Some adverse effects on their mental and physical issues include 'anxiety and stress thinking under the pandemic' and 'difficulty breathing due to wearing a mask'.
1 participant	Her husband had to go to work and come back to the hospital, but the process to re-enter the hospital was so complex and challenging.

Table 3: Difficulties in Pandemic

Among the group who experienced pregnancy and/or childbirth in COVID-19, 12 participants out of 15 answered they experienced an impact from the pandemic in healthcare. Here are important comments from their specific stories:

- It was inconvenient without husbands' help because only the patients could enter the facilities.
- The complex and slow process in the hospital was painful—changed hospital policy, limited number of family members, long waiting time even with a reservation, limited belongings, and severely controlled access.
- I felt communication difficulties in English with the healthcare staff by phone.
- I experienced physical and mental health issues—difficulty breathing due to mask, depression, anxiety, and less outdoor activities.
- It was challenging to see the doctor in when an emergency.
- After giving birth, only one family member was allowed to bring my baby for a regular check-up.
- It was challenging to get the care service for my baby and me in person after childbirth.

From the comments, many participants mentioned needing their husbands' help, but some hospitals had restrictions that their husbands were not allowed to visit together because of

COVID-19. I assume that they felt more stressful and nervous without their husbands, and it was one of the potential reasons for depression and anxiety.

Several women answered that they didn't experience any impact or negative changes due to the pandemic during their pregnancy and childbirth. Here are some quotes from the participants:

- The waiting time for specific tests became shortened.
- I felt that I had received more attentive care for my baby and me.
- I felt safe when I saw the facility tried to control the visitors.
- It became a little bit inconvenient, but it did not change too negatively.

After experiencing their pregnancy and childbirth in this pandemic, most participants in the group answered that they prefer using both physical visiting and remote communication methods (11 participants out of 16). Four participants still prefer to visit in person directly, and one participant answered that they preferred remote communications.

Communication Difficulties

There were plenty of stories about communication issues from the participants. Most of them were about difficulties with expression of their feelings and symptoms (Figure 2). Also, many participants mentioned that they felt fear and stress about conversing with healthcare staff.

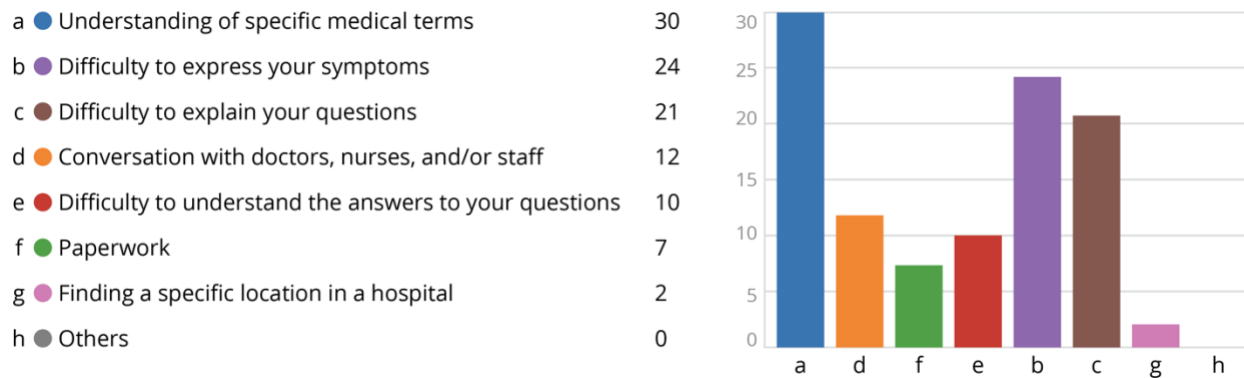


Figure 2: Communication Issues

Here are some comments about their communication difficulties:

- The hospital staff said that my reservation would be cancelled unless I visit with someone for translation.
- It was hard to express some specific symptoms so that sometimes I received more minor or more treatments than proper levels.
- I was confused because the common sense about pregnancy was different sometimes in Korea and Canada.
- My newborn baby had a high jaundice level, but I didn't understand why my baby should have been hospitalized when the nurses explained it to me.
- Due to the COVID-19 policy, I had to visit the hospital without my husband. So, it took lots of time than usual since I had to figure it out by myself in English.
- When the doctor explained something, sometimes I pretended as I understood even though I did not understand correctly.
- I wanted to ask some questions, but I gave up because I found it was difficult to explain in English.
- I could not understand the conversations with doctors or staff in the hospital, so I was always worried about any problem that I missed.
- I prepared common words and questions every time before I visit the hospital because of the burden of language.
- I was always not sure whether I understood correctly or not.

The uncertainty – those participants were not sure whether they understood correctly or not – seemed to be the main reason they felt fear and stress in the conversations.

For the multiple-choice question about influence of language barrier experience, mental and emotional influence were mostly chosen answers. The participants' answers indicated that they felt nervous, anxious, and gloomy feelings because of the communication issues (Table 4). It seems clear that emotional care for immigrant pregnant women is one of the keys to improving their experience.

Mental	14
Emotion	28
Physical	2
Other	1

Table 4: Emotional Influence Numbers

Some participants mentioned that they felt enormous sadness and depression when they experienced communication difficulties (Figure 3). Unsatisfactory situations occurred during communication difficulties, decreasing self-esteem as women blamed themselves. Low English Proficiency (LEP) and difficult medical terms/words were considered the main reasons for their language discomfort. Interestingly, there are some existing translation apps and websites offering general medical information. However, participants still felt difficulties even though they used the apps and websites.

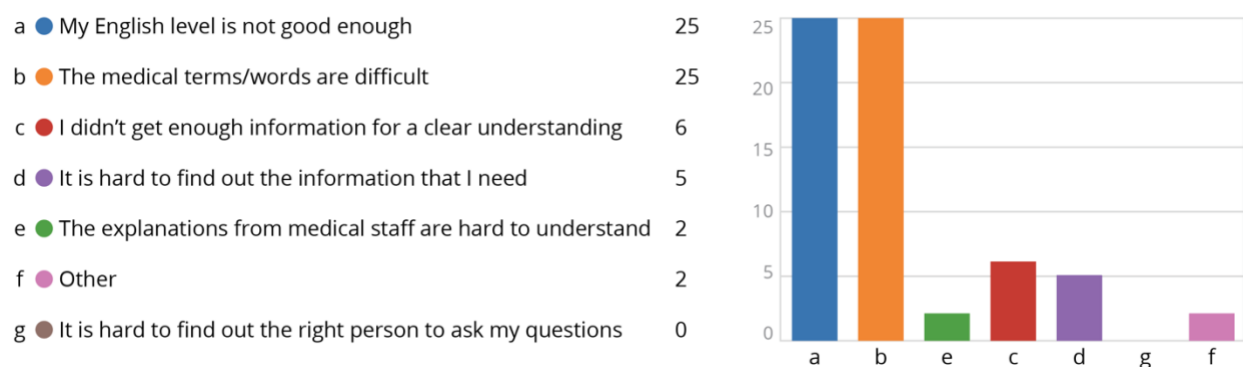


Figure 3: Situations of Communication Difficulties

Here are specific stories about their communication difficulties:

- During my pregnancy, I felt neglected because of the problem of communication with the receptionist for paperwork.
- I had a kind of urgent situation during my pregnancy. I had to talk with the midwife by phone, but it was difficult to understand.
- I had consultations with my midwife without an interpreter. I prepared my questions, and the midwife explained them as efficiently as possible and offered lots of information materials for me. It was a grateful experience.
- I could have enough time with my midwife for consultations or treatments. The obstetrician and gynecologist of the general hospital were friendly, but he was always busy, so I could not often have enough time to understand the results.
- I had a c-section at birth, but in the process, I had difficulties expressing my feelings and symptoms in English, such as tingling and feeling like vomiting.

I found that participants tended to feel comfortable and satisfied with their experience when they understood conversations and received enough information they needed.

Website, email and physically visiting were chosen as the most valuable communication methods. On the other hand, phone calls were the least useful option for communication with healthcare staff (Figure 4). In my opinion, this is related to their English level, as participants

answered that they were least comfortable with speaking. This could be the reason why they do not prefer phone call method, which relies on speaking. On the other hand, in a physical visit conversation, they could use gestures or mobile phones to communicate more fully.

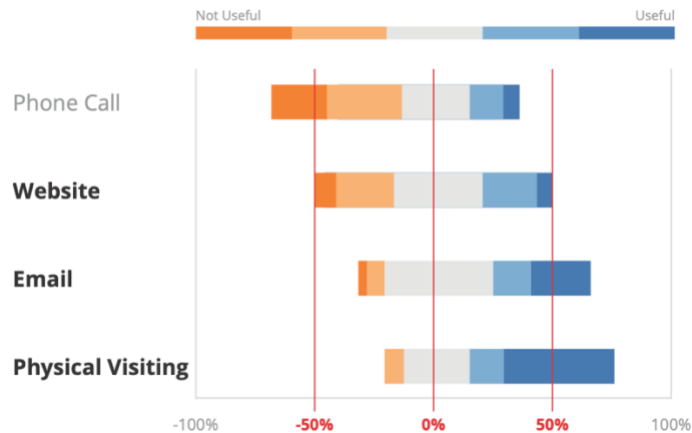


Figure 4: Communication Methods

Information Sources for Communication

Participants showed that they are familiar with various communication devices such as desktop computers, laptops, mobile phones, tablets, mobile apps, online websites, and visual meeting platforms (ZOOM or GOOGLE MEET). Among these methods, online websites and mobile apps were the most popular options. Here are the data that showed what participants wanted to get through the information sources (Figure 5):

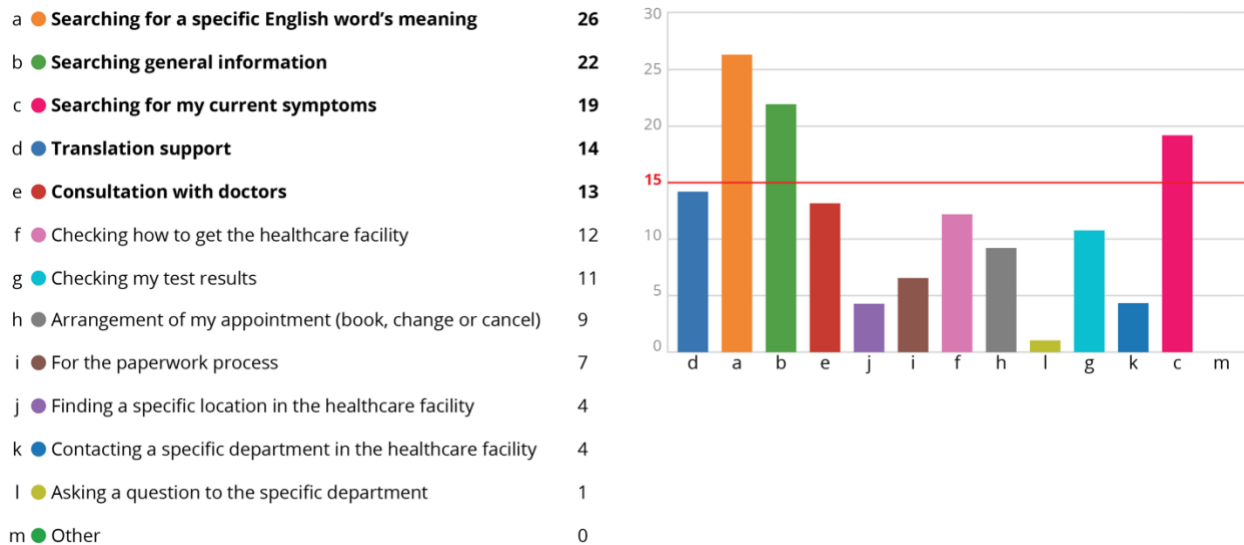


Figure 5: Purposes of Information Source Usage

Here are some quotes about the information sources and devices:

- I always carry my cell phone, so I could search immediately for a word I did not know.
- During pregnancy, I used my phone to look up the words that I do not know or get information.
- Smartphones are the most used device and necessary during pregnancy, childbirth, and after childbirth.
- You can search and find everything and compare it to the Korean pregnancy and childbirth process.
- I used my smartphone the most frequently. It was helpful in the situation that a translator was needed, such as check-ups. Also, I could explain the differences between Canadian and Korean childbirth cultures or search for things I did not know.
- I searched for medical terms that I did not understand with the mobile phone dictionary app, and if I still could not understand, I called a friend who could interpret.
- I was nervous, so I double-checked in advance and got medical treatment.

Using mobile phones and websites, participants tried to be prepared for conversations in English – with knowing the information and English words/meanings that they were not clear about. One interesting thing is that some respondents mentioned that they checked and

compared the healthcare system to Korean one. I believe that they wanted to know what different systems and processes they were going to have in Canada.

The data shows that mobile apps, online dictionaries, and websites were more valuable sources than interpreter services in supporting the women's linguistic issues in maternity care (Figure 6).

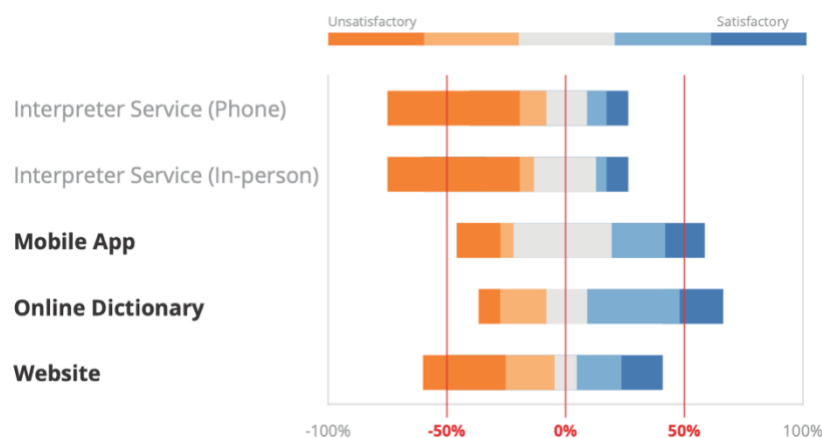


Figure 6: Satisfactory Levels of Linguistic Supports

Table 5 below shows sources of linguistic support that participants received during their pregnancy and childbirth.

9 participants mentioned	Online dictionary websites: Naver Dictionary, Prime Dictionary, and Daum Dictionary
9 participants mentioned	Translation apps: Google Translation and Naver Papago
5 participants mentioned	Online search engines: Google and Naver
3 participants mentioned	Korean online community in Canada (searching and asking other Korean mothers' experience, reviews, and questions)
3 participants mentioned	Interpreter services: in person and phone service

2 participants mentioned	Google Maps
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Table 5: Sources of Linguistic Support

The answers showed that various tools were used for diverse situations and purposes; however, participants pointed out positive and negative points simultaneously (Table 6).

Positive Feedback	Negative Feedback
<ul style="list-style-type: none"> • Searching some difficult words' meanings • With an interpreter, I felt comfortable in the situation, and I could ask more detailed questions with the interpreter. • With a translation app, I could make proper conversation when I had to ensure the ovarian bump before my birth. • It was helpful with searching some medical terms. • Useful during conversations • I searched for words that I do not know. • I prepared my symptoms and questions through the dictionary and translation app before I see a doctor. • I searched for some answers to my questions. 	<ul style="list-style-type: none"> • The tools were not helpful to make a perfect English sentence based on what I wanted to say. • It was helpful, but I could not figure out more specific answers to my questions. • I felt that the interpreter was listening to my personal information, so that I felt a little bit ashamed. • I found that there were some different expressions and medical terms used in Korea and Canada. • It was challenging to find specific words quickly during a conversation. • I was not sure whether the translation app correctly translated for my symptoms or not. • There was a problem that the translator could not work well.

Table 6: Feedback about Linguistic Support Sources

The list above shows users' positive and negative experiences of interpreters and digital tools. 91% of respondents (30 participants) stated that digital communication tools were valuable in helping with their language barriers, and only three participants (9%) found them problematic.

In other words, participants were open-minded to use of new methods for communication and getting information. Based on their experience with the tools and services, they offered some points about how they could be further improved:

- I wish there is an automatic translation functionality when I take to communicate with a doctor.
- I have experience with using ZOOM meetings. I thought it was convenient and safe in this COVID-19 times.
- My English level is not good enough for a phone conversation. I prefer to take communications through emails.
- I wish we can report symptoms and questions to the doctor through apps or websites.
- In Canada, it takes time to connect to a department or office in the hospital by phone. I think the system should be improved so that we can get help immediately.
- It is not easy to get connected by phone call meetings, and sometimes it is hard to understand English on a phone call.
- I think people would feel more comfortable and safer through email or ZOOM meeting communications.
- A phone is a challenging option for people who do not have enough English level.
- Virtual meeting communication in real-time like ZOOM seems to be convenient. Also, we can see the faces of each other. However, due to the lack of English level, people might feel fear with conversations in English. So, it would be great if there is a way to overcome the fear using the tools.
- I wish the translation system would be improved more. For example, I simply touch a button on my phone for the translation function.
- I hope the communication methods can be improved by focusing on convenient and diverse communication options.

From participants' feedback, they are willing to use new technologies, such as virtual meetings, apps, and websites. However, the existing technologies are not friendly enough to people with Low English Proficiency (LEP). The lack of user experience perspectives that specifically bring out the experience of immigrant women should be understood as a significant current gap.

4.2 Phase 2: Online Co-design Session

The online co-design session was designed to collect more profound feedback and more particular experience from selected participants. In this phase, six subjects took part in the online co-design process using the Phase 1 online survey's data analysis. They participated in the online whiteboard platform, MIRO, asynchronously and individually.

Session 1: Hospital website exploration (hospitals in GTA)

Participants chose one of the ten hospitals in the list—North York General Hospital, St. Michael Hospital, Grand River Hospital, Oakville Trafalgar Memorial Hospital, Royal Victoria Regional Health Centre, Scarborough Health Network, St. Catharines General Hospital, William Osler Health System, Sunnybrook Hospital, and Michael Garron Hospital. Each participant explored the hospital website they chose with various points based on a given scenario and mission (Table 7).

Scenario	Mission
You are currently 6 months pregnant, and you have a doctor at this hospital. You have an unusual symptom with your body. So, you would like to check your symptom on the hospital website first. Then, you would like to contact the OB doctor's office to make sure of your symptom.	<ul style="list-style-type: none">• First, find the pregnancy and childbirth info page on the website and see if you can find any information about your symptom.• Then, try to find out the contact information of the doctor's office (phone number and/or email address).
Selected Hospitals by Participants	Selected Symptoms by Participants

<ul style="list-style-type: none"> • 1 Sunnybrook Hospital • 2 North York General Hospital • 1 St. Catharines General Hospital • 1 Royal Victoria Regional Health Centre • 1 William Osler Health System 	<ul style="list-style-type: none"> • 1 Sudden labor pains • 1 A lump found in the ovary • 1 Persistent pain in the belly • 1 Leg numbness • 2 Back pain
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Table 7: Hospital Website Exploration

According to the participants' feedback about the symptom information mission, only one participant could find the specific information from the hospital website. The other five participants failed to find the information about their selected symptoms. Also, figure 7 shows the feedback concerning level of satisfaction with website experience, based on five categories: easy to navigate, clear information, visual clarity, language options, and user-friendly design.
















	Very Unsatisfactory	Unsatisfactory	Neutral	Satisfactory	Very Satisfactory
Easy to Navigate					
Clear Information					
Visual Clarity					
Language Options					
User-friendly Design					

Figure 7: Hospital Website Experience

Here are some important comments based on the website exploration.

About 'Easy to Navigate' Category:

- I am worried that it might take some time to reach the OBGYN department.

- Information search was easy, but it seemed that only limited information was provided.
- I could not find the doctor's office information. There was a note that they would reach me if I left a message to the general contact.
- There is a search box, but the appropriate information does not appear even if I enter the information I want.
- I had to try some links to find the information, but I could make it anyway.

About 'Clear information' Category:

- I found each departments' contacts and programs clearly. However, I could not find the information that I want.
- I do not see the page that explains symptoms. There is just information that I need to visit ER when an emergency.
- The information was not clear to find. Some information is in PPT format, so I must download it first to see the information.
- I found the page, Common Discomforts of Pregnancy, which explains the symptom well.

About 'Visual Clarity' Category:

- The icons and proper text sizes help to understand the information visually.
- I like the simplicity in that I can see the information quickly.
- I could see the web pages with clean layouts.
- The information looks clean.

About 'Language Options' Category:

- I did not know about the language option before.
- I wish they offer the Korean option too.
- There are only English and French options. It might be harder for people with low English levels to use the website than others.

About 'User-friendly Design' Category:

- I liked the text font and colour tones.
- It was a well-designed, clean, and straightforward homepage as a hospital website.
- I think the searching box is useful, but the results were not that helpful.
- I do not see any unique point of user-friendly design.

Other Interesting Quotes:

- For example, Korean hospital websites usually have a page that people leave questions and staff answer the questions. Nevertheless, here in Canada, I do not see any of the pages. Canadian hospital websites provide the general contact information of each department.
- I wish I can search pregnant women's common symptoms through the website. It will be useful to decide whether I should go to the ER or not.
- I will use Google instead of the hospital website.

Based on participants' feedback, I found that they tended to focus on the information itself rather than visual designs of the websites. Many of them mentioned that it was difficult to find a particular information that they tried to see. One thing that I would like to mention is that most of the websites were missing language options other than English and French even though they are representative hospitals in GTA that have many immigrant visitors.

Session 2: Hospital website exploration (NorthWestern Medicine in Chicago)

This session was a similar exercise to session 1. However, there was only one hospital website on the list—NorthWestern Medicine in Chicago. The hospital website was recently designed and chosen for this session 2 as an example of a well-designed website that provides a better

user experience for patients and visitors. Each participant explored the hospital website with various points based on a given scenario and mission.

Scenario	Mission
<p>You are currently 6 months pregnant, and you have a doctor at this hospital. You have an unusual symptom with your body. So, you would like to check your symptom on the hospital website first. Then, you would like to contact the OB doctor's office to make sure of your symptom.</p>	<ul style="list-style-type: none"> • First, find the pregnancy and childbirth info page on the website and see if you can find any information about your symptom. • Then, try to find out the contact information of the doctor's office (phone number and/or email address). • In this scenario, your OB doctor is "Jessica W. Kiley, MD" in the Obstetrics and Gynecology department of Northwestern Medicine hospital.
Selected Symptoms by Participants	
<ul style="list-style-type: none"> • 1 Sudden labor pains • 1 Persistent pain in the belly • 1 Itching • 3 Back pain 	

Table 8: Hospital Website Exploration – NorthWestern Medicine

From the exploration of the website, all six participants completed the given mission—they found the specific doctor's office contact information on the website (Table 8). For the symptom information mission, four participants successfully found the specific information about their selected symptom from the website, but the other two participants could not find

it. Figure 8 shows the feedback concerning level of satisfaction with website experience, and it shows the comparison of rated satisfaction in both sessions 1 and 2.



Figure 8: Hospital Website Experience – NorthWestern Medicine

Compared to the session 1, the website experience of session 2 offered more satisfactory results to participants. However, the website of session 2 also did not provide language options other than English.

Here are some important comments based on the website exploration:

About 'Easy to Navigate' Category:

- It was easier to find the information that I want, comparing to the Sunnybrook website. Also, the website menus are well-organized, so that I could search the information quickly.
- The search box shows the related information when I put an English word there. It looks nice and working well if there is no linguistic problem.
- I could see the information of symptoms through one of the website functions, Symptom Checker.
- It was not difficult to find the doctor's information. I could search using just the name.
- It was challenging to find symptom-related information, but medical staff information was accessible.

- There was a separate search box to find medical staff, so it was no difficulty.

About 'Clear information' Category:

- It was nice that I could see the doctor's photo and information when I search the name.
- The information is clear and accurate.
- I could see doctors' contact information of the corresponding departments by symptoms.
- I like the point that the website shows medical staff's background, including their education levels.

About 'Visual Clarity' Category:

- Visually, it was easy to understand the information there.
- Unlike North York General hospital, I could search information by a doctor's name. Also, the result shows the doctor's general information with a profile picture. It even provides map information of the doctor's office. These designs helped me to understand the website well.
- Each symptom showed human diagrams as well.
- Overall readability and menu arrangement were good.
- It is a design that is easy to understand visually.

About 'Language Options' Category:

- Unlike Canada, which is a multi-national country, it was based in Chicago, so it seemed that there was no language option.
- I could not find a Korean language option.
- There is no language option other than English.

About 'User-friendly Design' Category:

- I really liked that the search result shows the doctor's profile photo together.
- Thanks to the doctor's photo and video, whom I would meet, it was much more friendly and good.
- Each page has links to related information, so it is designed to be easily accessible to users.

Other Interesting Quotes:

- The search was quick and easy. The information was much more diverse. The searched doctor's picture and office map was an excellent idea.

Some respondents pointed out information with visual elements that they searched. The doctor's picture and location map offered positive effects to their emotions and feelings.

Session 3: Healthcare service/information website exploration

In this third co-design exercise, participants explored three different websites similarly to sessions 1 and 2. The three websites are healthcare information websites for pregnant women in Canada, including immigrant groups—The Society of Obstetricians and Gynecologists of Canada, Nest Stop Canada, and Government of Canada. There was no scenario and mission like sessions 1 and 2. Each participant explored the hospital website with various points, focusing on finding information for immigrant pregnant women (Table 9).

Contact Information Finding	Quotes
2 Participants out of 6 found any institution, department, group, or office contact information from the websites for immigrant pregnant women.	<ul style="list-style-type: none">• There was only a phrase on the YMCA website saying that you can proceed with a family doctor or midwife.• It was a bit vague, but I could get an idea of whom I should contact.• There was no information about a specific department, organization, or agency. They only said to find a health practitioner.
Information Searching Experience	Quotes
4 participants out of 6 thought that the websites provide accurate and precise information for pregnant women.	<ul style="list-style-type: none">• I could follow the imageries to find the information I wanted, although I did not understand each menu and its meaning.• The first website provides detailed information and explanations, such as

	<p>common symptoms, good food and recommended exercises during pregnancy.</p> <ul style="list-style-type: none"> • Through the three websites, I could get general information for pregnant women. Also, one of them offered a program to calculate approximate fees for pregnant periods. However, it is still not clear where I should contact and what I should do at first. • They provide diverse information; however, immigrant women cannot get the information properly without language options. Lack of accessibility of information. • They look like information websites for pregnant women, not for immigrant pregnant women, specifically.
Language Options	Quotes
No one found that the websites provide language options for non-English speakers.	<ul style="list-style-type: none"> • As a member of immigrants, I wish they offer functionality that can automatically translate into each language. • It still takes a lot of time to understand the information due to English. • Only English and French options.

Table 9: Healthcare Service/Information Website Exploration

Figure 9 shows the feedback concerning level of satisfaction with website experience. Overall, participants found positiveness with the websites, except language options and visual clarity, confirming that websites that offer information for immigrant people need to focus on diverse language options, basically. Negative feedback on visual clarity was mostly related to the texts of explaining paragraphs; however, this would be improved if the websites offer language options that viewers can understand well.

	Very Unsatisfactory	Unsatisfactory	Neutral	Satisfactory	Very Satisfactory
Easy to Navigate			● ● ●	● ●	●
Clear Information			●	● ● ● ●	●
Visual Clarity		●	● ● ●	●	●
Language Options	● ●	● ● ● ●			
User-friendly Design			● ● ● ●	● ●	

Figure 9: Healthcare Service/Information Website Experience

About 'Easy to Navigate' Category:

- Each information is vague about where to contact and where to start at the first stage.
- Searching for information is easy. Nevertheless, it might be a challenge for non-English speakers due to lots of texts.
- If I do not know about pregnancy and do not speak English well, the information would be complex.
- All three websites have a searching function so that I could search information by keywords

About 'Clear information' Category:

- In my view, it would be better if the website has links to the hospital or midwife list so I can be accepted.
- I do not think the websites' information is clear enough due to the lots of texts.
- The information looks trustable and clear, but I cannot judge because of my English level.

About 'Visual Clarity' Category:

- Comparing to the hospital websites, these websites look a bit old.
- It would be easier if they visualize a to-do list for pregnant women, for example.
- It looks complicated due to lots of texts.

- Like other Canadian government websites, it is visually complex and has too many explanations with texts.

About 'Language Options' Category:

- They have a French option, but not other languages.
- It would be great if they offer a Korean option.
- I think that websites for immigrant people should have language options.

About 'User-friendly Design' Category:

- The last one is a complicated and tedious style like other government websites.
- Their design is not so user-friendly, but not too bad.

Other Interesting Quotes:

- I would not use these websites. I would still use YouTube or Google.
- I will not use the websites. I can use Google instead.

The government websites provided plenty of information for immigrant people including pregnant women in Canada. However, some participants mentioned that they do not prefer to use them. Specific language options for diverse viewers could no doubt increase their use.

Session 4: How to improve hospital websites and apps

Participants worked on a mind map exercise in this session. It was about what functionalities, technologies, and/or services would be ideal for immigrant people, especially for pregnant women and mothers with newborn babies.

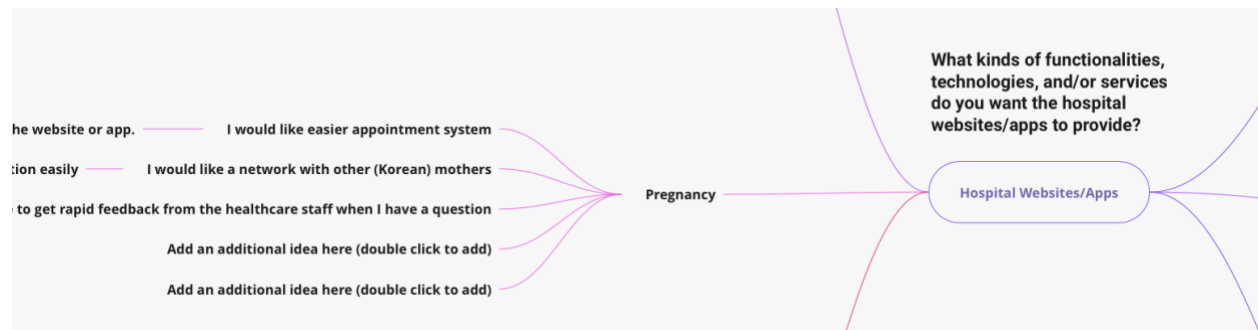


Figure 10: Mind Map Session

The mind map had some pre-written ideas under four main keywords—pregnancy, birth, after birth, and COVID-19 (Figure 10). Participants could agree or disagree with each pre-written idea, and they could freely add their ideas under the four main keywords in the mind map.

Table 10 below shows the common findings and participants’ additional ideas from the feedback of the mind map exercise.

** The numbers in the brackets mean participants’ numbers.*

Common Findings about Pregnancy	Additional Ideas from Participants
<ul style="list-style-type: none"> I would like to get rapid feedback from the healthcare staff when I have a question (5) I would like an easier appointment system (4) I would like a network with other (Korean) mothers (3) I would like to share information easily (1) 	<ul style="list-style-type: none"> I would like to know the general process, like blood and ultrasound tests, from pregnancy to birth I would like to know the information of possible childbirth methods I would like to have an integrated information website that I can get comprehensive information I would like to have timeline information that can be a guideline based on my pregnancy period. I would like to choose medical staff by myself I would like to check my test results online

Common Findings about Birth	Additional Ideas from Participants
<ul style="list-style-type: none"> • I would like to try a Virtual tour of the hospital facilities (5) • I would like to get real-time feedback (5) • I would like to do the complex paperwork through an online or mobile app (4) • I would like a network with other (Korean) mothers (2) • I would like to have answers to my questions before giving birth (2) • I would like to have answers to my financial questions as soon as possible (2) • I would like to save my time (2) • I would like to search about something I do not know well for the paperwork (2) 	<ul style="list-style-type: none"> • I would like to reduce my stress and fear before birth through something like healthcare staff's stories and experiences • I would like to where and how I should go first when I visit for childbirth. A visual map with clear instructions.
Common Findings about After Birth	Additional Ideas from Participants
<ul style="list-style-type: none"> • I would like to check my symptoms in an easier way (5) • I would like to get advice on how to care for my health after childbirth (4) • I need information and resources for a caring newborn baby (2) • I would like a well-organized website/app design for better navigation (2) • I would like a network with other (Korean) mothers (2) 	<ul style="list-style-type: none"> • I would like to know detailed information about newborn baby vaccination • I would like to search and choose a pediatrician or family doctor. Hopefully, online appointment system as well.
Common Findings about COVID-19	Additional Ideas from Participants
<ul style="list-style-type: none"> • I would like to see real-time news about the hospital's policy under COVID-19 (5): <ul style="list-style-type: none"> - what are restricted now? - Can my husband visit the facility? - How long can my husband stay at the facility? - What personal stuff can I bring to the hospital when I give birth? 	<ul style="list-style-type: none"> • How many people can accompany me?

<ul style="list-style-type: none"> - I would like a network with other (Korean) mothers (2) - I would like to share information easily (1) 	
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Table 10: Feedback from Mind Map Exercise

From the results, I found that participants want more intuitive and efficient experience such as rapid feedback from healthcare staff and easy processing of paperwork. Moreover, many of them mentioned about desiring more opportunities to share their stories and experience with healthcare staff and other mothers. It is possible that they would be able to release their stress and anxiety level by sharing their concerns and questions.

Session 5: Considering better pregnancy information websites and apps

In session 5, participants shared their thoughts about improving pregnancy information for immigrant women. They focused on what the ideal website/app would be like, based on ten different categories. Figure 11 below shows feedback about what the participants considered the ideal websites or apps should be like.

	Very Unsatisfactory	Unsatisfactory	Neutral	Satisfactory	Very Satisfactory
Easy to Navigate					●●●●●
Clear Information				●	●●●●●
Visual Clarity				●●	●●●●●
Language Options		●		●	●●●●●
User-friendly Design			●●	●	●●●
Instantly Understanding The Translated Words/Sentences			●	●	●●●●●
Real-time Communication with Healthcare Staff				●●●	●●●
Network with Other Immigrant Mothers		●	●●	●●	●
High Technology with More Convenient Functions		●	●●●●		●
Useful Resources for Emotional Care			●●	●	●●●

Figure 11: Feedback about Ideal Websites/Apps

Here are some interesting comments about this exercise:

- I wish websites show basic steps to do for pregnancy and birth. Also, it would be easier to have a system that connects the specific staff through email or phone.
- I would like to take communicate with other immigrant women through out-of-hospital websites. Maybe, through the existing online group pages. Personally, anonymity and privacy are susceptible points.
- It was a massive fear to me when I gave birth as an immigrant woman. For example, it was very stressful to search the Canadian hospital system and process from pregnancy to birth. Thus, I want a more integrated information service. Easy accessibility to the information as well.
- Searching for necessary information and communicating with medical staff in real-time is the most important.

In my opinion, participants considered the ideal apps/websites as tools that they could feel comfortable with and that could reduce their negative emotions and feelings. Attention to their information needs – with enough resources and easy/accurate translation functionality – would fill the gaps.

Session 6: Visual language expression exercise

In this exercise, participants were asked to imagine that they were feeling concerning pain during their pregnancy. Using a human diagram and bar graph with numbers, they expressed their pain through the given visual method (Figure 12).

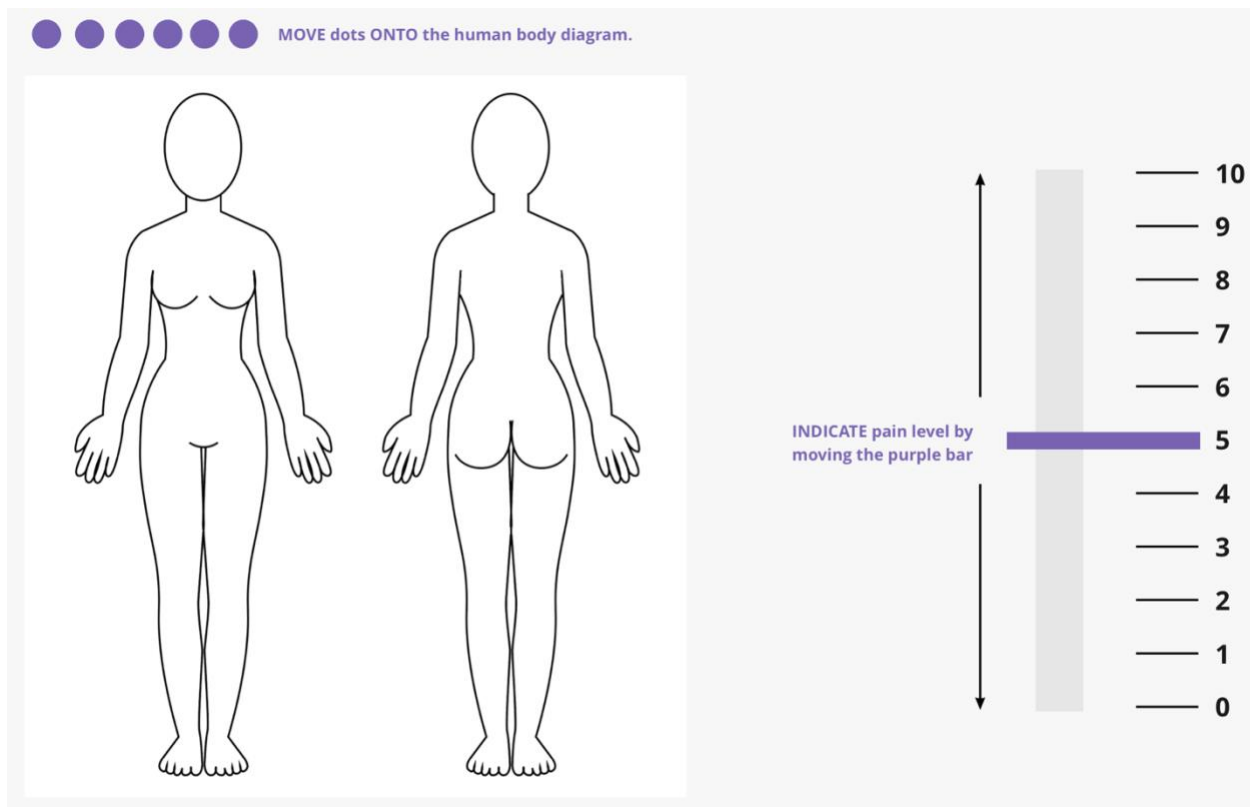


Figure 12: Visual Language Expression Exercise

Participants could move the purple dots on the human diagram to indicate their pain locations. On the right side, they could indicate the pain level by moving the purple bar. In the bar graph, number zero means 'no pain at all' and number ten means 'the pain of wanting to call an ambulance'.

Four participants out of six felt they could express their pain levels with the visual method provided. Also, four participants out of six thought that this kind of visual method would be helpful for communication with doctors, nurses, or healthcare staff. For the synergy effects, four participants out of six thought that this kind of visual method could be added to typical translation apps for synergy effects. Here are some essential feedbacks about the challenge of the visual method:

- The body diagram should be replaced with a pregnant woman's body.
- It is a great idea. I can express my pain level and where it is through the simple diagram.
- I wish I could have used this kind of visual way when I got pregnant.
- It would be better to write down the pain level, sort, and location next to the diagram in Korean.
- I wish I could express my pain was inside or outside of the body.
- Visualized language could reduce the effort and time of communication for both workers and patients.
- The sorts to indicate various pains should be more diverse and different. Also, supportive expressions could be helpful.
- I think the visual communication method is the most helpful tool for expressing my pain location and level. However, in my opinion, the pain level and sort are different when I think about back pain and calf pain. Maybe, they can be expressed in a different visual way.

I believe that, through this exercise, participants could see the potentiality of visual language, and they expanded some various ideas to improve the experience.

Session 7: Interactive visual language exercise

In this exercise, participants watched two different short videos (Figure 13). Both videos show the same conversation scene of regular consultation between a pregnant woman and a doctor in a hospital. However, the first video showed no visuals and provided only audio conversation. On the other hand, the second video showed the same audio conversation with additional information that can help the viewer understand—images, numbers, and translated medical words. After watching the videos, participants gave their impressions by comparing the two different experiences. Table 11 below shows the overall feedback.



Figure 13: Interactive Visual Language Exercise

I see the differences between the two videos. (6 participants)	I don't see the differences between the two videos. (0 participants)
The left video with only audio is better to understand the conversation. (0 participants)	The right video with multiple components is better to understand the conversation. (6 participants)
Visual information is useful for my communication. (6 participants)	Visual information is not useful for my communication. (0 participants)

Table 11: Feedback about Interactive Visual Language Exercise

Here are participants' comments about the interactive visual language exercise:

- It was way easier to understand, thanks to the images. I think that I will be nervous less.
- There was a vast difference between simple pictures and translated words.
- In fact, my midwife often explained to me with some drawings. It was easier to understand than the verbal explanations from my previous OB doctor.
- When I only listened to the audio, I listened to it several times to understand what it said, but pictures and words came out, and even Korean words appeared, so I understood quickly.
- For people who think medical English words are complex, it seems convenient and easy to understand if you use photographs or visual elements.
- I thought I could understand pretty much everything from the audio-only video; however, after watching the second video, I found I lost some points, the exact symptom, and the doctor's explanations.
- Translating complicated medical terms into Korean and showing them with related images helps a lot for communication.

I found that participants could see the difference clearly between traditional communication and new interactive methods. It seems that this could be one of the factors that could aid in to overcoming LEP language barriers.

Session 8: Potential elements for interactive communication

Through this session, participants focused on potential elements for interactive communication that may help immigrant pregnant women's communication experience. Figure 14 below shows what kind of elements they are considering the most.

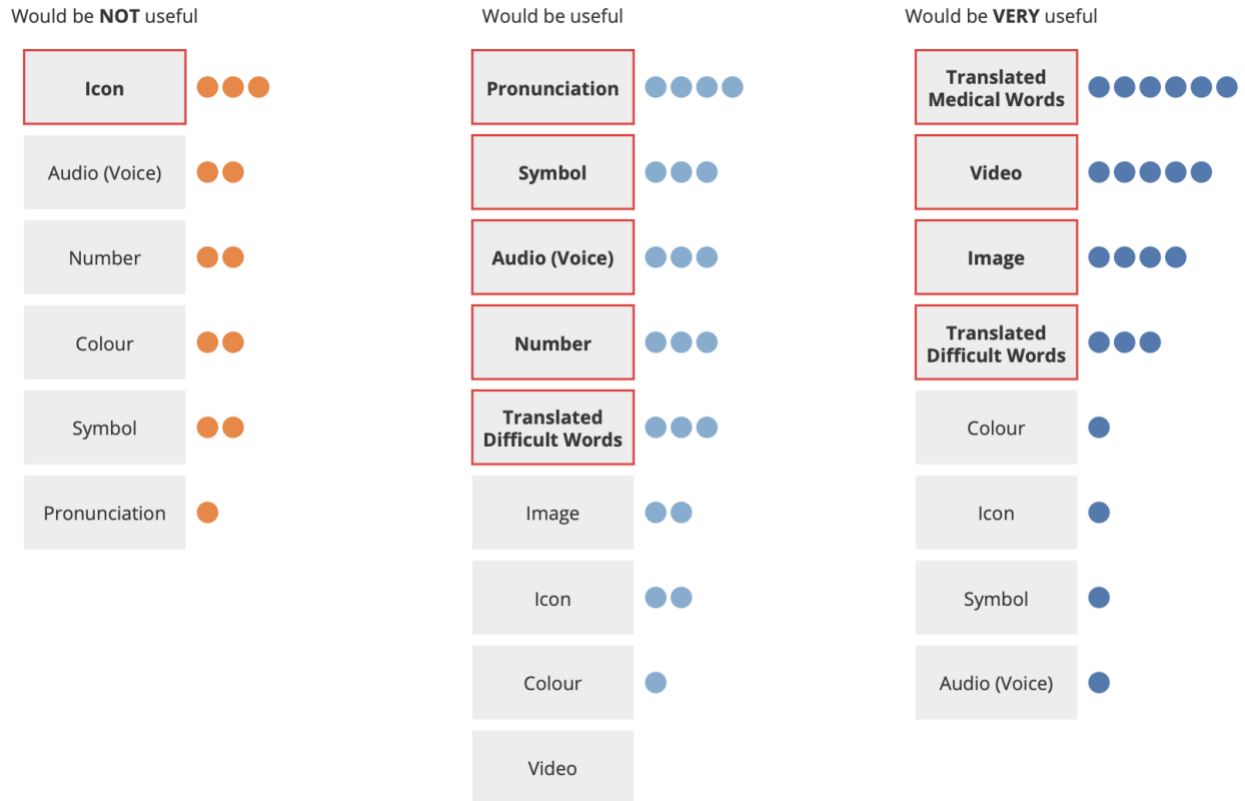


Figure 14: Answers for Potential Elements

Would be useful:	Would be not useful:
<ul style="list-style-type: none"> Diabetes test Information written in the language of each country explaining various tests It would be good if paper-made explanations about birth preparations were also prepared in the language of each country. Physical model of pregnant woman and baby 	No comment

Table 12: Additional Comments for Potential Elements

Table 12 above shows that participants gave thoughtful feedback about the interactive communication experience. Here are some important points:

- If there are more helpful resources only visually and auditorily, it will be much less tense and easier to explain and understand questions or needs to the doctor.
- I believe that interviewing and consultation with a doctor is the most important thing for pregnant women. I hope each pregnant woman should know their conditions and information correctly in a visual and well-translated way.
- Medical words are sometimes challenging, even in Korean. In English, we, immigrant people, sometimes forget the conversation with a doctor on the way home. Sometimes, we do not know how to spell a medical word, and it takes lots of time to google it.
- I wish I can record the conversation with a doctor and review it at home later. Also, I would like to double-check the recording with someone who speaks English well.
- A conversation about various medical terms or symptom expressions that we rarely encounter in general can never be more manageable. Communication in English is the most significant obstruction and stress. So, I like the idea of simple additional elements.

Through this session, participants indicated that they care about the conversation itself more than visual design elements. The supportive components, such as translated words, images, videos, and numbers, are the keywords that should be focused on the most.

Session 9: Live captioning

Most online meeting tools like ZOOM or Google Meet have a live captioning functionality thanks to advanced digital technologies, which work in real-time, showing automatic captions during the online conversation – but only if the function is turned on.

Questions	Yes	No
I know what live captioning means.	6 participants	
I knew the virtual meeting platform have the function.		6 participants

I know how to turn it on and off.		6 participants
I have used the live captioning function before.		6 participants
I could find where the function is in the platform.		6 participants

Table 13: Answers about Live Captioning Questions

Table 13 above shows the overall answers to the questions about live caption functionality. According to participants, they used the ZOOM or Google Meet several times to speak with healthcare staff. However, they had no experience with the live captioning function. Even though the functionality could be useful for supporting their Low English Proficiency (LEP), the tools did not provide user-friendly navigation on how to turn it on and off. Here are some comments about live captioning:

- I never know there is a caption function.
- Usually, I use the tool for children's online school, but I did not know about the live caption.
- Live caption can be helpful.
- Due to the COVID-19 situation, I often use the virtual meeting tool, but I did not notice live captioning.

In this session, participants showed how much they understood about live captioning and other interactive functionalities that could be useful for improving the virtual meeting experience for immigrant pregnant women. Figure 15 below shows the result about what functionalities are considered as useful or not useful for online meeting platforms.

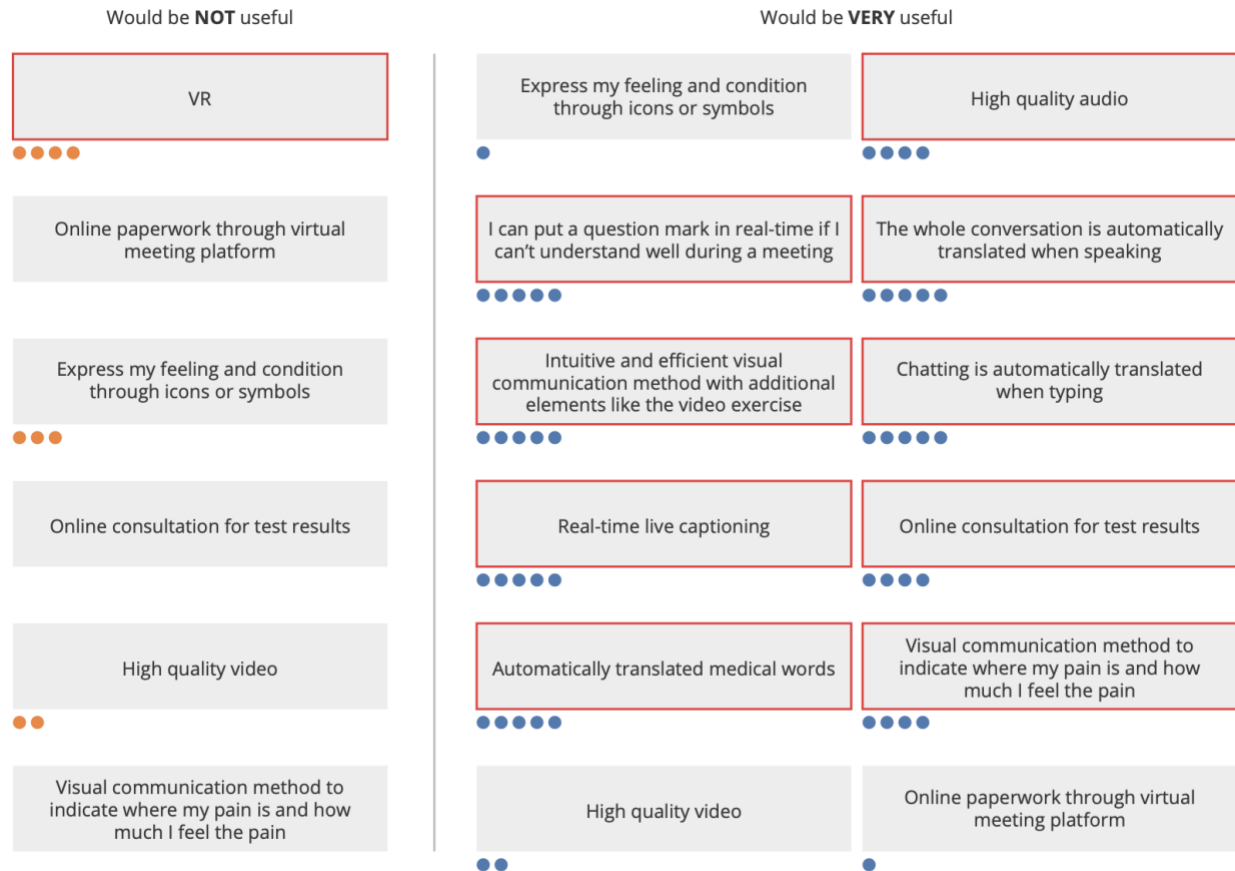


Figure 15: Feedback on Virtual Platforms Functionality

Here are some feedbacks to support their thoughts:

- VR is not that important for pregnant women.
- It is better to focus on some more necessary functions without having lots of functions. It would be more convenient to use.
- It seems that easier and smoother communication if visual elements are added to people with language barriers.
- The essential thing in medical treatment is whether I understand what the doctor explains and how much I can express my symptoms and conditions in a way that the doctor can understand.
- If English expressions that are expected to be needed to explain pain and symptoms are presented or at least imaged and selected, it will be of great help in improving communication.
- Sometimes, in the case of online conversation, it is difficult to identify pronunciation compared to direct conversation, so I think clear sound quality will also help.

The results of this exercise show that participants are focusing on the functionalities that can support their conversation in the virtual meeting. In my view, they would like to have virtual meeting tools that are customized for supporting their language barriers, and that facilitate rapid feedback to each question.

Session 10: Additional thoughts about the MRP

As the last part of this co-design exercise, participants gave thoughtful feedback about the MRP topic and detailed opinions about the research direction. Many of them mentioned the potentiality of existing apps or tools used for the translation function. Also, some participants positively considered the visual and interactive communication method that I tried in the sessions. Here are some meaningful comments from participants:

- Real-time translation would be helpful to many immigrants' pregnant women. I felt lots of stress and worried too many things when I was pregnant at first because of lack of information and my English skill.
- Pregnancy and birth are not just about mothers. I hope the new app can have some sections that can help fathers as well. For example, what paperwork can fathers do or what kind of help can they do for mothers?
- It was not easy to find information about pregnancy and other medical-related information. I had to search for the information in Korean first and then search one more time to find out English information.
- It would be nice if the information I am looking for is easy to access, visually and linguistically.
- If you are pregnant for the first time, you do not know the process in Canada. So, I want something that I can see and understand easily, like a flow chart of pregnancy and birth. Also, I hope the chart shows some general events during pregnancy visually.
- It would be great if you could find symptoms such as pain, bleeding, or dizziness that occurs during pregnancy on the web and find out if it is serious, general, or dangerous and how to deal with it.
- If I have a particular symptom, I do not know if I really need to visit the ER or not, so it would be nice if I could easily find information about them.
- When looking for symptoms, it would be easy and helpful to click on an area in the image and check the level.
- It would be nice if a standard level is given to express my pain level or specify the sort of symptoms.

- It would be more convenient if a program allows patients to register their symptoms or what they want to ask in advance and prepare a doctor's answer to them before treatment or consultation.
- In my experience, making an appointment was the most difficult thing. Sometimes, I needed to cancel and reschedule my appointment or ask about my appointment date since I forgot. For these things, I had to make a phone call to the office every single time. Very inconvenient experience. Arrangement of appointments by phone takes time is inefficient.
- I wish there is a visual guide that shows where I should go step by step when giving birth. I gave birth in a pandemic situation, and I was so confused when I got to the hospital at first because most doors and elevators were closed. It was fear.

The key points that designers could take from this final exercise include: 1) confusion and lack of clarity cause fear and stress; 2) there is a need for better visual development of basic information that is both comprehensive (about the whole duration of pregnancy/birth) and specific (to particular symptoms or conditions), and that is easy to find, navigate and understand; 3) appointments and other scheduling and paperwork elements could be more effectively handled through digital media; 4) most importantly, the user experience of those with LEP (or other main usage language barriers, in different locales) should be included in design process thinking/work.

Chapter 5: Conclusions

The results of this participatory study showed that Korean immigrant women with Low English Proficiency (LEP) do experience difficulties due to their LEP, and do have valuable advice that healthcare providers, government agencies and designers could utilize to improve healthcare services for this and other similar demographic groups. The most common communication

difficulties were related to the questions and needs for explicit knowledge, such as understanding medical terms, expressing specific symptoms, or explaining their questions. From the results of this study, I found that each moment of the unsolved questions and curiosities during their pregnancy and birth made the participants nervous, anxious, and stressed continuously.

The participants (aged 26-41) are familiar with digital devices and platforms, such as computers, mobile phones, apps, and online websites. Mostly, they used digital devices and platforms to figure out the answers to their questions and get support for translation. Also, digital resources were helpful for studying and checking unclear medical knowledge of their symptoms and general progress in the pregnancy term.

However, the visual meeting experience has not been familiar enough with the participants. The online meeting platforms like ZOOM or Google Meet became a standard digital method for social distance in this pandemic. Nevertheless, the participants answered that it is not the most preferred tool for communication with healthcare staff. I found that the reason could be that they are not confident with their English level to communicate with a doctor, nurse, or staff. Also, the results of my study showed that the participants did not prefer to communicate by distance methods like phone or online meetings since they felt that it was harder to understand the conversation than in the traditional environment of a physical meeting. That would be why those 11 participants out of 16 still preferred both physical visiting and remote communication

– even in this COVID-19 situation. Interestingly, one of the co-design sessions about virtual meeting tools’ live captioning showed that the participants found that the live caption functionality was considered positively as support within the online meeting experience.

During the Phase 2 process, the two case studies I had found during my Lit Review became valuable in considering and analyzing results and further steps. Ideas from these case studies were tested in the co-design exercises, for example, use of pictogram icons, merged with images and translated words. Further co-design work could continue to explore and test what kind of visual language and interactive components worked best, and whether there was a universal solution or a need for more specific solutions for different cultural groups. In other words, the results are relevant to other cultural groups who most likely are experiencing similar issues although this study focused on Korean immigrants.

As the case studies discussed potential approaches for information visualization, they were analyzed based on the Phase 1 and 2’s findings.

- Article 1: A Cross-Lingual Mobile Medical Communication System Prototype for Foreigners and Subjects with Speech, Hearing, and Mental Disabilities Based on Pictograms (Wołk, Wołk, & Glinkowski, 2017)
- Article 2: An iconic language for the graphical representation of medical concepts (Lamy, Duclos, Bar-Hen, Ouvrard, & Venot, 2008)

The first study (2017) showed analysis about existing technologies for communication, based on three different categories: listening devices, text-based technology, and web-based video conferencing technology (Wołk, Wołk, & Glinkowski, 2017). The article also explained diverse

mobile applications and technologies with smart devices or pictograms: the potentials and limitations. The second case study (2008) showed two graphical approaches (Lamy, Duclos, Bar-Hen, Ouvrard, & Venot, 2008). The first approach was information visualization with techniques such as graphs or tables. The other one was visualizing the content of text graphically. This article showed that visualized icons have a high cognitive impact and can be distinguished rapidly.

The following diagram (Figure 16) shows the three domains that emerged from my study that are important for improving maternity care communication with immigrant women: Emotional Care, Technology, and Design Functionality. The three different perspectives overlapping in the middle indicate the integration needed for improving inclusive communication for LEP maternity healthcare.

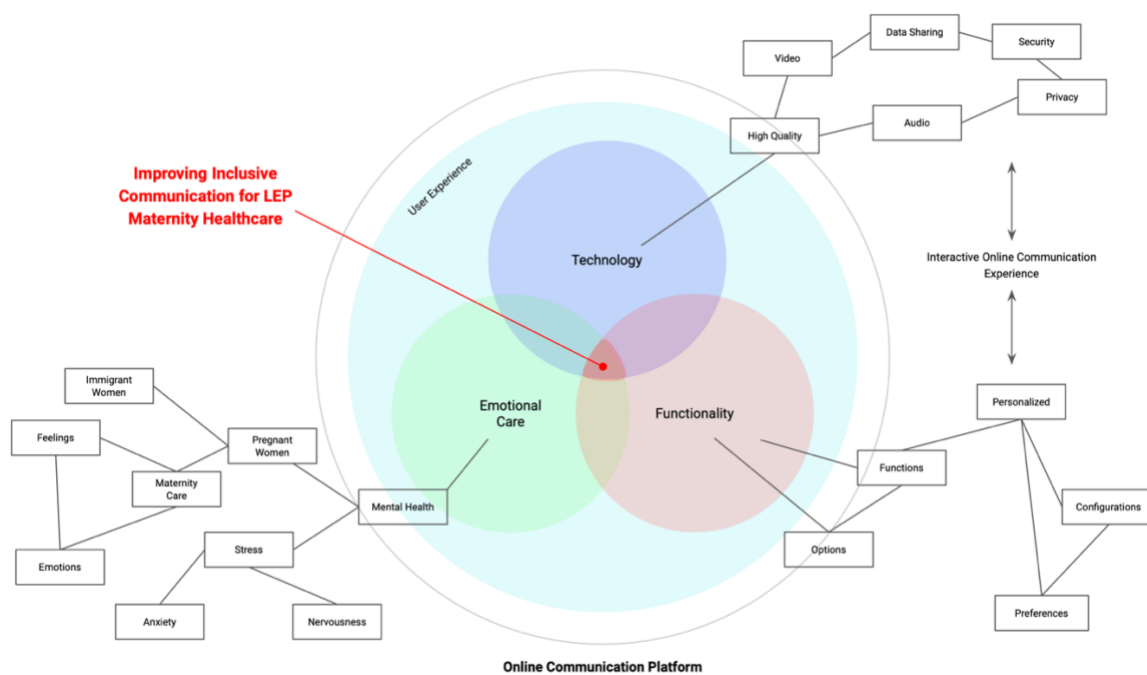


Figure 16: Domains Contributing to Design Needs for Immigrant Pregnant Women

Figure 17 shows a graphic representation of a design practice that is inclusive, participatory, and most meaningful to the users' special needs. It shows what aspects should be discussed in maternity care information design and design of care systems – what is important to consider, what is currently not being utilized, and what is not being optimized. It highlights the four significant sectors: user experience, emotional care, functionality, and technology. As my research shows women know what they need and want, and they could help design it and improve the system for all.

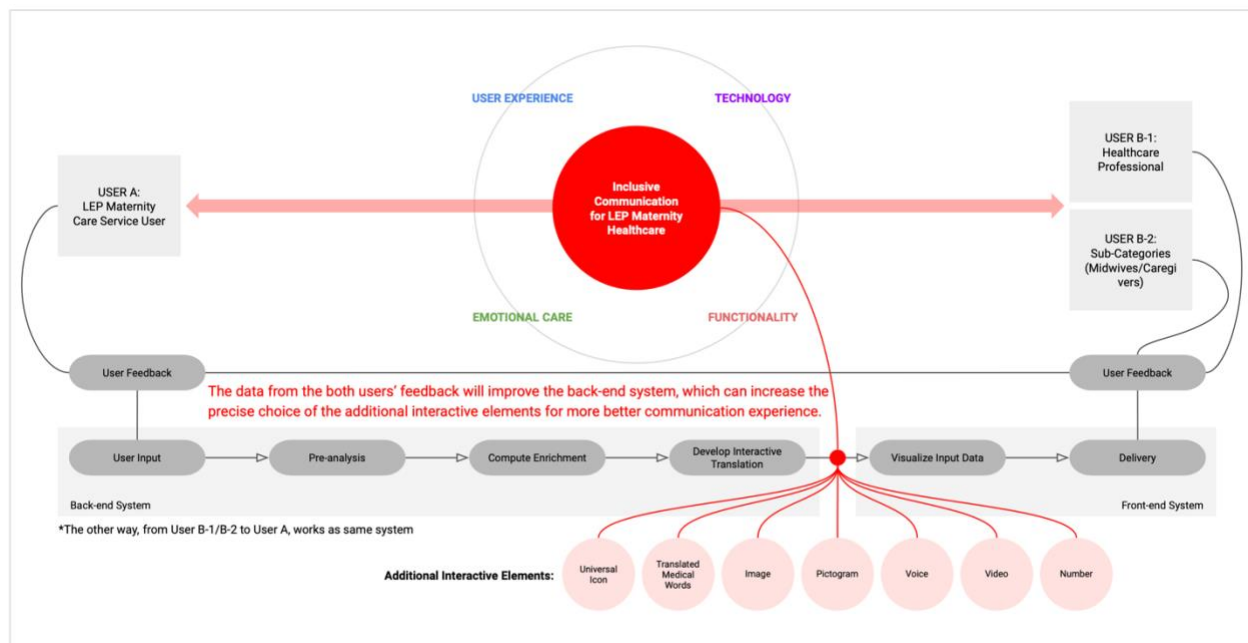


Figure 17: Model for Design Practice

It is clear that: 1) healthcare stakeholders need to be asked about their needs and desires; 2) as new technologies arise, they should be included with simplicity and efficiency for the public user, which can also help the healthcare providers to manage and streamline care; 3) when

these things are effectively considered in, and through a good design process, the ultimate improvement is in emotional care.

Emotional care is what matters most to immigrant women giving birth and indeed to their entire families and communities. Lowering stress contributes to the health and wellbeing of current and future generations, and inclusive design for healthcare is thus a valuable concept that can be incorporated into healthcare design processes and protocols.

Emotional care would help the pregnant women's communication experience, which means that the new communication methods should take care of their mental health, including feelings and emotions, to reduce their stress and anxiety levels as well as helping overcome their technical obstacles.

Figure 18 describes the stakeholders, including both pregnant women and healthcare providers. I firmly believe that the topic I studied and the findings that emerged through this research could be widely relevant and applicable to various groups of immigrant women in Canada. Emotional care is a significant topic for future research in this area.

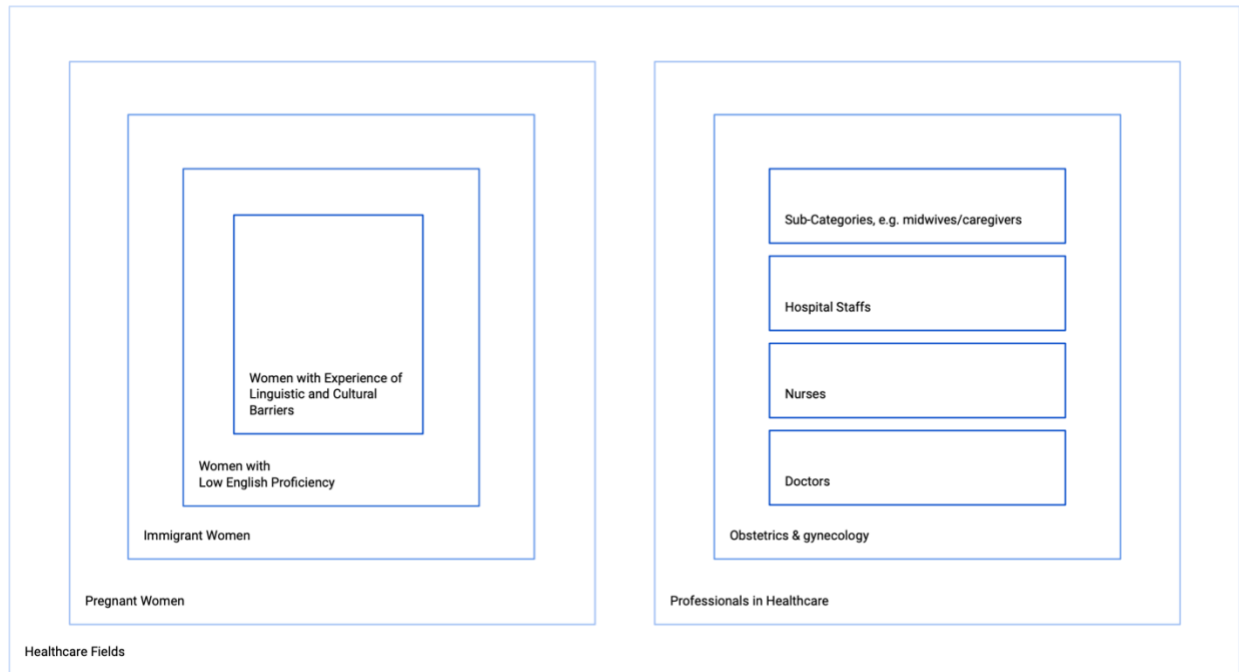


Figure 18: Ideal Stakeholders

In detail, the same approach of literature review and co-design exercises could be used for studying the emotional needs of other groups of people. The future literature review could be expanded to include the different experiences from nationalities and cultural backgrounds of immigrant women. Moreover, for the research methodology, the online survey and co-design exercise phases would be able to be conducted in person instead of online experience after this pandemic. It means that the research would have more diverse types of questionnaires and exercises that online study could not cover.

The data sets showed that the participants were influenced emotionally by their language barrier experiences. The discomforting experience of miscommunication gave them

nervousness, anxiety, and gloom (most frequent responses). According to some comments of participants, these impacts could lead to massive depression, frustration, and loneliness. Therefore, future research could also continue to explore the emotional impact of immigrant people's linguistic issues.

I believe that the findings through this study are significant resources for other researchers and designers seeking to improve design of healthcare communication systems. This should be an ongoing effort as technologies and approaches to care and healthcare issues (e.g., pandemics, disasters) change and develop.

In addition, I suggest that my research approach is not only useful for the topic of immigrant pregnant women. It could be helpful for studying language barriers in diverse arenas, such as other healthcare areas, or in border services of Pearson airport, or tourism in Toronto.

Language barriers create one of Canada's most significant social issues, since the number of people with Low English Proficiency (LEP) has been steadily increasing recently. In 2020, the Government planned to accept more than 1.2 million immigrants until 2023, despite hurdles created by the global pandemic ("Federal government plans to bring in more than 1.2M immigrants in next 3 years | CBC News," n.d.). There have not been enough studies about how to overcome language barriers for immigrant people in Canada.

In conclusion, I hope that this research can contribute to improving the inclusive design for healthcare service users in Canada and beyond, while it opens up the awareness of the needs of the immigrant population. Providing quality maternity care for all is important to the health and wellbeing of countless women and their children. Newcomers to Canada clearly would welcome better support during their pregnancy and childbirth. Inclusive design approaches can be crucial for creating positive change for the future.

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Appendix

Appendix A: Online Survey Questionnaire

Information about participant

1. What is your current status in Canada? (Choose one)
 - Citizen
 - Landed Immigrant (Permanent Resident)
 - Refugee
 - International Student
 - Other (Write)

2. Did you arrive on your own, or with other family members? (Multiple choice)
 - On my own
 - Husband
 - Partner
 - Father
 - Mother
 - Sibling
 - Child(ren)
 - Other (Write)

3. Do you live on your own, or with other family members? (Multiple choice)
 - On my own
 - Husband
 - Partner
 - Father
 - Mother
 - Sibling

- Child(ren)
- Other (Write)

4. Do you have any English test results or certificates? (Multiple choice)

- TOEFL
- TOEIC
- IELTS
- CELPIP
- Others

5. Please share score(s) if you remember or have access to them.

6. Which caregiver options did you choose for your pregnancy care? (Multiple choice)

- OBGYN
- Nurse/Practitioner
- Midwife
- Doula
- Other

7. Where did this care occur?

8. For any births that occurred, choose the year(s). (Multiple choice)

- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020

- 2021 (Expected)

9. Where did you give birth? (Choose one)

- Hospital
- Birth Centre
- Home
- Other

10. Which caregiver option did you choose for your childbirth care? (Multiple choice)

- OBGYN
- Nurse/Practitioner
- Midwife
- Doula
- Other

11. Please write the facility name and location of healthcare that you chose above.

COVID-19 Section

If you have been pregnant or given birth in 2020/2021 (January to present), please answer the following questions, or you can skip to the 'Communication Issues/Questions' section.

1. Are you pregnant now or have you given birth in 2020/2021? (Choose one)

- Yes, I am pregnant now. (going to #2)
- Yes, I have given birth in 2020 or 2021. (going to #4)
- No, I am not pregnant or haven't given birth in 2020/2021 either (going to the next section, Communication Issues/Questions)
- I don't want to answer this question (going to the next section, Communication Issues/Questions)

2. How many months into your pregnancy term are you? (Choose one)

- First Trimester: Week 1 to 13
- Second Trimester: Week 14 to 27

- Third Trimester: Week 28 to 40 (and up)

3. Please write your week.

4. When have you given birth in 2020/2021? (Choose one)

- January 2020
- February 2020
- March 2020
- April 2020
- May 2020
- June 2020
- July 2020
- August 2020
- September 2020
- October 2020
- November 2020
- December 2020
- January 2021

5. Which caregiver options did you choose for your pregnancy or childbirth care? (Multiple choice)

- OBGYN
- Nurse/Practitioner
- Midwife
- Doula
- Other

6. Please write the facility and location of healthcare that you chose above.

7. Please check any communication methods you used during your maternity care during this time. (Multiple choice)

- Phone
- Phone App
- Website
- Email
- Virtual Meeting/Conversation
- Meeting/Conversation in Person

8. Please offer any comments about the question above if desired. (Optional)

9. Please describe your experience, including any specific stories about your difficulties.

10. Do you feel Covid-19 impacted your maternity care? (Choose one)

- Yes
- No

11. Please explain anything you experienced that was negative or positive.

12. Which communication method do you prefer to choose for medical care, test or treatment in this COVID-19 times? (Multiple choice)

- I still prefer to visit in person.
- I prefer to communicate remotely.
- I prefer both physical visiting and remote communication.
- It is hard to choose.
- Other

Communication Issues / Questions

1. Please check any communications that you experienced difficulty with. (Multiple choice)

- Understanding of specific medical terms
- Conversation with doctors, nurses, and/or staff
- Paperwork

- Difficulty to understand the answers to your questions
 - Difficulty to express your symptoms
 - Difficulty to explain your questions
 - Finding a specific location in a hospital
 - Others
2. Please share any specific stories about the question above that would help us to understand what happened. (Optional)
3. Please provide additional feedback on your experience if desired.
4. Did the language barrier experience influence your sense of wellbeing in any way? (Multiple choice)
- Mental
 - Emotion
 - Physical
 - Other
5. If you were influenced emotionally, please fill in the scale below-rate any that apply. (Multiple choice with scale)
- Nervous
 - Angry
 - Anxiety
 - Sad
 - Depression
 - Gloomy
6. Please provide additional feedback on the emotions you experience if desired.
7. What do you think is the biggest reason for the language barriers that you experienced? (Multiple choice)

- My English level is not good enough
- The medical terms/words are difficult
- The explain from medical staff are hard to understand
- I didn't get enough information for a clear understanding
- It is hard to find out the information that I need
- It is hard to find out the right person to ask my questions
- Other

8. Do you have any other points or stories you would like to contribute related to your communication during pregnancy, childbirth or in follow-up care?

9. Do you have any of these devices and how familiar with them? (Multiple choice with scale)

- Desktop computer/laptop
- Mobile phone
- Tablet
- Mobile apps
- Online websites
- Virtual meeting tools (such as Zoom or Google Meet)

10. Are there other methods you use not listed above? If so, please explain.

11. Have you ever used any of these information sources during your pregnancy, childbirth or maternity care period? (Multiple choice with scale)

- Online websites
- Mobile apps
- Virtual meeting tools (such as Zoom or Google Meet)

12. Are there other sources of information you use? If so, please explain.

13. From the list below showing possible reasons for using any of these devices or methods, please select all that apply to your own experience. (Multiple choice)

- Translation support
- Searching for a specific English word's meaning
- Searching general information
- Consultation with doctors
- Finding a specific location in the healthcare facility.
- For the paperwork process
- Checking how to get the healthcare facility
- Arrangement of my appointment (book, change or cancel)
- Asking a question to the specific department
- Checking my test results
- Contacting a specific department in the healthcare facility
- Searching for my current symptoms
- Others

14. Please describe any device or tool you used that was very helpful or very problematic.

15. Did you use any specific devices or services to access help with language difficulties?
(Multiple choice with scale)

- Interpreter Service (Phone)
- Interpreter Service (In-person)
- Mobile app
- Online dictionary
- Website

16. Please provide details (names of services/sites/apps), and include other resources if not mentioned above.

17. Were any of the above services/sites/apps very helpful, or very problematic? If so, please explain.

18. If you have experience with a digital communication tool like a mobile app, online dictionary, or website, what do you think about the tool? (Multiple choice)

- I found useful points with the communication tool to support my language barrier
- I found things that I feel as problematic
- Other

19. Please write detail about the answer that you chose above.

20. Considering your own experiences, how would you rate these basic healthcare communication methods? (Multiple scales)

- Phone Call
- Websites
- Email
- Physically Visiting

21. Do you have any other thoughts about information and communication methods that could improve your health care – now, during Covid-19 times, or beyond?

22. If you have any other stories, experiences, ideas, or suggestions about the topics in this survey, please feel to share with us.

Appendix B: Online Co-design Session

Exercise 1

What do you think about hospital websites? (Part 1)

1. Choose ONE of the hospital websites from the list.

2. You can choose the hospital websites that you have experienced during your pregnancy and childbirth OR any website that you want to try.

3. Please read the scenario below. You will explore the website based on the situation described.

4. After exploring the website, you can answer the questions.

Hospital Website Links: Click ONE hospital name to open the hospital website.

• North York General Hospital

• St. Michael's Hospital

• Grand River Hospital (Kitchener)

• Oakville Trafalgar Memorial Hospital (Halton Healthcare)

• Royal Victoria Regional Health Centre (Barrie)

• Scarborough Health Network (General Hospital)

• St. Catharines General Hospital

• William Osler Health System

• Sunnybrook Hospital

• Michael Garron Hospital (Toronto East Health Network)

Scenario:

You are currently 6 months pregnant and you have a doctor at this hospital. You have an unusual symptom with your body. So, you would like to check your symptom on the hospital website first. Then, you would like to contact the OB doctor's office to make sure of your symptom.

• First, find the pregnancy and childbirth info page on the website and see if you can find any information about your symptom.

• Then, try to find out the contact information of the doctor's office (phone number and/or email address).

Then, you can answer the questions below.

Which hospital website did you choose?

Double click here to enter

Did you find a pregnancy and childbirth info page to check your symptom?

You can move the purple dot to Yes or No.

YES

←

•

→

NO

Did you find out the way to contact your OB doctor's office? (phone number and/or email address)

You can move the purple dot to Yes or No.

YES

←

•

→

NO

Based on this exercise, what do you think about the website?

You can move the purple circle to the number that you want.

very unsatisfied

unsatisfied

neutral

satisfied

very satisfied

Easy to navigate

1

2

3

4

5

Clear information

1

2

3

4

5

Visual clarity

1

2

3

4

5

Language options

1

2

3

4

5

User-friendly design

1

2

3

4

5

Feedback Box

Please share your thoughts if you would like.

Easy to navigate	Clear information	Visual clarity	Language options	User-friendly design	Any comments
<div>• Please double click to write your answer here.</div>	<div>• Please double click to write your answer here.</div>	<div>• Please double click to write your answer here.</div>	<div>• Please double click to write your answer here.</div>	<div>• Please double click to write your answer here.</div>	<div>• Please double click to write your answer here.</div>

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1. There is ONE hospital website in the list.
2. The hospital website was recently designed for better navigation and user-friendly design for patients.
3. Please read the scenario below. you will explore the websites based on the situation described.
4. After exploring the website, you can answer the questions.

Hospital Website Link: Click the hospital name to open the hospital website.

- [NorthWestern Medicine](#)

Scenario:

You are currently 6 months pregnant and you have a doctor at this hospital. You have an unusual symptom with your body. So, you would like to check your symptom on the hospital website first. Then, you would like to contact the OB doctor's office to make sure of your symptom.

- First, find the pregnancy and childbirth info page on the website and see if you can find any information about your symptom.
- Then, try to find out the contact information of the doctor's office (phone number and/or email address).
- In this scenario, your OB doctor is "Jessica W. Kiley, MD" in the Obstetrics and Gynecology department of Northwestern Medicine hospital.

Then, you can answer the questions below.

Did you find the pregnancy and childbirth info page to check your symptom?

You can move the purple dot to Yes or No.

YES ←————→ NO

Did you find out the way to contact your OB doctor, Jessica W. Kiley, MD, office? (phone number and/or email address)

You can move the purple dot to Yes or No.

YES ← ● → NO

Based on this exercise, what do you think about the website?

You can move the purple circle to the number that you want.

	very unsatisfied	unsatisfied	neutral	satisfied	very satisfied
Easy to navigate	1	2	3	4	5
Clear information	1	2	3	4	5
Visual clarity	1	2	3	4	5
Language options	1	2	3	4	5
User-friendly design	1	2	3	4	5

Feedback Box

Please share your thoughts if you would like.

[illegible]

Exercise 3 What do you think about Healthcare Information Websites for Immigrant Pregnant Women?

1. Try all THREE of the healthcare information website for newcomers.
2. Focus on how EASY or DIFFICULT to navigate and/or to find general information (For example, the information about who do you have to contact and/or information about pregnancy in Canada).
3. You can focus on certain information that you think it is important for IMMIGRANT pregnant women.
4. After the exploration of the website, you can answer the questions.

Hospital Website Links: Click the organization name to open the website

- [The Society of Obstetricians and Gynaecologists of Canada](#)
- [Nest Stop Canada](#)
- [Government of Canada](#)

Did you find where to get information and who to contact first?

You can move the purple dot to Yes or No.



Did the websites provide adequate and understandable information for you as an immigrant pregnant woman?

You can move the purple dot to Yes or No.



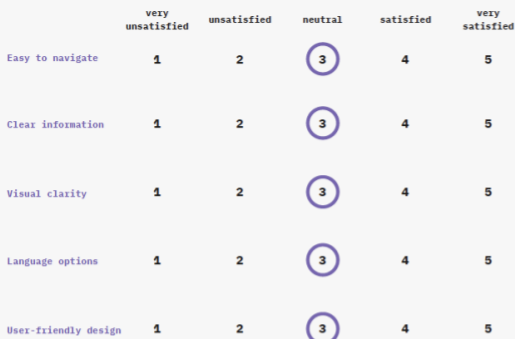
Did the websites provide any option for Korean language or use of translation?

You can move the purple dot to Yes or No.



Based on this exercise, what do you think about the websites?

You can move the purple circle to the number that you want.



Feedback Box

Please share your thoughts if you would like.

Easy to navigate	Clear information	Visual clarity	Language options	User-friendly design	Any comments
• Please double click to write your answer here.	• Please double click to write your answer here.	• Please double click to write your answer here.	• Please double click to write your answer here.	• Please double click to write your answer here.	• Please double click to write your answer here.

Exercise 5 Considering better pregnancy information websites and apps

Lets think about improving pregnancy information for immigrant women. What are the issues if we can have a new hospital website and mobile app, what should the websites/apps be like?

- You can rate each category from 1 to 5

Easy to navigate

You can move the purple dot to the number you want.



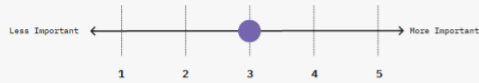
Intuitive translation (Instantly you understand the translated words/sentences)

You can move the purple dot to the number you want.



Clear information

You can move the purple dot to the number you want.



Real-time communication with healthcare staff

You can move the purple dot to the number you want.



Visual clarity

You can move the purple dot to the number you want.



Network with other immigrant mothers

You can move the purple dot to the number you want.



Language options

You can move the purple dot to the number you want.



High technology with more convenient functionalities

You can move the purple dot to the number you want.



User-friendly design

You can move the purple dot to the number you want.



Useful resources for emotional care

You can move the purple dot to the number you want.



Feedback Box
Please share your thoughts if you would like.

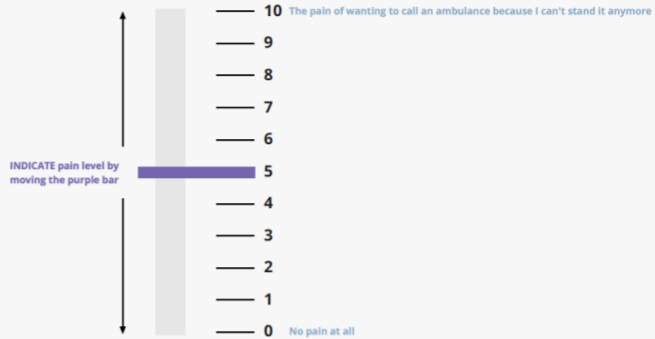
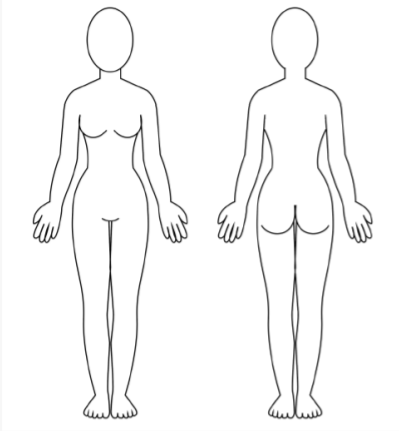
Any comments

• Please double click to write your answer here.

Exercise 6

In this exercise, I am asking you to imagine that you are feeling pain during your pregnancy.

- EXPRESS your pain to doctor through this visual method.
- Decide WHERE the pain is on the human diagram
- Then, express HOW BIG the pain is on bar graph on the right side.
- Write your feedback in the feedback box below.



Could you express your pain level with this visual method?

You can move the purple dot to Yes or No.

YES ←————→ NO

Do you think this kind of visual method would be useful for the communication with doctors, nurses or healthcare staff?

You can move the purple dot to Yes or No.

YES ← ● → NO

Would you like to add visual methods like this to typical translation apps?

You can move the purple dot to Yes or No.

YES ←—————●————→ NO

Feedback Box

Feedback Box
Please share your thoughts if you would like.

Any comments

- Please double click to write your answer here.

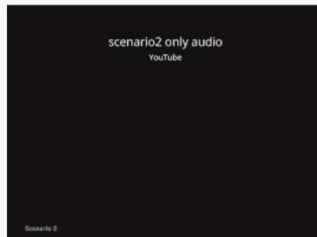
Exercise 7 Interactive Visual Language Exercise

In this exercise, you will watch two short videos.

- The first video on the left side displays only audio conversations, not visual information.
- The second video on the right side displays some additional information that can help the viewer's understanding - images, numbers, and/or translated words.
- After watching those two videos, you will be asked your thoughts.

Scenario:

IMAGINE that now you are an immigrant pregnant woman and having a conversation with doctor. You are discussing recent blood test results.



Do you see the differences between the two videos?

You can move the purple dot to left or right side.

Yes, I can see the differences



No, I cannot see the differences

Which video option is better for you to understand conversation?

You can move the purple dot to left or right side.

The video without the additional information



The video with the additional information

Do you think visual information is useful for your communication?

You can move the purple dot to left or right side.

Yes, I think visual information is useful



No, I think visual information is not useful

Feedback Box

Please share your thoughts if you would like.

Any comments

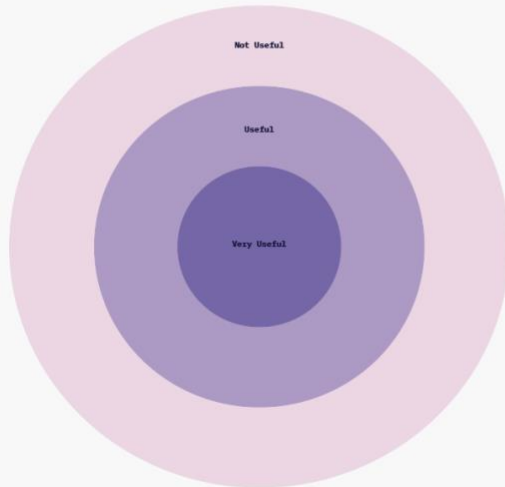
- Please double click to write your answer here.

Exercise 8

Additional Information for Better Communication

There are potential elements for interactive communication that may be able to help immigrant pregnant women's communication experience.

- MOVE each keyword into one of the circles that you think fits the most.
- ADD any keywords or ideas if you would like to.



Potential Elements for Interactive Communication

Audio (Voice)	Video	Image	Translated Medical Words	Translated Difficult Words
Symbol	Icon	Number	Colour	Persuasion

Other Ideas (if you have)

You can write here by double clicking	You can write here by double clicking	You can write here by double clicking	You can write here by double clicking	You can write here by double clicking
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Feedback Box

Please share your thoughts if you would like.

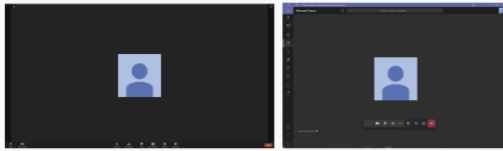
Any comments

- Please double click to write your answer here.

Exercise 9 Virtual Meeting Platforms

Let's think about the functionalities of these platforms (Zoom and Microsoft Teams), especially about language difficulties for understanding the conversation correctly.

- THINK about your previous experience when you communicated with healthcare providers through the virtual meeting.
- There is an exercise box below. DRAG the keyword boxes into the exercise box. The white keyword boxes can be added by double-clicking and you can write down the keywords or thoughts if you wish.



There is a live captioning function in each platform!

Do you know what live captioning means?

YES ← ☐ NO

Did you know that?

YES ← ☐ NO

Can you find it from the screenshots above?

YES ← ☐ NO

Do you know how to turn it on?

YES ← ☐ NO

Have you ever used that?

YES ← ☐ NO

Do you have any thoughts about the live captioning function?

Zoom	Microsoft Teams
<p>Please double click to write your answer here.</p>	<p>Please double click to write your answer here.</p>

What functionalities do you think are necessary more in the virtual meeting platform?

HIGH NECESSITY

This is nice to have.

This is not necessary.

LOW NECESSITY

Keyword Box: Currently Existing and/or Ideal Functionalities

Live captioning	During not understanding virtual meeting	
Automatic translation when speaking	Visual feedback for the participant's response	
Automatic translation when listening	Automatic input control as additional information for context	
High quality video	Visual words are automatically translated	
High quality audio	I can express my current feeling with icons	
Virtual reality	Visual feedback for the participant's response	
Automatic translation when listening		

Feedback Box

Please share your thoughts if you would like.

Any comments

Please double click to write your answer here.

Please share any additional thoughts!

Any comments

- Please double click to write your answer here.