Designing an App for Maternity Care: Improving Communication between Swedish Midwives and Arabic-speaking Women

Jean E Stevenson[1] & Gunilla Byrman[2]

[1]Department Medicine and Optometry, Faculty of Health and Life Science, Linnaeus University

[2] Department of Swedish, Faculty of Arts and Humanities, Linnaeus University

Good communication is essential for good healthcare. In maternity care, inadequate communication may contribute to poorer outcomes in pregnancy. A large number of Syrian, Arabic-speaking immigrants arrived in Sweden in 2015-2016. A trans-disciplinary team acted as intermediaries between midwives and a technical company to develop a Swedish-Arabic communication app for use in antenatal care. An earlier study describes the creation of the content and the development of the prototype. This paper describes the next phase of the study, i.e., testing the prototype, refining the structure and content, and development of the next version. A user-centred approach with a norm critical perspective was applied. Workshops and observations were performed for interaction between the midwives and the research group, facilitating development from a user perspective. A final version of the app was developed. Future plans are to evaluate the app and produce a Swedish-English version.

Keywords

app development, Arabic-speaking women, maternity care, midwives

1. Introduction

Good communication is essential in healthcare to avoid misunderstandings and potential medical errors [1]. In maternity care, cultural and communication difficulties have been recognised as one of the reasons for poorer outcomes of pregnancy for immigrant women [2]. Studies have shown that immigrant women have a higher incidence of complications such as pre-term delivery, peri-natal mortality and low birth weight [3] and a higher rate of maternal and infant mortality [4-5]. In Sweden, all women who do not speak Swedish have the right to an interpreter but interpreters are not always available and are sometimes not equipped with the language skills required for a meeting between a midwife and her client. Furthermore, interpreters are often men and some women are reticent when a female interpreter is not available [6].

Sweden has a long history of welcoming immigrants to its shores and 18.5% of its 10 million population is foreign born [7]. In 2015 and 2016 approximately 300,000 refugees arrived in Sweden, the majority from Syria. Midwives felt challenged when communicating with immigrant women requiring maternity care. Appointments took longer and, despite utilisation of telephone interpreters, midwives were dissatisfied, and feared that communication between themselves and non-Swedish-speaking women (at the time, mostly Arabic) may not be adequate to provide safe and equal care [6].

In 2016, we began a project to develop a multi-modal app for iPad to facilitate communication between Swedish-speaking midwives and Arabic-speaking women with the aim of improving care, communication and patient safety. The app was not intended as a replacement for interpreters, but to be used as a support tool. It could be used if an interpreter was not available or to provide clear information in the form of text, images and voice-over if a midwife wished to be certain that a woman had received the correct information.

We adopted a trans-disciplinary approach, building a team of six: five university researchers: three from Swedish language, one from health informatics, one from midwifery education and an active midwife from labour ward who spoke Arabic. Seven midwives from antenatal care clinics participated in the project.

In an earlier study, we describe how we adopted an iterative user-centred design to develop the content for the app. To obtain the initial data regarding midwives' work routines and roles, midwives were interviewed in a focus group. In addition, four field studies to observe midwives in meetings with women who required an interpreter, were carried out by one of the researchers. After obtaining the initial data, the researchers began to develop the content for the app. The required content covered all aspects of maternity care, that is, from conception to birth and the early weeks of a new baby's life. Thus, the content included antenatal care, routine checks and tests performed during pregnancy, foetal growth, preparation for labour and delivery, breast feeding, immediate post-natal care and contraception. The content was multi-modal and included images, text and voice-over recordings. During the development phase, the research team met at least every four weeks to plan and discuss the content.

After generating the initial content for the app, a workshop was held with the midwives so that we could go through the content with the potential end-users, checking that we had understood the role of the midwife, that the information was accurate and that the way in which we presented images was suitable. In addition, we corroborated the information with national guidelines for maternity care to double-check that it was evidence-based. Following the workshop, researchers continued to modify and refine the information. Next, a second workshop was held, leading to further refinements and modifications. The app content consisted of three main sections, greetings, obtaining information and giving information. The material was sent to a software developer who developed a prototype for testing. iPads with the app prototype were distributed to seven midwives in December 2017.

The purpose of this paper is to describe how we tested and evaluated the prototype and how we developed the next version of the app. Figure 1 outlines the lifecycle model of this app. This study builds on our previous work by describing sections 4-6 of Figure 1.
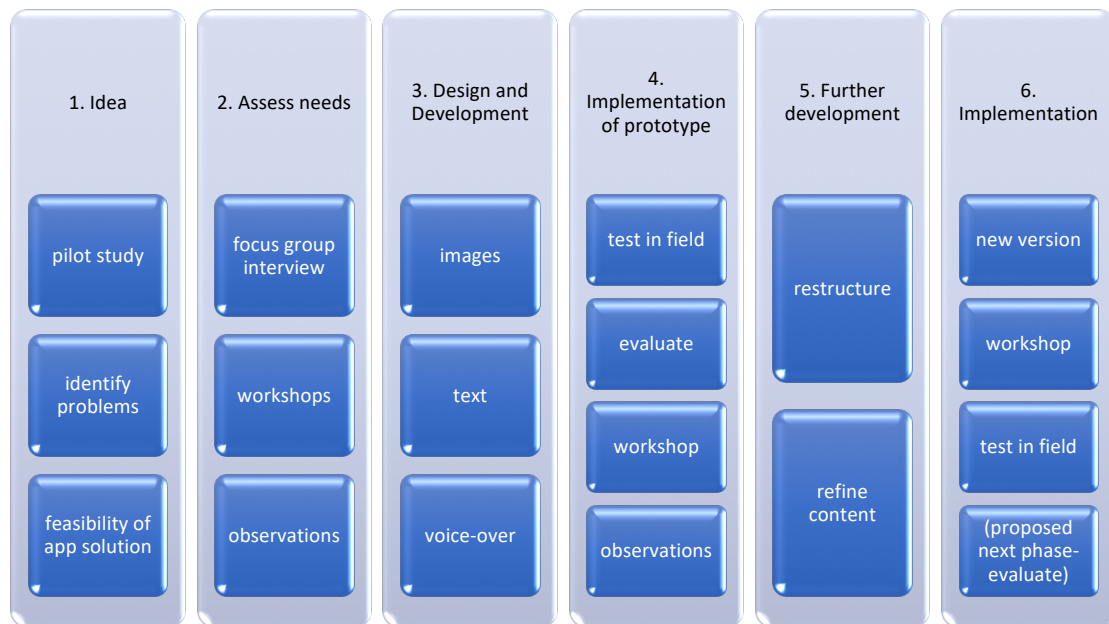

Figure 1 Lifecycle model of app development.

2. Method

The study was carried out using a user-centred iterative approach with a norm critical perspective. This meant that researchers worked closely with the potential end-users so that an effective app could be produced [8,9]. A norm critical perspective was adopted to avoid stereotyping with regard to gender, class and ethnicity [10] and to design an app that could be acceptable across different cultures.

2.1 Setting

The study took place in the southeast of Sweden. The midwives were employed at regional antenatal clinics in six municipalities that included both urban and rural settings. Midwives in Sweden are responsible for antenatal, intrapartum and postnatal care. In antenatal care, midwives monitor pregnancy to promote maternal and foetal health. Their work aims to detect complications and identify risk factors during pregnancy and adheres to a national programme [11]. Assessments are based on women's obstetric, medical and psychiatric history, family history, and lifestyle.

2.2 Participants

The midwives recruited at the beginning of the project continued the collaboration in the second phase of the project, moving from the status of prospective users to users. There were seven midwives all of whom worked in antenatal care. The prototype of the app was uploaded to iPads and these were distributed to seven midwives in December of 2017. At a meeting with two researchers, the midwives were shown how to use the iPads and had the opportunity to try them out and ask any questions they might have. They were encouraged to use the iPads as and when required to aid communication between themselves and Arabic-speaking women.

2.3 Data collection

There were two methods of data collection: two workshops and one observational study. Workshops are a useful method when a dialogue is required between potential users and researchers. It allows for discussion and a close relationship to be nurtured between two parties. Observations allow for deeper insights into usability.

Workshops
The workshops were held at the university campus, one in February 2018 and one in February 2019. Each workshop lasted approximately two hours. The first workshop was attended by four midwives and the aim was to find our how the app had worked in practice. The second workshop, in February 2019 was to demonstrate the new version of the app and was attended by six midwives. Workshops were audio-recorded and transcribed.

Observations
Observations were carried out at a rural antenatal clinic in October 2017. Interactions between a Swedish midwife and Arabic-speaking women were observed when the iPad with the app was in use. Two meetings were observed, the first woman attended the clinic for a six-week post-natal check-up and the other for her second visit with the midwife in the 12th week of pregnancy. There was a short discussion with the midwife following the visits at which the midwife was asked how she felt about the visit and if the app had been useful. At both meetings an interpreter was present by telephone at the beginning of the appointments but had to leave before the appointments were finished. Field notes were taken of each exchange and interaction.

2.4 Data analysis

Transcriptions were made from the audio-recordings made at the workshops. Qualitative data from the observations were organised and discussed at length within the project group to identify any further app requirements. Detailed descriptions of required alterations to the app were collated.

2.5 Ethical issues

Ethical approval was received for the project from the Regional Ethical Review Board, Linköping, Sweden (Dnr 2017/166-31). The midwives received oral and written information about the aim of the study. They were told that participation was voluntary and that they could withdraw at any time without explanation. Confidentiality was assured. Written informed consent was obtained from the midwives. Before the data analysis began, all data were anonymised.

3. Results

The results are presented chronologically, i.e., in the order in which the data were collected: workshop 1; field studies 1 and 2; workshop 2.

3.1 Workshop 1

iPads containing the prototype were distributed to the participating midwives in December 2017. In February 2018, a workshop was held. Five midwives and three researchers attended. At this time, the midwives had had access to the app for two months. The midwives spoke freely and the rapport within the group was good.

Three of the midwives had used the app with Arabic-speaking women. One midwife had used it 4 times. Three of these times had been at first meetings with new clients, so early in pregnancy. She found it was easier to introduce the app when it was a first meeting. She had also used the app at a postnatal visit and found the section on contraception useful. Two of the midwives had used the app eight and ten times respectively. The remaining two midwives had not had the opportunity to use it as they had not met with Arabic-speaking women during the two months in which the app had been available.

The midwives mentioned that as some time had passed since the first influx of new immigrants, they had become more used to integrating interpreters into visits with non-Swedish speaking clients. Furthermore, some of the Arabic-speaking women now understood a little Swedish and this made meetings somewhat easier. Midwives told us that they usually looked at the app with the women but sometimes left the women, or women with their husbands, to watch a film by themselves while the midwife did something else. There were two main issues highlighted by the midwives, one related to functionality and the other to content. Below are some examples of what the midwives related.

Issues related to functionality

The midwives stated that the sections on obtaining information, for example, past obstetric history, had not been useful as they anyway had to document that information in the electronic health record (EHR) using another computer. Thus, the iPad was not useful in this instance as it was quicker to use the interpreter and the EHR.

In relation to history taking, if they used this section, e.g., because no interpreter was available, they said that they needed a better overview as it was difficult to find the questions and they had to switch from one section to another searching. *"Could you put some favourite questions in a special section?"* Generally, they found the information section difficult to navigate and asked if there could be some kind of contents list.

The information giving section of the app contained a series of films, made from images with a voice-over recording. The midwives said that sometimes they wanted to show a certain picture within the film, but that it was difficult to navigate to a desired picture. They wanted to be able to click directly to certain images.

A particular problem was that the film on contraception was very long and it was difficult to get to the section they needed within the contraceptive film. They said that hormone methods were the most useful and asked, *"Could it (the film on contraception) be divided into smaller sections?"* Furthermore, the midwives said that 'Introduction to antenatal care' film was too long. This meant that it could not be shown to the women within the duration of the visit.

Issues related to content

According to the midwives, the most useful sections were the introduction to maternity care, labour and delivery, pain control in labour, postnatal care and contraception. These sections are all within the 'information giving' section of the app.

During one of the meetings, a female Arabic-speaking interpreter had reacted to the words, *'It's painful to insert a coil'*. This created some discussion about content and finally one midwife suggested to concentrate on methods and take away the information about side effects. Midwives also asked whether more languages could be added to the app.

3.3 Observations

Two observational studies were carried out in a rural antenatal clinic in which the researcher observed meetings between a midwife and Arabic-speaking women. The following is a brief description of the most significant observations.

3.4 Field study 1

The first appointment was with a woman who was 10 weeks pregnant with her second child. It was the second meeting with the midwife. The woman could speak and understand a little Swedish. The interpreter was contacted and communication began.

This meeting had several aims:

- To go through the health assessment form to obtain a complete medical and family history
- To check the mother's health status
- To carry out some tests, including a urine test and blood tests, and measure blood pressure and body weight

Finally, the midwife showed the woman the section on 'labour and delivery' in the app. The woman listened closely and stared at the screen. She was clearly interested, but then, the midwife had to move on to the next patient. One of the problems this woman had was nausea so the midwife suggested that the researcher showed the woman some information on the app about nutrition and exercise. The researcher sat with the woman and her husband and looked at parts of the 'lifestyle' section of the app. They watched carefully. On the slide about nausea and vomiting, the woman was smiling and nodding her head. They both said they thought the app was good.

3.5 Field study 2

The second woman attended the clinic for a six-week postnatal visit and her baby was with her. This was her sixth child. At the beginning, the midwife contacted the interpreter by telephone and communication began. First, the midwife asked about the recent delivery, how the mother experienced it, how her recovery had been following the Caesarean section, how the new baby is, and how it was going with breast-feeding.

Next, the midwife brought up the subject of contraception. The woman said, *"When I don't have periods, I won't get pregnant."*

At this point, the interpreter had to leave the meeting because of another appointment. The midwife continued, speaking slowly in Swedish and telling the woman it is important to consider contraception. (The midwife wanted to emphasise its importance because there were six children and the last three had been by Caesarean section implying considerable risk if there were to be another pregnancy). She showed the woman the app on the iPad and told her that the information was in Arabic. She selected the section with hormonal contraception. The woman watched and listened intently. When it got to the part about progestin implant, the midwife pointed at the picture, then looked directly at the mother, smiled, and gave a 'thumbs-up' for this method. The mother shook her head and said "no, no". Next, the midwife pointed to the picture of the progestin (contraceptive) injection and the mother shook her head to that too. Then the woman made some gestures that indicated Coitus interruptus or the 'withdrawal method'. It was difficult to find this method on the app but together with the researcher, it was found. The woman listened to the voice-over and said, "I know that, I can do that".

Summary of challenges identified during workshop 1 and observational studies

3.6 App content and structure Workshop 1 underlined that there were problems with the structure of the app. This confirmed what the research team had noted regarding navigability when they first saw the prototype. The comments from the midwives helped to define the structural changes that were required. The observations also clearly demonstrated how crucial it was that the midwife could go directly to a specific section of the app to give the exact information needed at a particular time.

Although field studies were limited in number, valuable information was gained during the observations. This demonstrated that the content of the app was appropriate and appreciated by both midwives and clients. Furthermore, it was clear that the app provided support for the midwife in her efforts to ensure that women received timely and accurate information in the event that an interpreter

suddenly had to leave the meeting if the midwife was running slightly late, or ran out of time before her next appointment. Moreover, it was noticeable that Arabic-speaking women appreciated hearing information in their own language.

Midwives sometimes let women, or women and their husbands look at the app by themselves. This allowed some time to be spared, e.g., if the midwife was running late, the couple could continue to receive information while she commenced her next appointment. Saving time is an important feature given time restraints and that midwives often feel stressed because of lack of time [6]. Moreover, it gave the parents the opportunity to view and listen to information in their own language in peace and quiet. This indicates that the app would be useful for women beyond actual visits to the midwife.

Informed by the workshops and the observational studies, work continued to develop and refine the prototype. A new structure was devised and a plan of the structure was mapped-out in order to communicate requirements to the software company. This included menus with headings and sub-headings that would appear on the left-hand side of the screen so that navigation could be simple and intuitive. Films that the midwives had experienced as too long and hence difficult to navigate were carefully reviewed and divided to more appropriate lengths, with subsequent new headings. In the prototype there were 14 films, with a duration ranging from 40 seconds of six minutes. The new version had 29 films and a range of 25 seconds to four minutes.

Expansive discussions took place to perfect the content, and to ensure culturally sensitive language and diverse images. Midwives within the research team reassessed the content for accuracy, and Swedish language experts examined the language for the script to ensure the language was clear, unambiguous and culturally neutral. The team discussed the need to include images of women from diverse backgrounds and viewed the material from a norm-critical perspective [10]. One example is that they discussed the best way to express to women that they should be punctual in attending appointments, as this was something the midwives had emphasised. However, culturally, people have varying attitudes towards time-keeping and it was important that this was relayed in a polite and friendly manner. For example, a quote that began as "Be sure to come in time for your appointment!" changed to "It is important to come in time so that you have time to ask questions and get the care you are entitled to. Please cancel your visit in advance if you can't come or if you are sick. This way, someone else can be offered your appointment." Thus, content was further refined following discussions in the project team about language and cultural aspects.

Researchers worked individually or in pairs for specific development: planning a new structure; dividing films to appropriate lengths; working on language to ensure it was clear and unambiguous; translating from Swedish to Arabic; writing scripts, making recordings; checking that all information was evidence-based and followed national guidelines for maternity care. The desired changes were sent to the software company in November 2018 to produce a new version of the app. Examples of the layout and content of the revised version can be seen in Figures 2 & 3.
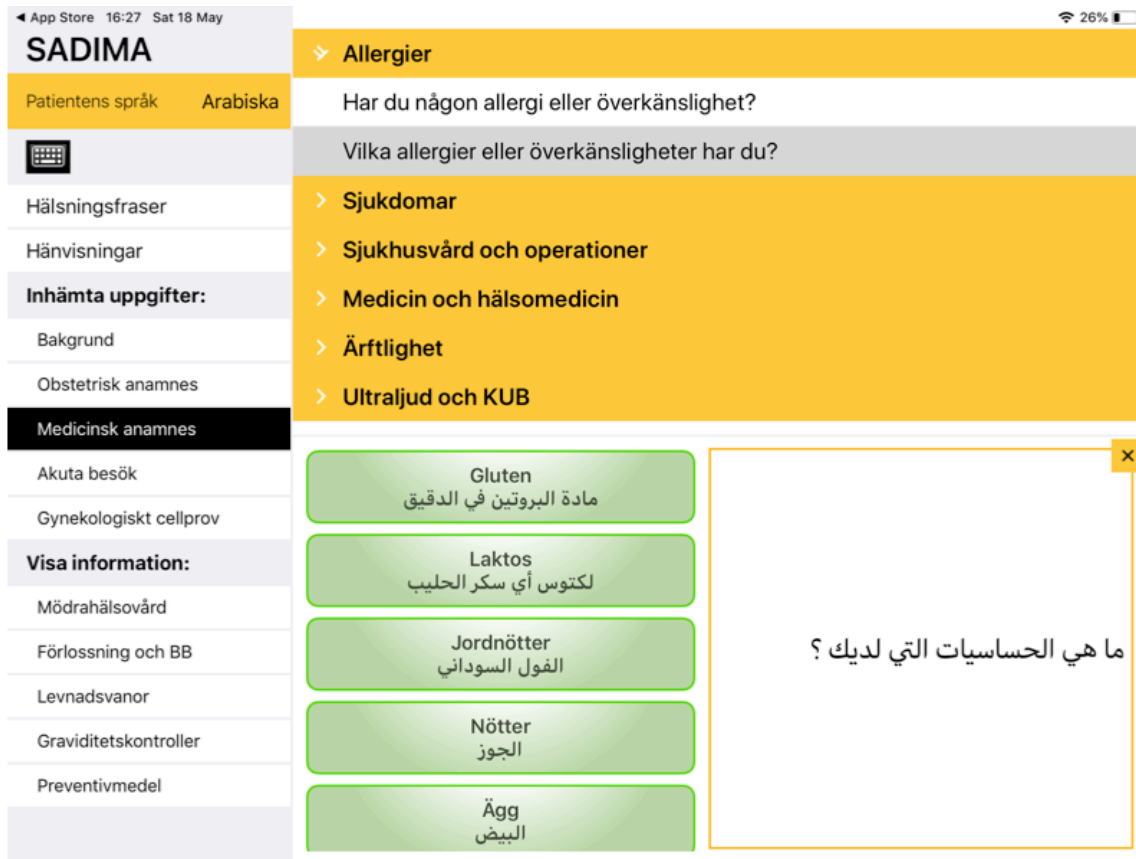
Figure 2 Screenshot of medical history, asking about allergies (obtaining information).

Figure 2 shows a page from the from the 'obtaining information' section with questions about the past medical history. The question is 'What are you allergic to?' A dropdown list with a green background becomes available with a selection of possible allergies: Gluten, Lactose, Peanuts, Nuts and Egg. It is possible for the woman to click on the dropdown list to show which allergies she has.

Figure 3 Screenshot showing advice on nutrition in case of nausea (giving information).

Figure 3 shows a screenshot from the Information Giving/Nutrition section of the app. The title is 'Nausea and Vomiting'. As can be seen, the picture describes foods that should be avoided and foods that may be suitable in the event of a woman suffering from this problem during pregnancy. The

images were chosen to be as communicative as possible on the premise that a picture paints a thousand words.

3.7 Workshop 2

The second workshop was held in February 2019 with the purpose of distributing the iPads with the new version of the app and instructing the midwives on the changes that had been made. The workshop was held by two of the researchers and six midwives attended.

One researcher introduced the app and demonstrated the new structure of the app the most important changes. Then the midwives were given the iPads and several possible scenarios so that they could practise navigating through the various sections of the app. This included background information, medical history and obstetric history. For instance, they were asked to find out when a woman last menstruated by clicking on 'background', 'health', 'menstruation' and the question, "What was the first day of your last menstrual period?" When the calendar appeared, the midwives should select 'Arabic' as the language and scroll through the dates.

In the 'giving information' section, the midwives were asked to find the film introducing antenatal care, change the view to full screen and test fast forwarding the film to pause at a particular image. Another exercise was to find the film about the 'morning-after pill', start to play it in Swedish, then change the language to Arabic. They were asked to check further information sections to familiarise themselves with the new structure and the revised content.

This was followed by a period of discussion and a chance for the midwives to comment on their first impression of the new version. The midwives could immediately see that it was easier to get an overview of the content. They also appreciated that many of the films had been divided into a series of shorter clips. The midwives also inquired whether more languages could be added, particularly English. They said that sometimes women spoke some English but midwives did not feel they were proficient enough in English to use it professionally.

4. Discussion

Testing the prototype gave information for the continued development of the app. Issues related to functionality, user-needs and content were evaluated, resulting in revision and refinement for the new version. Poor communication can lead to negative outcomes of pregnancy and communication may be assisted by technology [12]. This paper describes how we carried out the second phase of development of a communication app. This involved testing of the prototype by midwives, a workshop with midwives after two months of testing, a period of revision within the project team during which time questions arose about what was actually happening during use of the prototype in the field. In turn, this led to the research team carrying out observational studies in October 2018.

Adding extra data collection methods can be necessary during a design process. As Berg 2004 points out, "the optimal way to involve end-users can only be discovered during the process" p 169 [13]. User involvement was essential to ensure that the midwives felt they have had an influence over the content. A major consideration was to select the most important content. The midwives' 'wish list' had a tendency to grow, for example, there was a request to add information about special services available to women who had a fear of childbirth, but there were limits to what could be included and, thus, the research team had to be stringent about what could be added and were guided by national standards for basic ante-natal care programmes. In addition, meetings between midwives and women had time limits, therefore, films had to be succinct, accurate and useful. The phenomenon of end-users having increasing requests has been noted previously [13].

A new structure was essential for the app to function efficiently. During the second workshop, when the revised version was distributed, it was confirmed that the structure was greatly improved as midwives soon became familiar with the app. Midwives also noticed that some content required further refinement. The improved structure may have made it easier to see the content more clearly and the midwives were encouraged to be vigilant and to make any further requests before the end of March 2019 so that we could make any final adjustments to the final version. This underlines the importance of collaboration through user-centred design in which there is an open dialogue between designers and potential end-users, essential in the process of developing the usable technology [9,14,15].

An important part of the development process was the extensive discussions that took place within the project team. The team met at least every four weeks to plan and develop. Norm critical perspectives were discussed to ensure equality and avoidance of stereotyping [8]. Images included women from different parts of the world, and of fathers to show that they were welcome to attend the health centre or hospital with their wives. The language used in the texts and recordings was also discussed expansively, to ensure unambiguous and culturally suitable language. Furthermore, these discussions included ascertaining that all content was evidence-based. Triangulating results from the workshop, observations and research team discussions helped to further refine the prototype. The final version is in use but it is currently only available for iPads. Organisationally, it was problematic for midwives to download the app. Thus, the app content is currently being adapted to become accessible from a bespoke website. This will make the app more widely available and easily accessible for midwives all over Sweden. Although we stress that the app is for use by midwives in maternity services, this study also indicates that the app was useful for women and couples to look at by themselves. Thus, a website could also be useful for Arabic-speaking women or Swedish-speaking women who want to access reliable information about maternity care at any time. Future plans, in lieu of gaining further funding, include to produce a Swedish-English version of the app. In addition, we plan to evaluate the current version.

Limitations

We are aware that we may have benefitted from further observations and with more than one midwife. However, it was very difficult to arrange visits because of time constraints, difficulty in making direct contact with busy midwives and finding times when a researcher was available at the same time there was an appointment with an Arabic-speaking woman.

5. Conclusions

This study confirmed the need for user involvement when developing an app to be used by healthcare professionals. Midwives, for whom the app was created, are clearly the best people to ask, firstly, about the content and, secondly, about their experience of usability, as they are the people who will use the tool. The study also highlights the benefits of a trans-disciplinary team to act as intermediaries between the users and the people producing the app. The trans-disciplinary team could examine the app from several perspectives. They modified the language to ensure accurate communication, included a norm-critical design to emphasise equality for women from different ethnic backgrounds and discussed the content and function of the app from the viewpoint of several disciplines. In conclusion, combining a user-centred approach, norm-critical design and a trans-disciplinary team adds to knowledge about how a successful healthcare app can be created and promotes bridging the gap between technology and practice [16].

References

[1] Manojlovich M, Adler-Milstein J, Harrod M, et al. *The effect of health information technology on health care provider communication: A mixed-methods protocol.* Journal of Medical Informatics Research 2015; 4. DOI: https://doi.org/10.2196/resprot.4463

[2] Tobin C, Murphy-Lawless J. *Irish midwives' experiences of providing maternity care to non-Irish women seeking asylum.* International Journal of Women's Health 2014; 6: 159-69. DOI: 10.2147/IJWH.S45579

[3] Zanconato G, Iacovella C, Parazzini F, et al. *Pregnancy outcome of migrant women delivering in a public institution in northern Italy.* Gynecologic and Obstetric Investigation 2011; 72: 157-62. DOI: https://doi.org/10.1159/000328318

[4] Essen B. *Increased perinatal mortality among sub-Saharan immigrants in a city-population in Sweden.* PhD Thesis, University of Lund, Sweden, 2001.

[5] Wahlberg A, Roost M, Haglund B, et al. *Increased risk of severe maternal morbidity (near-miss) among immigrant women in Sweden: a population register-based study*. BJOG: An International Journal of Obstetrics & Gynaecology 2013; 120: 1605-11. DOI: https://doi.org/10.1111/1471-0528.12326

[6] Axelsson C, Byrman G, Petersson G, et al. *"So much can go wrong": Pilot study about midwives' experiences of communication with pregnant women who do not understand Swedish.* Kalmar/Växjö Linnaeus University: Languages and Literature Nursing, 2016, p. 15.

[7] Skodo A, *Sweden: By Turns Welcoming and Restrictive in its Immigration Policy*. Migration Policy Institute. December 2018.

[8] Berg M. *Patient care information systems and health care work: a sociotehnical approach.* International journal of medical informatics 1999; 55: 87-101. DOI: https://doi.org/10.1016/S1386-5056(99)00011-8

[9] Scandurra I, Hägglund M, Koch S. *From user needs to system specifications: Multi-disciplinary thematic seminars as a collaborative design method for development of health information systems.* Journal of biomedical informatics 2008; 41: 557-69. DOI: https://doi.org/10.1016/j.jbi.2008.01.012

[10] Isaksson A, Börjesson E, Gunn M, Andersson C, Ehrnberger K. *Norm Critical Design and Ethnography: Possibilities, Objectives and Stakeholders.* UK. Sage; 2017. [cited 10 March 2020] Available from: https://journals-sagepub-com.proxy.lnu.se/doi/full/10.1177/1360780417743168.

[11] Swedish Federation of Societies of Obstetrics and Gynecology SFOG. *Mödrahälsovård, sexuell och reproduktiv hälsa, ARG-rapport nr 59.* [Antenatal care, sexual and reproductive health]. Stockholm: SFOG; 2008.

[12] Silvera-Tawil D, Pocock C, Bradford D, et al. *Cald Assist- Nursing: Improving Communication in the absence of interpreters.* Journal of Clinical Nursing. 2018; 27: 4168-78. DOI: https://doi.org/10.1111/jocn.14604

[13] Berg M. Health Information Management: Integrating information technology in health care work. Routledge. London and New York 2004.

[14] Clemensen J, Larsen S, Kyng M, et al. *Participatory Design in Health Sciences: Using Cooperative Experimental Methods in Developing Health Services and Computer Technology.* Qualitative Health Research 2007; 17: 122-30. DOI: https://doi.org/10.1177%2F1049732306293664

[15] Stevenson J, Nilsson G. *Nurses' perceptions of an electronic patient record from a patient safety perspective: a qualitative study.* Journal of Advanced Nursing 2011; 68(3), 667-76. DOI: 10.1111/j.1365-2648.2011.05786.x

[16] Darbyshire P. 2003. *'Rage against the machine?': nurses' and midwives' experiences of using Computerized Patient Information Systems for clinical information.* Journal of Clinical Nursing 13: 17-25. DOI: https://doi.org/10.1046/j.1365-2702.2003.00823.x