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ORIGINAL CONTRIBUTION

Study on APP Design of Assisting New Immigrant Women with Healthcare Communication

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Abstract— The main purpose of this study is to develop an interactive medical communication board that would be adaptable both in terms of language and metaphor. This board would be tested on diverse population to assess its efficacy in clinical diagnosis to help new female immigrants and their children. Therefore, this study intends to develop an assistive visualization tool of medical communication to achieve the objective of friendly communication among foreign spouses, ill children, and medical service. This research project focuses on integrating medical and design professional fields to develop medical information and auxiliary communication tool, as well as to design doctor-patient communication APP prototype concept. Design draft and discussion with users were conducted. The study mainly adopted interviews, observations, and User Experience Innovation Design (UXID) to carry out interviews with 24 Vietnamese and Indonesian new immigrant women. These firsthand practical data were then transcribed and sorted out. By designing an APP prototype, researchers finally achieved the purpose of assisting new immigrant women in seeking health care and expressing their symptoms. This study is a pioneer study in health communication for immigrants and it can also serve as a reference for other follow-up studies.

Index Terms— New Immigrant Women, Healthcare Communication, UXID, APP prototype

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Introduction

Background and motivation

According to data of the Ministry of the Interior (Taiwan) in October 2015, there are approximately 508,000 foreign spouses in Taiwan at present. Among them, except some from Mainland China, most are foreigners from Southeast Asia. The number of Vietnamese women ranks the first, accounting for nearly sixty percent, followed by Indonesian, Filipino, Thai, and other nationalities. Given that the Taiwanese husbands of new immigrant women from Southeast Asia generally occupy a relatively low social and economic position, they and their families hope that they could stay at home to take care of children and parents as well as do housework. However, it takes these immigrants quite a long time to overcome language barriers and to adapt to the local life, so in most cases, many of them have few contacts with local society and know little about their vital interests. Since these new immigrants have to face a totally strange social environment, plus different climates, lifestyles, customs, cultures, languages, and family relationships, their living pressure is relatively heavy. During their first year in Taiwan, due to the language barriers, they often cannot express their pain and symptoms clearly. Hence, it is more necessary for them to rely on family members to describe their diseases to doctors (Wang & Yang, 2002). Studies on immigrants also find that because foreign spouses in Taiwan lack the ability to speak and write, they have no access to use health information or the ability to distinguish the information they have acquired. With language difficulties, they are often considered as people who do not comply with doctors' orders during the diagnosis and treatment. In fact, they are not unwilling to cooperate, but do not understand the health information provided by doctors. Language barriers or the lack of interpreters' help will also lead to their hopelessness and frustration because they cannot understand doctors' medical terms (Yang & Wang, 2003).

According to studies on the comments of new immigrant women on clinics in an unfamiliar environment, the main and most urgent concern for new immigrants to seek medical care is to explain diseases and seek convenience (Jou, Hsu, Lee, & Tang, 2006; Niha, Jantarasiriput, Tonyongdalaw, & Vaichompu, 2016). Language barriers prevent them from acquiring health knowledge, distinguishing correct health information from wrong one as well as understanding and using the information, which leads to the obstacle of self-care. By integrating design with medical domain, this study investigates healthcare communication problems when foreign spouses and their children seek for medical care as well as their need for health information, to further develop suitable visual healthcare support tools. Hence, the main purpose of this study is to create a graphic communication APP prototype to help new immigrant female spouses from Vietnam and Indonesia seek medical care. The APP will replace linguistic decoding with simple icons to help them have a good communication with doctors about their diseases when they could not speak fluent Chinese or English,

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meet their need of healthcare, and provide doctors with more accurate information of patients.

Literature Review

As the social environment and labor structure in Taiwan change in recent years, the number of immigrant spouses and workers increases largely. Due to different languages, diets, climates, and cultures, the maladjustment of foreign workers and spouses when they first come here will also indirectly influence the social and economic environment in Taiwan. What's more, when they seek for healthcare in Taiwan, the language barriers will also influence the safety and convenience. Hence, how to integrate these foreigners into the society and adapt them to the life in Taiwan as soon as possible is a critical issue for all governments (Ministry of Health and Welfare, 2006). Generally speaking, new immigrant women from Southeast Asia gain healthcare information through hospitals and clinics, but a few have no concept of health education or know how to ask questions or seek assistance (Qing-Fang, 2013). Given the regional lack of healthcare information, cultural differences, and the language barriers, these women could not judge the accuracy of information or read healthcare information released in Taiwan. However, if they accept Taiwanese notions blindly, they will have wrong concepts of healthcare on the basis of their own culture, feel frustrated and defeated easily, and even suffer from cultural bias and medical discrimination (Kharismadhany, Sari, & Rakhmah, 2017; Yang & Wang, 2003). As for the personal health of new immigrant women, during their early stage of adaptation to the new cultural environment, the pressure of adaption often reflects on health problems. The main diseases of new immigrants in Taiwan are mainly divided into psychological melancholia as well as gastrorrhagia and gastric ulcers related to intestines and stomach. In addition, their language barriers seriously affect the safety and convenience of medical care. What's worse, with limited knowledge of health education and difficulties in expressing and receiving information, they often cannot resolve health problems effectively when they see a doctor (Lee, Su, & Shin, 2004; Prabsangob, 2016; Qing-Fang, 2013). These women need to depend on their spouse's family members to solve problems for them, but Taiwanese men, as the economic pillar of the family, could not answer questions or accompany their wives at any time, which makes it inconvenient for new immigrants to see a doctor. Nowadays, interpreting service is the standard solution provided by governments of various countries to help migrant patients overcome language barriers. However, this method cannot probe into all hospitals or clinics effectively, or solve all problems. In terms of the current medical need of new immigrants from Southeast Asia, healthcare in Taiwan still faces the challenge of providing the best care for patients speaking different languages. It is necessary to seek for a more effective method to provide more suitable healthcare communication service (Lor, Xiong, Schwei, Bowers, & Jacobs, 2016; Naido, 2015).

Relevant studies show that when patients with poor literacy were helped to understand labels of prescription medicine and other medicine instructions, they can benefit more from graphic medicine instructions. Compared with a text message, information conveyed by icon is more helpful for them. The poorer literacy patients have, the more possible that they would pay attention to image information, which indicates that they remember what medicine to take. In addition, images can make patients more satisfied (Kripalani et al., 2007). In other words, the way of presenting information by images is more helpful for patients with language barriers and poor literacy to understand the content. In studies on the effect of adding images to health communication, images are equipped with narrative function, which could increase patients' memory retention rate and improve their understanding ability. What's more, nearly all text messages with additional graphic instructions are more easily to be remembered than simple texts, indicating that picture-superiority effect is extremely helpful for patients with poor literacy (Houts, Doak, Doak, & Loscalzo, 2006). The graphic communication design that these patients need should coincide with the theme, be simple and beneficial for understanding (Peregrin, 2010).

In recent years, the rapid development of communication technology promotes the bond between medical support tools and latest technology products as well as greatly improves people's convenience in life and living quality. By 2011, mHealth APPs on the Apple APP Store had been downloaded 718 million times, with the download number of medication APPs up by 97% year-on-year and mobile medical and health apps becoming the most popular (Yu Bin, 2013). Given that a small mistake of mobile user interfaces (MUI) in healthcare domain could be fatal, the medical MUI design quality is vital. The quality empirical concern of human-computer interaction relates to five important characteristics of the framework, namely, effectiveness, productivity, efficiency, error safety, and cognitive load. Effectiveness is the number of actions required to complete the subtasks of each task; productivity is the time taken by the user to complete the task; efficiency is the efficiency of the user in completing the task in a specified context of use; error safety is the number of errors committed in each action of each task performed in a specified context of use; cognitive load is the weighting of each screen view for a given user task, which means that the number of actions performed on that screen must be minimized and it takes some time to remember the easy operation (Alnanih & Ormandjieva, 2016; Alnanih, Ormandjieva, & Radhakrishnan, 2014). APP graphic design is easier to be recognized universally and more attractive than text design. Universal images can transcend language barriers to convey information to users, decreasing the rate of mistakes and users' learning time as well as achieving effective operation in a short time (Lin & Yang, 2010). Thus, APP graphic MUI designs can minimize mistakes, reduce learning time, and improve users' satisfaction.

Methodology

Research method and process

After searching literature, this study builds a basic argument for the APP prototype design relative to the healthcare communication of new immigrant women according to UXID. UXID, also called User Experience, is a development concept design focusing on users, covering three stages - APP design analysis, evaluation and integration (China Productivity Center, 2013). The most important factors of UXID are as follows: 1. Understand users' potential preference and what consumer groups of target users are, and then find out core product requirements; 2. Investigate users' using motivation and purposes behind the behavior, discover users' need and then satisfy them; 3. Connect users' using situations, namely, when and where they like to use this APP, because details reflect users' behavior preference, which often determines whether they will enjoy it. Take this as the standard of APP design and observe carefully each running process of the APP to analyze users' behavioral habits and hold their true opinions and need of the APP (Xue, 2014). Healthcare Communication APP design for new immigrant women is a specific device developed to promote medical consultation. For patients, the mobile phone is relatively light and thin, and the APP is easy to operate, so it's convenient for them to take along and use it. The mobile medical APP on promoting communication could greatly help new immigrant women solve problems when they see a doctor. Thus, the positive side of mobile app is for sure.

Framework design is roughly divided into three stages. Firstly, the study on users was carried out to understand their living environment as well as difficulties and need of healthcare through semi-structured interviews with 24 Vietnamese and Indonesian new immigrant women.

After recording and taking photos to record the whole interview as well as sorting out interview transcription and problems, researchers carried out radiant thinking through by Mandala thinking method to search for innovative solutions and provided references for later information design by sorting out users' need.

Secondly, visual users were created by persona, which is to create a real user centering on users to help them discover new framework functions of the APP and to ensure the functions and reduce the risk of failure with default APP functions. Thirdly, all previous information was collected and sorted out to create a new default of APP functions on the basis of interviews.

Concept generation

Interviews with new immigrant women include basic personal data, level of education, occupation, residence time in Taiwan, basic information of their family, sources and need of health information, whether to use internet to collect healthcare information, the biggest difficulty in medical treatment, how well to communicate with healthcare workers, what kind of help they like to be provided, opinions on paramedics and support tools for healthcare communication, etc. By transcribing and sorting out materials, researchers made a conclusion on the social environment of most of the new immigrant women from Southeast Asia in Taiwan, and analyzed the internal and external factors of problems (Figure 1).

	New Immigrant Women
Own Problem	1. Language communication barrier 2. No health insurance card 3. Social status is low 4. Personal education is low 5. Poor native family conditions
Information Sources	1. Most do not know about medical information 2. There is no corresponding foreign manual 3. Most cannot use Chinese smart phone
Living Environment	1. Cannot touch the same country sisters 2. Cannot learn Chinese 3. Economic pressure 4. Most live in the country

Fig. 1. Correlation analysis of living environment of new immigrant women from Southeast Asia

According to the analysis of interviews, the healthcare communication situations of these women can be divided into two categories. The first one aims at family members and new immigrant women who should take care of the old and children. The second one relates to the physical conditions of new immigrant women, such as not acclimated when they first come to Taiwan, antenatal care, and diseases. Since patients involved in the first category can often speak Chinese or are taken care by local people, they could communicate with doctors on their own. Thus, the main problem is the communication problem of new immigrant women when they see a doctor alone. Thus, how these women communicate with doctors effectively, how to clearly explain their diseases, and how many problems involved should be resolved were investigated. Mandala thinking method was applied to the radiant thinking centering on users' needs, to discover various relationships between these women and healthcare, express their needs, and investigate the real reason for the difficulty of healthcare communication (Figure 2).

People	Situation	Health ID Card
A new immigrant woman, A pregnant woman, Need to take care of the elderly	Acclimatized, maternity, child care, communication with family, household, language communication barriers	Arrived in Taiwan for six months without health insurance card

Fig. 2. Radiant thinking on healthcare need of new immigrant women from Southeast Asia

Scripting framework

Persona is a method to integrate users' psychology into designers' mind and help designers to think about and predict users' behaviors through perspective-taking. In the phase of building scenario, people, place, time, things and difficulties were considered in the mock scenario and two new roles were created according to the previous conclusion (Table I).

Table I
Imaginary new immigrant female patients

Basic Data					
Residence Time in Taiwan	Nationality Symptoms	Health Insurance	Place of Medical Treatment	Barriers	Emotion
3 months	Vietnamese	Not acclimated, diarrhea, dizziness, cold	No Clinic	Know nothing of Chinese, language barrier	Nervous
9 months	Indonesian	Stomach diseases	Yes Hospital	Know a little Chinese but could not express clearly her symptoms	Anxious

These two types of new immigrant women both need medical treatment, but they do not know healthcare information in advance, are afraid of talking to medical workers, do not understand medical terms, and cannot express clearly their symptoms. In the medical treatment, they have the need for communication APP on assisting new immigrants and the APP should transcend language barriers. Hence, APP MUI design should give priority to icons, with brief framework and easy operation to decrease mistakes and satisfy users.

App Interface Design

APP prototype design framework

On the basis of two scenarios faced by the imaginary Vietnamese and Indonesian new immigrant women, the APP prototype design first arranged scenarios on a timeline in the way of narration and simulated APP sketch design (Figure 3).

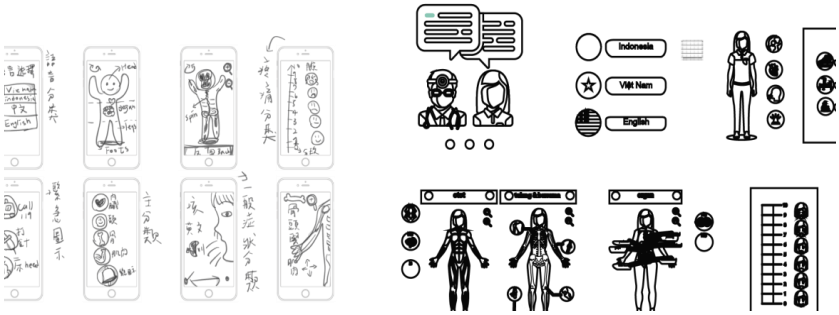

Fig. 3. Scenarios arranged on a time line of healthcare communication of new immigrant women (drawn by the study)

The APP design is easy to operate for both Vietnamese and Indonesian immigrant women, which could reduce their nervousness and disgust at the APP. Interface framework adopted the iOS interface in Apple mobile phone. Given that the specification of iOS interface design can guide developers to keep the consistency of the APP, this study took iOS interface as the APP prototype design.

According to the above APP interface timeline and function sketch, the APP default functions are as follows:

1. The icon design of APP;
2. The language selection interface includes English, Vietnamese, and Indonesian;
3. Main interface contains one female body, with human skeleton, organs, muscle, common diseases, and emergency button on the right menu interface;
4. The second level of menu interface includes human skeleton interface, organ interface, muscle interface, emergency button interface, and general disease interface.

For example, the human skeleton interface includes a menu of little trumpet, bone, pain ratings, and emergency button, as well as brush, simultaneous multiple choices, annotation and note interface toolbar, which contains a pain rating scale to represent the ratings of stomachache (Figure 4). The pain rating scale adopts the Visual Analogue Scale (VAS), which is suitable for patients above seven-year-old who can express their physical conditions, ranking from 0 to 10 with 0 representing no pain and 10 representing unbearable severe pain. The feelings of pain are separated by colors and the instruction is easy to understand.

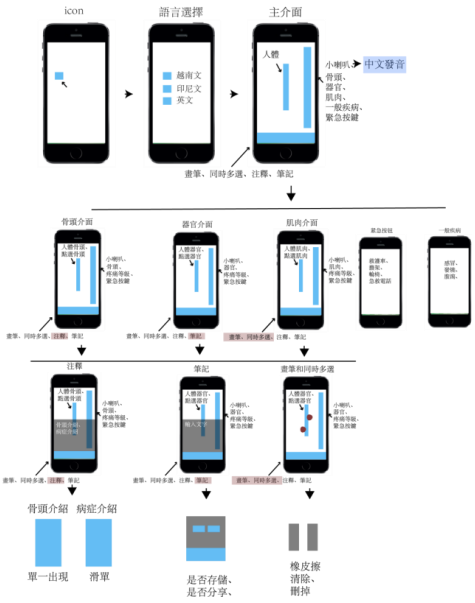

Fig. 4. APP framework levels

The first level of interface on language selection is to provide a familiar language environment for users. The main interface uses one word to present the function of the button for users' convenience to acquire an overall understanding of APP functions. The second level of interface is to choose diseased areas and is equipped with pain ratings on the right side for users to assess symptoms. In addition, with the function of the little trumpet, the APP will pronounce Chinese when users click buttons. There are also two radio button interfaces of emergency care and common diseases to prevent emergency and make common diseases easy to be chosen.

This will complete users' information and make the APP convenient for users. The third level is the four buttons of function improvement below the main interface, namely four functions of disease selection in the second level of interface. In this level, users can make notes and choose disease description. The fourth level is the selection menu button after finishing four functions, indicating whether it is stored and showing detailed description of symptoms.

APP prototype interface design evaluation

According to the APP framework, the APP prototype was created. After finishing the sketch, researchers carried out follow-up evaluation with 5 new immigrant women by interview and observation. The content of interviews includes questions like whether the APP icons could clearly express the language, whether graphic interface design is easier for receivers to decode, whether there is deviation during the decoding of information, etc. In addition, interface design was presented on paper to observe users' operation of simulation task to check whether the design was reasonable and whether there was any bug. According to the conclusion, the prototyping was modified (Figure 5).

Fig. 5. APP evaluation process

The result of evaluation shows that the narrative function of images can help patients with language barriers to understand healthcare workers quickly and have easy conversations with them. In the first test, new immigrant women with higher level of education performed better in learning and understanding, while those with lower level of education performed worse in understanding. However, after 3 to 5 simulation tasks, the latter could easily finish the task. Hence, the cognitive effect of APP icons is obvious. With simple interfaces, few operation errors, low error rates, and easy design to be remembered, this APP can basically meet the five standards of interface quality design. As long as the graphic interfaces maintain simple lines and warm and clear colors, graphic design is more possible to create a relaxing atmosphere and reduce users' nervousness, compared with real 3D bodies. Undoubtedly, the Vietnamese and Indonesian translation in the APP should still be improved because there are many vocabulary mistakes.

APP interface design

The study on APP design helps new immigrant women to address healthcare communication problems in Taiwan with an active attitude (Figure 6).

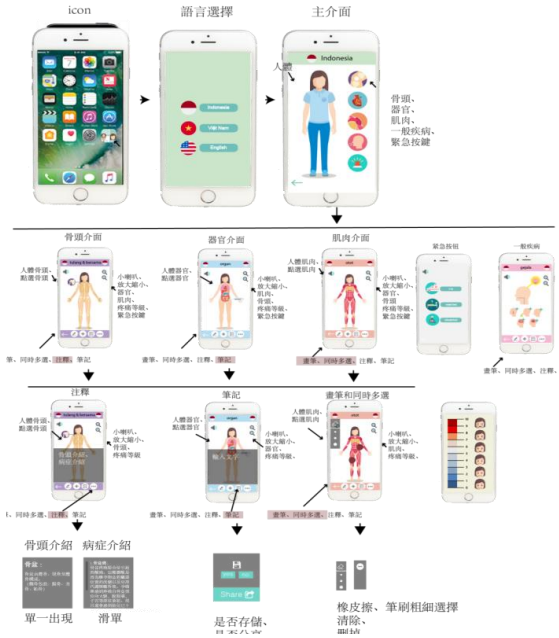

Fig. 6. Healthcare communication APP design for new immigrant women

In terms of healthcare communication of these women, due to their language barriers and cultural differences, they cannot describe their diseases clearly, leading to many inevitable mistakes during the communication between patients and doctors. On the basis of this, researchers studied on the APP prototype development to help these women adapt to healthcare communication in Taiwan. A simple and clear system of mobile APP interface can help them have effective communication with doctors, explain symptoms, and provide a new direction of thinking on the issue of assisting new immigrants with healthcare in Taiwan. After the APP design was finished, researchers cooperated with the information team to discuss the construction of the APP, ensure the usability of information, and provide actual support for new immigrant women with language barriers to have effective communication with doctors.

Limitations and Future Research Directions

This study focused on medical communication of immigrants where new immigrants still have many medical problems to be resolved, such as enriching their healthcare knowledge, like creating websites of healthcare consultation for new immigrant women, teaching emergency medical treatment, promoting healthcare information, and holding healthcare consultation lectures. Scholars are encouraged to extend this model further and it is hoped that this study can also serve as a reference for other follow-up studies.

Conclusion

Regardless of their reasons to immigrate to Taiwan, those women mainly want to pursue a healthy and happy life. However, this study finds that new immigrant women have language barriers and difficulties in reading and writing. The limitations resulting from language barriers lead to many difficulties in healthcare. This study is the study on APP design of assisting new immigrant women with healthcare communication, adopting interviews, and observation to understand their real situations as well as UXID and persona to simulate difficulties in healthcare communication in their real life from the perspective of users' needs. Researchers developed an APP design meeting five standards of interface quality design and devoted to help these women reduce difficulties in healthcare communication and improve their willingness to see a doctor. What's more, the voice function of the APP design can also help them learn Chinese medical terms, make good use of fragmented time, and improve learning efficiency. Although the interface design has been finished, the program still needs to be written and assessed to finish the whole APP design.

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References

Alnanih, R., & Ormandjieva, O. (2016). Mapping HCI principles to design quality of mobile user interfaces in healthcare applications. *Procedia Computer Science, 94*, 75-82. **DOI:** 10.1016/j.procs.2016.08.014

Alnanih, R., Ormandjieva, O., & Radhakrishnan, T. (2014). Empirical evaluation of intelligent mobile user interfaces in healthcare. In *Canadian Conference on Artificial Intelligence*. Springer, Cham. **DOI:** 10.1007/978-3-319-06483-3_3

China Productivity Center. (2013). *User experience innovative design handbook: From customer insight to business value.* Retrieved from http://cpc.tw/en-us

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling, 61*(2), 173-190. **DOI:** 10.1016/j.pec.2005.05.004

Jou, T., Hsu, Y., Lee, C., & Tang, C. (2006). An evaluation of the utilization of OB/GYN clinic service by foreign spouses. *Chinese Journal of Family Medicine, 16*(1), 51-63.

Kharismadhany, Sari, U. E., & Rakhmah, Q. A. (2017). Increasing women's awareness on the importance of early detection of cervical cancer through socialization method and focus group discussion in Sabdodadi village Bantul, Yogyakarta. *Journal of Advances in Health and Medical Sciences, 3*(1), 9-16. **DOI:** 10.20474/jahms3.1.2

Kripalani, S., Robertson, R., Love-Ghaffari, M. H., Henderson, L. E., Praska, J., Strawder, A., ... & Jacobson, T. A. (2007). Development of an illustrated medication schedule as a low-literacy patient education tool. *Patient Education and Counseling, 66*(3), 368-377. **DOI:** 10.1016/j.pec.2007.01.020

Lee, H. C., Su, H. C., & Shin, C. Y. (2004). An assessment of the health of foreign brides in Hsin-Tien County. *Hu Li Za Zhi The Journal of Nursing, 51*(4), 88-93.

Lin, T.S., Yang, Y. C. (2010). The universe and identification of safety information design: A case study on escape sling operating instructions. *Journal of Design, 15*(4), 19-40.

Lor, M., Xiong, P., Schwei, R. J., Bowers, B. J., & Jacobs, E. A. (2016). Limited English proficient Hmong-and Spanish-speaking patients' perceptions of the quality of interpreter services. *International Journal of Nursing Studies, 54*, 75-83. **DOI:** 10.1016/j.ijnurstu.2015.03.019

Ministry of Health and Welfare (2006). *Assisting foreigners to seek medical advice.* Retrieved from https://goo.gl/UVCzM5

Naido, P. (2015). Evaluation of clinics on the provision of youth friendly services in the Ethekwini Metro of Kwazulu Natal. *International Journal of Health and Medical Sciences, 1*1, 1-7. **DOI:** 10.20469/ijhms.30001

Niha, S. Jantarasiriput, B. Tonyongdalaw N., & Vaichompu, N. (2016). Reproductive health among bangoebadae muslim women: Cervical cancer care. *International Journal of Health and Medical Sciences, 2*(3), 52-57, 2016. **DOI:** 10.20469/ijhms.2.30002-3

Peregrin, T. (2010). Picture this: Visual cues enhance health education messages for people with low literacy skills. *Journal of the American Dietetic Association, 110*(4), 500-505. **DOI:** 10.1016/j.jada.2010.02.019

Prabsangob, K. (2016). Relationships of health literacy diabetes knowledge and social support to self-care behavior among type 2 diabetic patients. *International Journal of Health and Medical Sciences, 2*(3), 68-72. **DOI:** 10.20469/ijhms.2.30005-3

Qing-Fang C. (2013). *Immigration difficult to see a doctor.* Retrieved from https://goo.gl/Sbe6Er

Wang, H. H., & Yang, Y. M. (2002). The health of Southeast Asian women in transnational marriages in Taiwan. *Journal of Nursing, 49*(2), 35-41.

Xue, D. (2014). Enhance the *charm and strength of App, user experience to teach you from where to start!* Retrieved from https://goo.gl/ChxSdY

Yang, Y. M., & Wang, H. H. (2003). Life and health concerns of Indonesian women in transnational marriages in Taiwan. *Journal of Nursing Research, 11*(3), 167-176. **DOI:** 10.1097/01.JNR.0000347633.72476.4a

Yu Bin H. (2013). *Potential business opportunities: Medical APP annual growth doubled.* Retrieved from https://goo.gl/upLNyh