

Acceptability Testing of a Mobile Application to Improve Immunization Status Monitoring and Compliance in Selected Barangay Health Centers in Iligan City

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Abstract— With the availability of vaccines given freely by the government for immunization, it is still a question as to why the goal of 100% fully immunized child (FIC) status has yet to be reached. Hence, an android application was created, designed and developed to help increase the immunization rate specifically in Iligan City which only has 81.01% or 7,509 out of 9269 total eligible population. This mobile application was tested for its acceptability among nurses, midwives, and/or Barangay Health workers in ten different Barangay Health Centers in Iligan City. This was done in three phases; the orientation phase, implementation phase, and evaluation phase.

Results showed that the application was strongly beneficial (Median=4) to them with an extreme ease of use (Median=6.75). They were also very satisfied (Median=1) with its performance. The findings of this study have proved to be promising in improving monitoring of immunization status and compliance. The android application is of great contribution and has guaranteed a time-saving, cost-effective way in productivity and delivery of safe, quality care.

Keywords— *Immunization; Android Application; Fully Immunized Child.*

I. INTRODUCTION

Every child has the right to have a fair chance in life. They deserve a chance to live a long life, to feel safe and to be protected against various diseases. However, in the year 2015, an estimated 5.9 million children under 5 years of age died with a global under-five mortality of 42.5 per 1000 live births which is an estimate of 28 deaths per 1000 live births in the Philippines before they can even reach the age of five [2]. The causes of these deaths are said to be from several vaccine-preventable diseases, namely measles, tuberculosis, poliomyelitis, diphtheria, tetanus, and pertussis which has also been reported to cause an estimate of 3 million deaths or disabilities each year. These, however, can be prevented through a complete and timely immunization [1].

As defined by the World Health Organization (WHO), immunization is the process wherein a person is made immune or resistant to an infectious disease by the administration of a vaccine. Vaccine, on the other hand, stimulates the body's own immune system to protect the person against subsequent infection or disease. Given by the fact that children who are not fully immunized are more vulnerable to common childhood diseases, a program to improve immunization status of each country was created. This program is called the Expanded Program on Immunization or EPI which is a program established by the WHO in 1976 mainly to reduce infant and child mortality that are commonly brought by the said vaccine-preventable diseases. The program also ensures the infants, children and even mothers an access to the

recommended infant or childhood vaccines, thus achieving the goal of Fully Immunized Child (FIC) in the Philippines [3].

Globally, the immunization coverage for the six major vaccine-preventable diseases has risen significantly but had also stalled over the last decade. Philippines, having at least 60% of the total number of children who did not receive vaccination, has been one of the eight countries to have many unvaccinated children [4]. Studies show that various factors have caused barriers among the mothers from adhering to the Expanded Program on Immunization. Among all other factors, barriers due to personal beliefs, social influence and geographical locations, lack of knowledge and awareness on EPI are the most prevalent [5].

On the other hand, technologies like smartphones have paved their way to becoming very useful in the lives of the many. Nowadays, smartphones became the defining technology of the 21st century. It was estimated that by the year 2020, 80% of the total population especially adults worldwide will have their own smartphones [6]. Thus, smartphones having its easy accessibility and efficiency, have proven their use to many, even to improving health care delivery system [7], [9], [14].

Since EPI was established last 1976, significant changes have resulted to the immunization status worldwide, and most importantly in the Philippines. But due to various factors, Philippines cannot seem to achieve its 100% goal of Fully Immunized Child all over the country. In fact, in Iligan City, only 81.01% or 7,509 out of 9,269 total eligible population have reached the Fully Immunized Child status in the end of the year 2015 [8]. But with the advancement of technologies nowadays and with the use of smartphones and various mobile applications, health care delivery system may just be improved, thus, giving chances in improving and even achieving the goal for the immunization status in the country[14].

Therefore, with the increased demands and advancements in technologies like smartphones and its capacity to aid and improve health care delivery, the researchers were dedicated to create a solution to the decreased immunization status in the country, specifically in Iligan City where it has not achieved the 100% status. The researchers specifically developed a mobile application with the intent of increasing the immunization rate of the children in Iligan City.

Objectives:

- To determine the acceptability of the mobile application as to ease of use, preferences, satisfaction rating, and perceived benefits and disadvantages.

- To determine the strengths and weaknesses of the mobile application based on the perception of the respondents.

II. RELATED STUDIES

In the area of technology and advancement, the effective use of smartphones cannot be denied that it has even become the defining technology of the 21st century. An estimated 80% of the total population, especially adults, will have their own smartphones by 2020 [6]. According to statistics, the number of smartphone-users in 2016 will be an estimated 2.1 billion. By 2019, the numbers are expected to exceed the 5-billion mark. However, the use of these smartphones has also established its utilization in the area of improving the health care delivery system [7]. Mobile technologies are making a breakout in health care systems since its gradual evolution towards new models of care based on integrated care processes [9]. It offers ways to help improve access and quality of health care. It can connect clients and health-care providers in real-time, creating an access to each other and enables monitoring and management of health indicators [10]. Mobile Applications will transform health care in 5 ways – improved access to care, improved patient engagement, new provider business models, reduced fraud and improved patient safety [11].

Mobile applications have been advantageous and have greatly impacted the healthcare industry. It helps create solutions to immunization challenges through its focused and bidirectional communication system. In Canada, as of 2015, the Android app store reveals 225 existing mobile applications on immunization. Moreover, searching the Apple App Store for such applications produced 98 results. The diversity of these applications ranges from provision of immunization information, permission of vaccine tracking in both individuals and animals and even in assistance with the creation of customized schedules and identification of vaccine clinics that serves as a source of education. For individuals, the use of mobile applications provides an avenue for better quality of record keeping, assistance with the logistics of vaccination, and better means of communicating information. In systems, mobile applications provide the potential to improve the quality of information residing in immunization information systems and program evaluation, facilitate harmonization of immunization information between individuals, health care providers and public health as well as reduce vaccine hesitancy. As mobile technology continues to rapidly evolve there will emerge new ways in which apps can enhance immunization practice [12].

In the Philippines, the Department of Health has been implementing their new program called the iClinicSys. This is a system which caters several functions of any health centers or units in the country. iClinicSys is a data saving system which generates standardized patient records and reporting requirement both at the local and the national level. It has several systematic features such as the Field Health Services Program, Unified Disease Registries, Watching Over Mother Babies, Philippine Health Information Exchange, and so on. This system requires the use of a computer, laptop, or smartphones and as well as an internet connection [13].

The new electronic age has paved the way as the world looks for better means to provide quality healthcare, shifting towards Electronic Health Records and Electronic Medical Records. This will also help break the barriers that prevent reaching the goal of 100% Fully Immunized Child (FIC)

status. In line with this, the researchers have designed, created and developed an android application. Its features are similar to some of the existing apps which are primarily to improve the storage of patient information and communicate data in a cost and space-effective means. But unlike the typical EHRs and EMRs, patients can also have access to view their immunization data and status. Moreover, if the use of the app will be expanded, access by the health care workers will be a lot easier and quicker, even if the data is from the father side of the country. The app is more centralized and has an added auto SMS sending which will remind parents on immunization dates 1 week before, 3 days, 1 day before and on the day of the immunization schedule to entice them to adhere to schedules.

III. RESEARCH METHOD AND THE MOBILE APPLICATION

A. Research Method

The study had four phases: the planning and development of the mobile application, orientation phase, implementation phase, and the evaluation phase. The researchers created the mobile application based on the immunization forms used by the DOH and the local government. Then after orientation, it was implemented and tested for acceptability on 20 respondents from the ten different barangay health centers in Iligan City with the least compliance to immunization. The respondents were chosen using a non-probability specifically purposive or judgmental sampling. There were criteria in choosing the respondents. They must be a licensed or certified nurse, midwife, and/or barangay health workers; must be an android smartphone or tablet users with the mobile application installed; must be recognized as an employee of the health center; and must pass the basic matrix skills for android with a score of at least 20 points.

During the orientation phase, the respondents were taught by the researchers how to utilize the mobile application using the observer's guide. They were shown how the application works. After several minutes of demonstration, they were then asked to perform a return demonstration on how to use the application. The respondents were graded using the basic matrix skills derived from Component-Based Usability Questionnaire (CBUQ) on how well they performed during their return demonstration [16]. The orientation phase lasted for a week, with the researchers visiting individually each barangay health centers to give their full attention to the knowledge of the respondents. Next was implementation phase. The respondents were given the actual task of utilizing the mobile application on their own. They were given two weeks to experience using the mobile application by themselves, especially on Wednesdays or Immunization days. After two weeks of implementation, the respondents were given the structured questionnaires to evaluate the application. Structured questionnaires were developed to collect data in order to evaluate user's satisfaction to the android application. The questionnaire was composed of different sections namely the generalizations and the android application experience; modified from study of Davis [17]. The generalized section consisted of demographic profile of respondents in terms of gender, age, civil status, educational attainment and length of service in the selected barangay health centers. Following the general section was android application experience wherein barangay health workers' responses were evaluated in correlation with the benefits and disadvantages, ease of documentations, satisfaction and their preference in using the mobile app.

B. The Mobile Application

The mobile application the researcher created allows and provides electronic form of documentation of clients under the Expanded Program on Immunization. It allows the users to input new patient’s data, edit and view the data, and monitor the immunization status of the client. It is also added with a special feature which sends an automatic notification to parents or guardians of the client regarding the immunization schedule, status of the client, and health promoting messages related to immunization. This application saves data collected to a cloud-based database. The app operates on mobile devices with Android Operating System. It is compatible with Android 4.4 Kitkat and higher versions. The researchers of the study believed that android OS has more users than that of the other operating systems. According to statistics released by the Gartner last February 2017, 81.7% of smartphone users are android OS users, while only 17.9% comprised the users of an Apple iOS [15]. The application requires connection to internet in order to save data to the cloud-based database. After installation on the device, the app can be used immediately without any further configuration. The mobile application has three user types; the admin, healthworker, and patient or client. However, to ensure confidentiality and security of data only the admin or the healthworker has the power to edit or change any data on the system, while the patient user type can only view his or her data on the system. A user’s manual or observer’s guide was also created to help the user understand the mobile application. It explains in general terms the system and the purpose for which it is intended. The user’s manual consists of five sections: General Information, Application Summary, Getting Started, Using the Application, and Frequently Asked Questions.

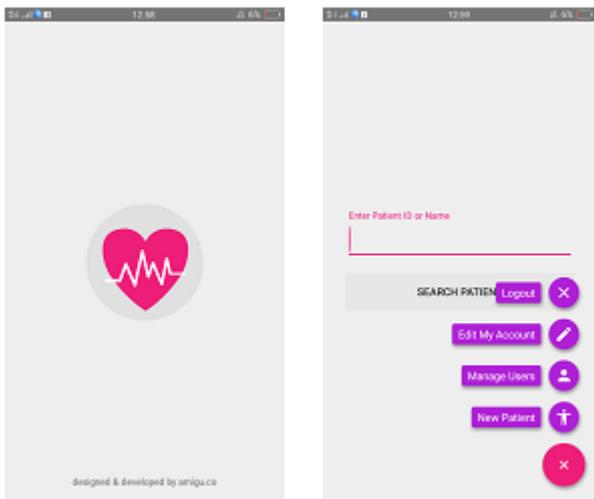


Figure 1: Screen captures of the logo of the mobile application and the system menu containing 4 tabs

IV. RESULTS AND ACCEPTABILITY TESTING

In terms of the acceptability of the developed android application, four parameters were measured in terms of median – ease of use, satisfaction, strengths and benefits, and disadvantages. The overall results were 6.59 (extremely likely), 1.2 (very satisfied), 4 (strongly agree), and 22.7 (seldom), respectively.

Based on these results, the introduction of the mobile application has been successful due to the positive responses of the nurses, midwives and barangay health workers of selected barangays. The willingness to adapt to technology and transition to electronic health records is broadly considered today. The respondents of the study have been very satisfied

and interested to see what lies ahead for this advancement. The innovation has confirmed beneficial to the community’s management of immunization and its status.

For the strengths of the application, the respondents think that through its utilization, more time can be saved and data saving and access is easier. In contrast, it can’t be used offline or without internet connection and electricity, making the application usage limited only to certain barangays.

Table 1: Acceptability Testing

Parameter	Median/ Percentage	Remarks
Ease of Use	6.75	Extremely likely to use the app
User Satisfaction	1	Very Satisfied
Perceived Benefits	4	Users have agreed strongly that the app is of great benefit
Perceived Disadvantages	3	Seldom, users experience unavailability of the system and also the network, system downtime or crashtime, and some missing files.
Preference	95% for app 5% for paper-based	95% preferred the app

CONCLUSION

The findings of this study have proved to be promising to the health sector. It has guaranteed a time-saving, cost-effective way in productivity and delivery of safe, quality care. The android application is of great contribution to information management, report facilitation and data management of nurse’s immunization documentation.

Acknowledgment

The authors would like to thank the College of Nursing of Mindanao State University- Iligan Institute of Technology, and the health workers of the 10 barangays of Iligan City for their support in the preparation and completion of the study.

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