1

Android Based Application for Monitoring Patients Health and Medicine Intake

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1.1 INTRODUCTION

The number of individuals who suffer from chronic disease continues to increase worldwide (WHO, 2015). Health awareness together with the improvement in living conditions and treatment has increased the life expectancy of people suffering from chronic disease; nevertheless without efficient health management and monitoring, the quality of life is decreased (Whitehead, Seaton, 2016). Progressive growth in computer-mediated technologies such as social networking, smartphones and medical applications provide a useful platform for self-health management and awareness. Towards empowering people in practicing self-health management, individuals who suffer from chronic disease need to have access to timely information, advice, assessment and treatment from medical practitioners in order for them to manage their long-term illnesses conditions systematically (Zoffmann et al. 2016). Medical practitioners play an important role in empowering self-health management by giving guidance, monitoring adverse
events and identify areas for improvement while giving patients independently self-management their health (Whitehead, Seaton, 2016, Smith et. al, 2016). Through computer-mediated technologies, systematic intervention from medical practitioners and community is feasible thus improving quality of life for individuals (Lorig et. al., 2016).

Health care industries benefit significantly through the expansion of mobile health (mHealth) applications. People are going mobile where 52% of smartphones users gather health-related information on their phones while 80% of physicians use smartphones and medical apps (Govette, 2015). The success of mHealth due to its usability and cost saving, especially in home health care and self-health management where patients can get access to trusted wellness programs (Smith et. al, 2016). Wheras through mHealth, health care industries could link to their electronic medical record system for disease surveillance purposes (Gallegos, 2015).

Medical intervention is critical for individuals who suffers from chronic disease, since they have to take medication promptly and their condition must be monitored closely. Most of the individuals are elderly people who sometime neglect to take their medicine as scheduled that cause them serious health relapse. Thus, as preventive measures, this research has developed a pilot prototype android based application as mobile-enhanced preventive care, wellness management system to monitor patient health and medicine intake. As a pilot study, a prototype application called MedsBox Reminder is developed to empower self-health management. This application not only encouraged self-health management but also connect medical practitioners with their patients on personal level for guidance, monitoring and medical intervention.
1.2 RELATED WORKS

In this section, the essential background knowledge of mobile application and its related works which represents the essence of our work, are introduced.

Mobile applications (apps) can be defined as a software application that can be run on mobile devices such as Smartphones, tablets or other electronic devices. Android and iOS are among smart phone operating systems that are popular nowadays. Currently, mobile applications have become a necessary tools to assist users in managing their daily personal and professional tasks. Apps have been developed to run on a mobile device used to check email, access the Internet, download information or remembering things like important appointments. However, with some improvement, mobile apps not only used for common task but also help in solving complex task in particular domain such as communication, education, finance, travel, entertainments, medical and health domain (Siuhi and Mwakalonge, 2016). In other words, mobile apps have become basic necessity in our daily life.

Nowadays, mobile applications in health care domain has become common in health care and clinical practices where numerous apps are available in assisting medical professional or non-professional user (Ventola, 2014). The ability to download medical apps on mobiles devices for example via Google Play Store helped countless users in managing their wellbeing. Some of the tasks are for monitoring patients health or self-monitoring (Nguyen et.al., 2016, Nandi et. al., 2015 and Diez et. al., 2016), reminder (Peck et. al, 2014), diagnosing diseases (Oluwagbemi, Oluwagbemi & Ughmadu, 2016), non-communicable disease
prevention (Parmar et. al, 2015) and clinical decision making (Divali et. al., 2013).

Currently, monitoring and self-management mobile application has emerged as one of approach in assisting patients. One research has proposed a low cost mobile health care monitoring system for that monitor ECG, blood pressure, SaO2 signal and temperature that help in the treatment of chronic diseases (Nandi et. al, 2015). The collected data was shown graphically in an Android device to assist patients in performing their daily activities. Nguyen et al. (2016) has identify few mobile apps to enhance self-management of patients with gout. These apps allow user to monitor their gout disease including monitoring serum uric acid, record acute attacks and educate patients about gout. Other apps was self-management and education of cardiac patients that try to help fight against chronic diseases, specially heart diseases (Diez et. al., 2016). This apps were divided into three sections; medical information section, record the users’ activities for their heart conditions and a section for registering users and their medication time. There are also apps develop to assist in non-communicable disease prevention such as Stroke Riskometer that provides estimates of the absolute risk of stroke within the next 5 and 10 years for individuals aged ≥20 years and also provide user a baseline risk comparison that allows them to compare their stroke risk with someone of the same age and gender who has no risk factors (Parmar, 2015). Since 5 to 10 years prediction of stroke risk is still inadequate, there are several researches that studied about the personalized modelling using spiking neural networks methods to predict stroke risk event several days earlier before stroke occurrences (Othman, 2014, Kasabov et. al, 2014, Kasabov et. al, 2016). Since these researches based on a very complex network of system and rely on a correct combination of a large number of hyper-parameters, there are many unresolved issues on technological and computational scaling primarily on computational speed, power consumption and the
system’s physical size (Kasabov et. al, 2016). Thus implementing it on mobile technology is still beyond reach.

Besides monitoring and self-management apps, few works have studied the usage of medical apps as reminder for instances immunization reminder (Peck et. al, 2014). Through a survey evaluation, the usage of android smart phone application for immunization reminder received positive feedback from physician, parent and guardian. The advancement in mobile technology and authentication leads toward improvement in home health care where a person who suffers from chronic disease need a reminder applications to signal them in taking medicine promptly (Samir and Girish, 2016). Therefore, Internet of things (IOT) have become an essential part for data transaction between source points to destination for above reminder applications. Finally, a mobile phone reminder applications using text message was developed for antipsychotic patient (Kauppi et. al, 2015). This tool is a practical and ideal approach towards aiding different type of mental illness patients when patients can select preferred text messages as reminder for medication intake, treatment appointment and support during their free time.

Summing up, all this monitoring and reminder apps have been helpful for users in assisting them in monitoring or managing their diseases. This initiate the development of MedsBox Reminder Application with intention to help clinician in administrating the apps, and provide patients the access to the prescribed medication by the clinician and usage of reminder function as notification for their daily medication intake.

1.3 METHODOLOGY

Object-Oriented System Development approach is utilized as guidance toward the development of MedsBox Reminder
Application. During initial stage of study, several series of data collection methods are carried out to measure the acceptance of this approach including survey and questionnaires distributed among patients and clinicians, interview conducted with registered clinicians and physicians, and observation in clinics and pharmacies. These respondents are then invited to participate in the evaluation of the initial prototype.

Figure 1 depicts the system architecture where two main entity describes as clinicians and patients, will have direct access to the system. Clinicians will access the system via administrator website while patients need to download the MedsBox Reminder apps and install it in their mobile phone or tablet, to gain access to their record.

Figure 1 System Architecture of MedsBox Reminder

Figure 2 shows screen shots of administrator site where clinicians can insert or update patients’ data such as personal data, medication information for patients, current health condition given by the physicians and also updating scheduled appointment for patients’ checkup.
MedsBox Reminder apps allow patients access to all information regarding medication prescribed for them by the clinicians. The apps also provide setup reminder functionality to schedule personal medicinal intake according to the physicians’ direction entered by the clinicians. Patients are also permitted to view and reschedule their medical appointment via the MedsBox Reminder application. Figure 3 shows the screen capture of MedsBox Reminder application on patients’ mobile phones.
Figure 3 Patient Mobile Application

The pseudocode of MedBox Reminder for reminder function is presented below. Pseudocode 1 is pseudocode for the medication intake reminder, set by the patients themselves. Whereas Pseudocode 2 is pseudocode for appointment reminder with the physician, set by the clinician. This two pseudocode is vital to the success of this application where empowering self-management initiatives and medical intervention.

PSEUDOCODE 1 MEDICINE REMINDER

1. function savedState ()
2.     Initialize medsname = mName.getText().toString();
3.     Initialize special_notes =
4.     sNotes.getText().toString();
5.     Initialize qty = eQty.getText().toString();
6.     Initialize dateTimeFormat = new
7.         SimpleDateFormat(DATE_TIME_FORMAT);
8.     If mRowId == null
9.         long id = mDbHelper.createReminder (medsname,
10.        special_notes, reminderDateTime, qty);
11.     If id > 0
12.         mRowId = id;
13.     Else
14.         Call mDbHelper.updateReminder (mRowId, medsname,
15.             special_notes, reminderDateTime, qty);
16.         Add new ReminderManager(this).setReminder (mRowId,
17.             mCalendar);
18.     end function
PSEUDOCODE 2 APPOINTMENT REMINDER

1. function savedState2 ()
2. Initialize apptt = apptext.getText().toString();
3. Initialize dateFormat = new SimpleDateFormat(DATE_TIME_FORMAT);
4. Initialize apptDateTime = dateFormat.format(mCalendar.getTime());
5. If mRowId == null
6. long id = mDbHelper.createReminder2(apptt, apptDateTime);
7. If id > 0
8. mRowId = id;
9. Else
10. Call mDbHelper.updateReminder2(mRowId, apptt, apptDateTime);
11. Add new ReminderManager(this).setReminder(mRowId, mCalendar);
12. end function

1.4 RESULT AND DISCUSSION

This section will discussed on the user acceptance testing (UAT) result that conducted to get feedback from users. UAT is considered as the last phase of any software development process that help in making sure that the software or apps can handle its required real world tasks. With UAT, it give users chance to interact with MedsBox Reminder and find out if everything work as it should.

The testing was conducted through five respondents. These respondent are patients that are accustomed to the service they received from a clinic. Questionnaire form was distributed to the respondents while testing on the prototype. The implementation of system testing is successfully conducted with the clinician and the actual outputs are similar to the expected results. Comments and suggestions from the user acceptance testing are gathered and
adopted to improve the system in the future. Figure 4 show result of user acceptance survey in using this apps for managing daily medication intake. Two respondents (40%) strongly agree with this statement while three respondents (60%) agree with using MedsBox Reminder in managing their daily medication intake.

![Figure 4 Chart on User Acceptance Survey](image)

**Figure 4** Chart on User Acceptance Survey

Figure 5 show result for survey on overall MedsBox Reminder application usability. Four respondents (80%) agree that this apps is functioning well while one respondent (20%) strongly agree that this apps is functioning well. Overall, MedsBox Reminder application has achieved the objective to be a well function application that help user in their managing their daily
medication intake. Though, there still some room for improvement in making MedsBox Reminder.

1.5 CONCLUSION

As conclusion, the enhancement of mobile technologies initiate opportunities in mHealth field especially for self-management of individual health, immediate medical interventions and assistance from medical practitioners and also health awareness at individual level. As a result, health care industries and community gain substantial benefits that improve overall quality of life for the future generation.

1.6 REFERENCES


Selected Topics In Information Technology


