

A Mobile Reminder System for Elderly and Alzheimer's patients

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Abstract

Mobile technologies is finding a role in patient monitoring in several different environments: homes, hospitals, and nursing homes. mHealth applications include the use of mobile devices in collecting community and clinical health data, delivery of healthcare information to practitioners, researchers and patients, real-time monitoring of patient vital signs, and direct provision of care. Therefore, usability of software applications is the key to success of any system. This study focused on creating an application for smart phones with android system. The main aim of the proposed system is to help two important categories of the society they are elderly and Alzheimer's patients, these two categories shared in one recipe which is a forgetful. This system gives them the ability to have small memory can help them to remember all tasks to life, which may contribute to the prevention of progression of the disease rapidly, and the technology is best care because it is not susceptible to forget or damage. The design of the proposed system presented in this study includes reminding them of the dates of their medications and the amount of medicine. It also reminds food times and some of the important events. The study concludes that the working environment would be improved by supporting with mobile technology and reduces the health expenditures and burden of health care professionals in care facility units.

Keywords: *Mobile, Healthcare, Reminder, Elderly patient, Alzheimer.*

1. Introduction

The rapid expansion of mobile Information and Communications Technologies (ICT) within health service delivery and public health systems has created a range of new opportunities to deliver new forms of interactive health services to patients, clinicians, and caregivers alike

[1, 2]. mHealth is an abbreviation for mobile health. A term used for the practice of medicine and public health supported by mobile devices. mHealth applications include the use of mobile devices in collecting community and clinical health data, delivery of healthcare information to practitioners, researchers and patients, real-time monitoring of patient vital signs, and direct provision of care (via mobile telemedicine). Within the mHealth space, projects operate with a variety of objectives, including increased access to healthcare and health-related information (particularly for hard-to-reach populations); improved ability to diagnose and track diseases; timelier, more actionable public health information; and expanded access to ongoing medical education and training for health workers. Mobile technologies are becoming ubiquitous in the U.S. and the world, changing the way we communicate, conduct commerce, and provide care and services. Certainly some of the most compelling benefits of mobile technologies are in the areas of disease prevention, chronic disease management and improving healthcare delivery. For all the advances that are occurring in mobile health, or mHealth, its full potential for one very large group of beneficiaries' older adults and the persons who support them is only starting to emerge.

It is projected that by the year 2014 public and private healthcare providers could save between \$1.96 billion and \$5.83 billion in healthcare costs worldwide by utilizing mHealth technologies for health monitoring [2, 3].

Kingdom of Saudi Arabia, where the scope of this study, gave superior attention for health care since its inception till now, the Kingdom's represented by the Ministry of Health keen to keep abreast of developments and technology, which indicates that the launched of e-health

conference several months ago in Jeddah also, and in order to keep up with technology the Ministry of Health launched the main application of it for smart phones and then launched several other applications for different purposes.

Alzheimer's disease causes dementia that leads to short-term memory loss and cognitive impairment. Patients in advanced stages forget how to perform bodily functions such as swallowing ultimately leading to death. It is essential for patients such as these to keep up with their medications. Approximately 5 million people have been diagnosed with Alzheimer's disease which has created social and medical issues for patients and caretakers [4]. Much time and efforts have been devoted for creating a set of tools to assist with the effects of this destructive disorder. Reviewing results of these efforts can provide beneficial information for research and development teams who are working to improve diagnostic tools and treatment for patients. The Alzheimer's Organization (www.alzh.org) provides background information, treatment and coping suggestions, and up-to-date prescriptions for how to remedy debilitating effects. In addition Alzheimer's patients also suffer from memory loss, in the beginning, the problem is simple which is about forget some recent events, such as forgetting the people had met or what did that day, but the problem evolve with time. In the other hand, the elderly often take many medications and physicians often complain of lack of commitment to the dates of medication or dose necessary and it is due for forgetting to take medication or increase the dosage, which is reflected on their health. Therefore this study aimed to develop a system based on mobile handheld solution in order to help and improve quality care of Alzheimer's and elderly patients.

2. Related Works

Portable device is accompanying users most of the time. Thus, makes it an interesting platform for building convenient applications that can display output any part in the world [5, 6]. The world population of people over the age of 65 is growing rapidly at a rate of 800,000 per month [7]. Eventually, many of these people reach a point where they can no longer live independently. Consequently the elderly person needs to be taken to a nursing home. It is well documented that those who live in nursing homes tend to require more hospitalization and doctor visits. Once moved into a facility, it is common for them to become depressed because of their lack of independence. It is everyone's best interest for people to live independently for as long as possible. Technology could play an

important role by providing a smart environment that aids the elderly in being independent.

There are several reminding systems that have been developed, but with different aims. However, not all of these systems were designed for elderly and Alzheimer patients. This implies that most of the existing systems do not address the problems that were outlined. This section reviews some related literature as well as some existing systems and mobile applications that were developed as possible solutions.

A large number of smart homes have been developed as a physical test bed to support the elderly society. Chowdhury and Khosla. [8] developed a RFID-based hospital real-time patient management system. They developed the system by following Agile System Development Methodology (ASDM) using C# in Microsoft Visual Studio.net 2003 environment. It facilitates automatic streaming patient identification in hospitals with the help of mobile devices like PDA and smart phones.

The Harvard University research project, CodeBlue [9], deploy low-power wireless devices to provide ad hoc sensor network infrastructure for emergency medical care. They developed patient triage application in .NET compact framework, running on an iPAQ PDA with Windows CE. The application is capable of operating as active tags to store the information of a patient's identity, status, and history.

Oresko et al. [10] implemented a prototype system for wearable Cardiovascular Disease (CVD) detection on windows smartphone. It is capable of performing real-time ECG acquisition and display, feature extraction, and beat classification. They developed two smartphone-based platforms for continuous monitoring and recording of a patient's ECG signals. Application successfully detects realtime CVD and generates personalized cardiac health summary reports.

John et al. [11] developed a smartphone application Wedjat, to avoid in-take medicine mistakes. It can remind its users to take the correct medicines on time and keep an in-take record for later review by healthcare professionals. It was developed on a Windows Mobile 6.0 with the help of built in calendar of .NET framework.

Haghigh et al. [12] developed a mobile data mining for intelligent healthcare support on Nokia 95 phone to facilitate blood pressure patients. A general approach for Situation-Aware Adaptive Processing (SAAP) of data streams that incorporate situation awareness into data stream processing using fuzzy logic. Their prototype system can reason about situations of normal, prehypotension, hypotension, prehypertension and hypertension. Smartphone has already been used for the provision of health care applications. In the context of aging society, we present a daily life activity tracking

application over android smartphone to enhance their independence and quality of life.

3. Proposed System Prototype Design

Nowadays the mobile applications are very important for many people, these applications used at most field of our life especially at the medical. This paper discusses a mobile application that works as a reminder for Elderly and Alzheimer's patients to help and improve the quality of care.

Figure 1, the elderly and Alzheimer's use case diagram model shows the functionality of both elderly and Alzheimer's patients as actors of the prototype. The functionality of elderly and Alzheimer's patients are the ability to interact with the prototype directly only by display the prototype and choose elderly or Alzheimer's buttons. Based on the information requirements we have the following actors:

- Care provider
- Elderly patient
- Alzheimer's patient

The following are snapshots which explain the system design

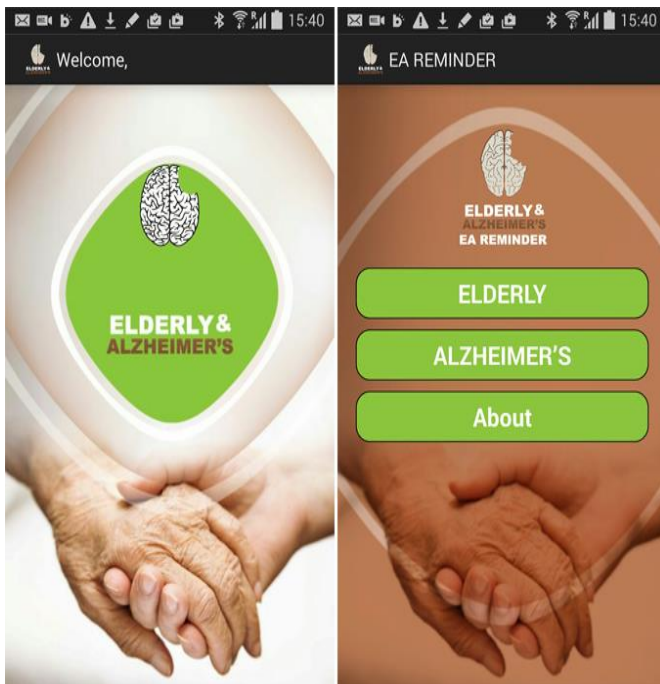


Fig 1: System Interface and the Main System Page

Main page displays the title of the system and two buttons of categories that will use this app. In addition, there is a button (About app) which contains some information about it.

a) Care Provider

The care provider is responsible for more than one patient, which can help patients who cannot use the system by themselves.

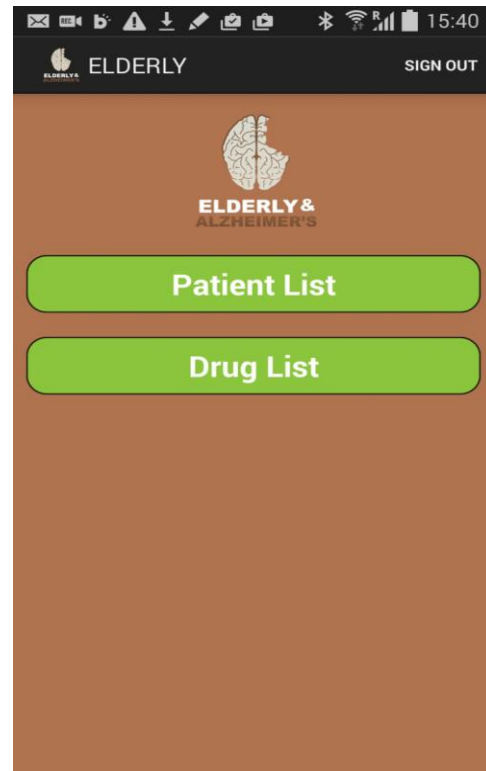


Fig 2: Care Provider Page

When the care provider log into the system will display this page which contains two buttons: Patients List and Drug List.

Patients list: It contains list of patients who have added by the care provider as shown in Figure 3. Whilst Drug list: It contains list of drugs that have added as well as shown in Figure 4.

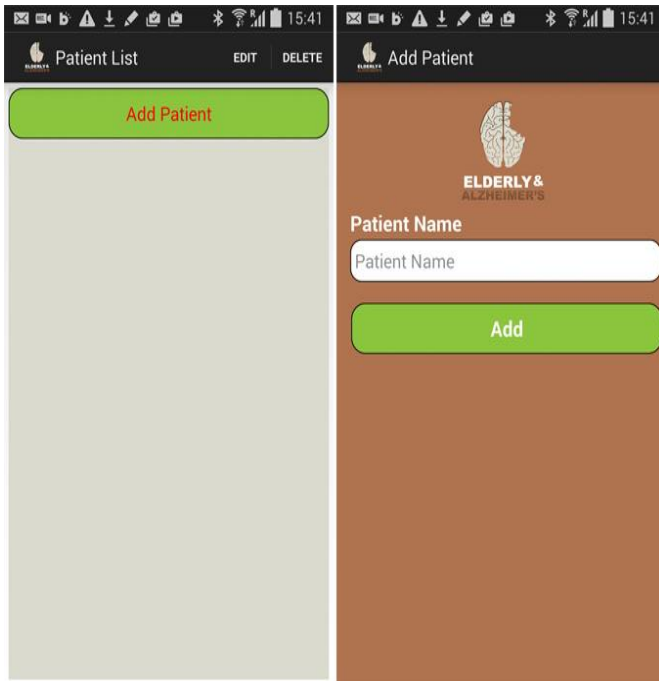


Fig 3: Patient List and Add Patient Pages

After pressing the patient list button, the care provider can Edit, Delete and Add patient from these pages. When the care provider press Add Patient button the system will display another page contains patient name, by write the patient's name and press Add button the patient will directly add to the patient list page.

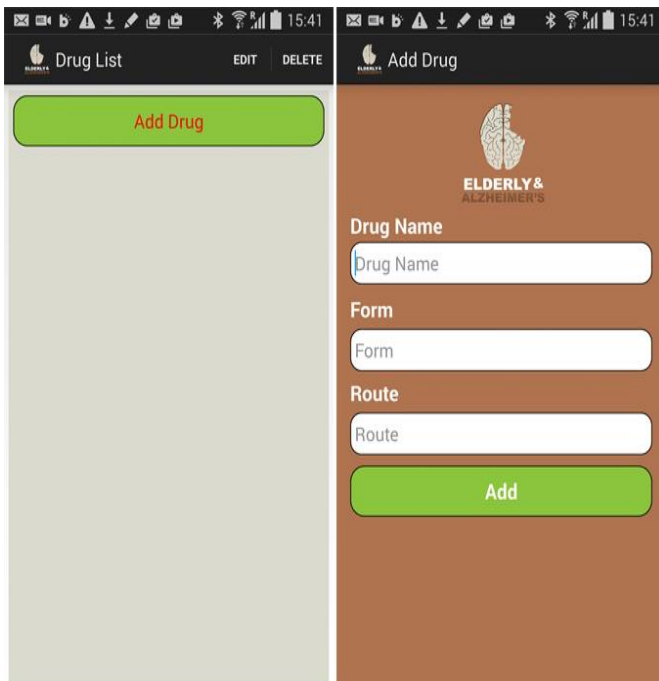


Fig 4: Drug List and Add Drug Pages

When the care provider press Add Drug button the system will display another page contains some required information about the drug such as: Drug name, Form and Rout.

b) Elderly Patient

For elderly patient, the system contains Medications Pages. The elderly patient can add a new medication from these pages. When the patient press (+) on Medications page the system will display another page contains some required information about the medication includes: Medication name, Drug Name, Quantity, Notify on less than (Quantity) Dose, Refill By (E-mail), Dose amount and Alarm tone. As shown in Figure 5.

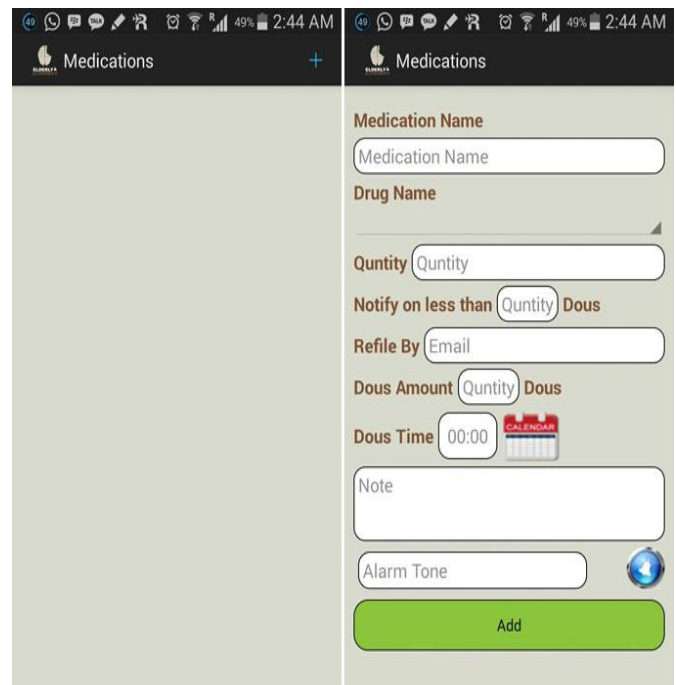


Fig 5: Medications Pages

c) Alzheimer's Patient

For Alzheimer's patient page, it contains three buttons: Family and Friends, Meals and Water and Event List as shown in Figure 6.

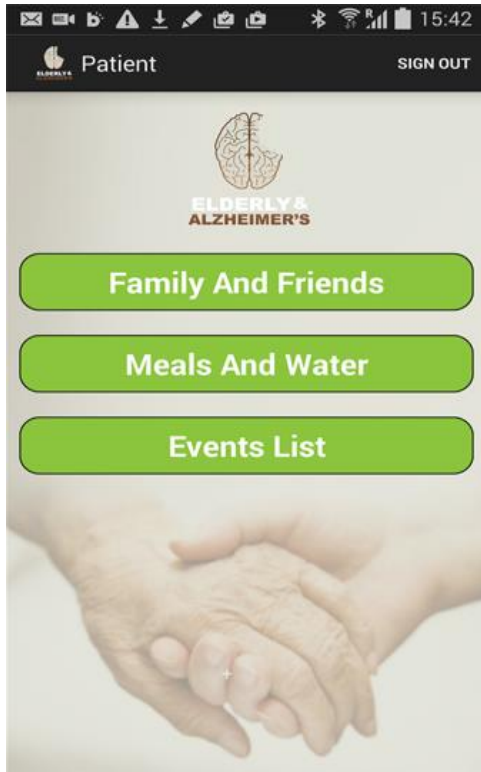


Fig 6: Alzheimer's Patients Page

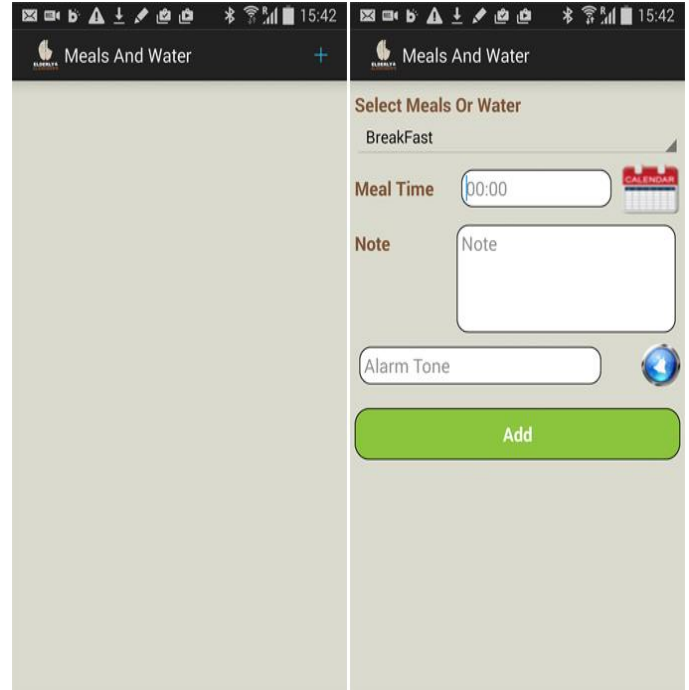


Fig 8: Meals and Water pages

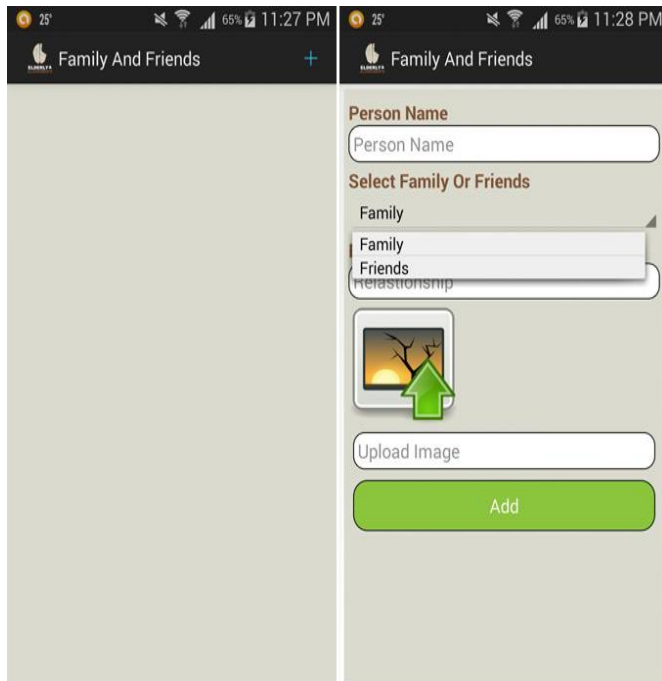


Fig 7: Family and Friends pages

Alzheimer's patient forget a lot of things, one of it is forget the people whether family or friend. Therefore, in Family and Friends page patient can add a person and its relationship to the patient with a picture, and that help the patient to remember them easily. As shown in Figure 7.

Alzheimer's patient almost forgets to eat and drink water and this increases the deterioration of his/her health [13]. Therefore, the system contains Meals and Water Page which consists of list of meals that have been added. When user press on (+) button the system will display another page contains the Meal type, Meal time, Note and Alarm tone. The system will send an alert at the specified time of the main meals. It also send an alert at the specified time for reminding the patient to drink water.

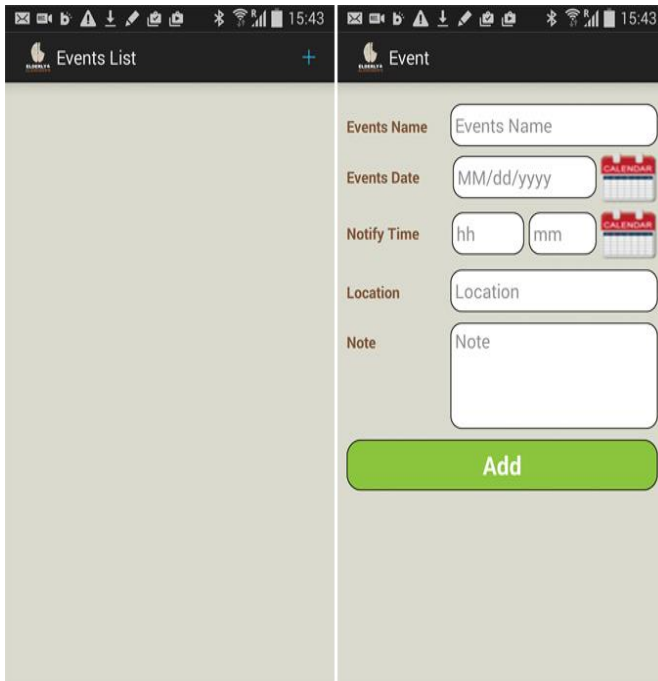


Fig 9: Event Pages

Event Page contains a list of events that have added by the patient or the care provider, the system enables to add a new event by press the button (+). It will display another page contain Event name, Event date, Notify time, Location and Note. Notify time to send an alert at the date of the event and location to select the location of an event.

4. Discussion

Not taking prescribed medication and noncompliance can have serious health consequences. The reasons why people forget or don't take medications are varied. Maybe the doctor didn't explain how to take it properly. Maybe they feel better and think they don't need the medicine anymore. But for the scope of this study the Elderly and Alzheimer's patients forgetting to take medications it is a common problem for them. Since elderly and Alzheimer's patients obliviousness causes social inconvenience and psychological complaint, they often forget daily schedules and miss their personal belongings such medication. Moreover, while barriers to medication adherence are complex and varied, but the most common reason cited by patients, Elderly and Alzheimer's patients, is that they simply forgot to take their medication.

Alzheimer disease is a dementing disorder, characterized by cognitive and behavioral problems. It involves the damage, breakdown of connections, and death of the brain cells. It affects the parts of the brain that control memory,

thought, and language. It usually begins at age 60. Some of the signs include loss of memory. In addition, forgetting to take a medication is a common problem in older people and is especially likely when an older patient takes several drugs simultaneously. According to World Health Organization, the threshold age to be considered elderly is sixty years [14]. As age increases, it is usually associated with a reduction in the efficiency of the immune system, lessened and weakened hearing, diminished and decline in eyesight, and reduced mental or cognitive ability [15]. Owing to this, elderly people face a lot of challenges in executing certain tasks in their every-day activities.

Recently, technological advancements have spurred various ideas and innovations to apply on elder independent living. In this paper, we proposed system to assist elder and Alzheimer's patients living independent and improve aged quality of life. By using the proposed system patients can receive alerts and this allows patients to be more accountable for their care, therefore they can better manage their conditions, reduce the number of clinic visits and have more control over their personal health all leading to lower healthcare costs. The system consider that from in Family and Friends page Alzheimer's patient can add a person and its relationship to the patient with a picture, and that help the patient to remember them easily. As well as the system contains Meals and Water page which consists of list of meals that have been added. The proposed mobile application has an advantage in helping the elderly patient and Alzheimer's patient to perform the main function: such as Medication, Add drug, Reminder, Refills, Family and Friends, Meals and Water and Event List. The proposed system can potentially improve the effectiveness and reduce the costs of traditional medication adherence interventions.

5. Recommendations

In order to develop a good application and enhance the features of the system it is recommended that developers should consider few things. Firstly, it is advisable that the application requirements should be treated and maintained in the consistency way. It is strongly recommended the interface of proposed system works constantly. It is not recommended to touch or changing code structure of the proposed system, any updating or changing will effect on the performance negatively and disabling the functions of the proposed system.

6. Conclusion and Future Work

In recent years, emphasis on improving the quality of care provided by the hospitals has increased significantly and

continues to gain momentum. Therefore, the demand now is creating new needs to help and make better choices as using the mobile application in health care sector. Elderly and Alzheimer's patients suffered from the problem of forgetting, and this problem leads to the deterioration of their health because the elderly often take many medications and physicians often complain of lack of commitment to the dates of medication or dose necessary and it is due for forgetting to take medication or increase the dosage, which is reflected on their health. In addition, Alzheimer's patients also suffer from memory loss, in the beginning, the problem is simple which is about forget some recent events, such as forgetting the people have met or what did that day, but the problem evolve with time. Therefore, the main aim of this study is to help them. The technology is best care because it is not susceptible to forget or to damage. This paper is proposing the Reminder application prototype system that includes a lot of features which helping them to remember easily and contribute for keeping their health in the long run. Finally, we hope that this work up to the target groups and helps them to overcome their problem with forgetting and to live their lives better. Looking ahead, for deploying the application as widely as possible and make it available to everyone on the Google Play store and also submit it to the concerned authority of the target groups in order to benefit from it.

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