A Smart Medicine Reminder System for Improved Patient Compliance

by

Examination Roll: 212110

A Project Report submitted to the
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in partial fulfillment of the requirements for the degree of
Professional Masters in Information Technology

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DECLARATION

I hereby declare that this thesis is based on the results found by ourselves. Materials of work found by other researcher are mentioned by reference. This thesis, neither in whole nor in part, has been previously submitted for any degree.

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CERTIFICATE

The project titled "A Smart Medicine Reminder System for Improved Patient Compliance" submitted by Gazi Tamzeed Hossain, ID: 212110, Session:Summer-2021 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Professional Masters in Information Technology on the 5th October 2025.

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ABSTRACT

Uncontrolled medicine administration can always show unpropitious effects on the health of the patients. The proposed system is designed to help the patients to take the required medicine in the right quantity at the right time. It reduces the likelihood of missed doses and medication errors, thereby promoting adherence to treatment plans. Additional features such as emergency sos message, nearby hospital and pharmacy location enhance users convenience and safety. To develop this software I implemented java code for all logical condition and xml code for UI design. Also collected several feedbacks from the user on how this software improved their daily life medication . Therefore, preliminary evaluation suggests that the proposed system offers a practical, user-friendly solution to improve treatment outcomes and support patient-centered care.

Keywords: Medicine Reminder, Medicine Scheduler, Notification Alarm, Medicine History, Medicine Shop and Hospital.

LIST OF ABBREVIATIONS

IIT	Institute of Information Technology
JU	Jahangirnagar University
IIT	Institute of Information Technology
QoS	Quality of Service
XML	Extensible Markup Language
SOS	Save Our Soul
UML	Unified Modeling Language
UI	User Interface
UAT	User Acceptance Testing
OCR	Optical Character Recognition
AI	Artificial Intelligence
API	Application Programming Interface

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CHAPTER I

Introduction

1.1 Overview

Doctors often prescribe medications that must be taken at specific times throughout the day. Taking medications on time as prescribed is important to ensure that our bodies have an effective amount of the medication at all times. It is estimated that not taking medicine on time accounts for up to 50 percent of disease treatment failure which is a major issue for many people around the world and can cause severe problems for the patients. But in our busy lives, we often tend to forget the intake of medicine and thereby causing several issues.

This Medicine Reminder Application is a mobile app designed to help users manage medication schedules, tracking medicine history and refill needs. With secure data storage, customizable alarm, and options for cloud sync, the app provides reliable support for individuals and families managing complex health routines. Its user-friendly interface and privacy-focused features make it an essential tool for improving medication adherence and enhancing health management with ease and confidence.

1.2 Limitation of Existing Works

In most of the other similar existing apps there isn't any voice input feature,emegency sms system. Also in few related apps the nearest hospital and medicine shop tracking system aren't included. So, these limitations motivated me to develop this Medicine Reminder application in which all those features are implemented accurately.

1.3 Problem Statement

Problem statements of this projects are as follows :

- Improving the daily medicine schedule for a patient by reducing the chance of any missing dose.
- Easily finding the nearest medicine shop and hospital for any emergency situation.
- Tracking all the previous medication schedule and other relevant information.

1.4 Motivation

The motivation behind developing a Medicine Reminder and Medicine Taken Tracker with Emergency SOS Mobile app is to improve medication adherence, which is a critical factor in managing chronic conditions and preventing adverse health outcomes. The app can help users take their medication on time, track their medication intake, and provide alerts in case of missed doses. Additionally, the app can help users keep track of their medication schedule, dosage, and other relevant information, which can be useful when communicating with healthcare providers.

Overall, the motivation behind developing a Medicine Reminder and Medicine Taken Tracker with Emergency SOS Mobile app is to improve medication adherence, promote better health outcomes, and provide an added layer of safety and security for users.

1.5 Objective

Some specific objectives of the app could include:

- To improve medication adherence by reminding users to take their medication on time and providing a log of their medication intake.
- To keep track of patients medication schedule, dosage, and other relevant information, which can be useful when communicating with healthcare providers.
- To provide an added layer of safety and security for users by including an emergency button that quickly and easily contacts emergency services or alerts their emergency contacts.

1.6 Research Outline

The project report is structured with few chapters as follows: In **Chapter I** Intoduction part provides the background, problem statements, motivation, objectives on the study and research outline. **Chapter II** Literature Review discusses about the existing solutions or related works, their features, limitations and comparison between existing and proposed app. **Chapter III** System Design and Methodolgy explains the architecture, flow chart and use cases. **Chapter IV** analyzes about the implementation, result and interfaces of the system. Lastly in **Chapter V** future work and conclusion is mentioned.

1.7 Conclusion

In this chapter, background and motivation of the project presented along with limitations of the existing works. Alongside with the problem statements and the objectives indictate the necessity of a Medicine Reminder system in a patients daily life to maintain the prescribed doses. This chapter also provides the research outline which guides the overall project design and implementation.

CHAPTER II

Literature Review

2.1 Overview

Medication non-adherence (missing doses, incorrect timing, premature discontinuation) is a major global problem that reduces treatment effectiveness, increases morbidity, and raises healthcare costs. Studies and reviews across chronic and acute conditions show that a substantial proportion of patients do not follow prescribed regimens, particularly for long-term therapies. This problem motivates technological interventions — broadly called medicine reminder systems or medication adherence technologies which aim to support patients in taking the right medicine at the right time.

2.2 Related Works

Due to the shortcomings in the functionality of the current reminders, Wong and Kamaludin [1] created Medcare as a substitute method of reminding users to take their medication. Managing reminders and medication inventories is another benefit for users. Plans for the system development process were scheduled using a waterfall paradigm. Using Android Studio and Firebase, the application was designed for the Android operating system. It was the goal of the medication reminder app's development to make taking medication more convenient.

Sehlabo et al., [2] highlighted how serious health problems are caused by chronic illnesses such as diabetes, cancer, HIV/AIDS, and TB. Patients frequently struggle to follow recommended treatment regimens because of hectic schedules and drug overuse that causes forgetfulness. An application for medication reminders was created by the study team as a natural solution to this forgetting issue. Design science research

technique directed the application's development and deployment. Initial results confirm that developing a safe app, adding regional languages, and supporting several prescription reminders is doable.

In ref. [3], the mainly focused thing was the Smart medicine pill reminder box. There was not any smart app to act as a reminder. There are voice functions and display functions to help the patients via the auditory method and visual methods.

In "Pill Dispenser with alarm Via Smart phone notification" system [4], proposed a dispenser consisting of alarm system which helps to get alert in the form of notification on smartphones. They have used the available technology to send notification on the smartphone using instapush application. After receiving the notification user needs to press the dispenser button which is located at pill dispenser unit.

By referencing [5], we can see the paper is about autonomous medicine reminding applications in mobile operating systems. It is called MEDiDEN. This has some unique features; categorized medicine packages, a reminder function that can be worked in mobile operating systems, and can be updated with the latest news on the medication field.

This paper [6] discusses in detail a proposed IoT-Based Smart Medicine Reminder Device that will be designed for the elderly based on the issues faced by the elderly.The paper also explores the similar implemented systems to identify strengths and weaknesses of other relevant systems so that a better device can be developed.

In this paper [7], authors propose an innovative architecture for a smart pill-dispenser enhanced by a smart device that furnishes the capability of automatically identifying the user, other than logging medicine in-take activities. A real-world prototype, based on an emulated pill-dispenser connected via an NFC link to different smart devices has been purposely realized.

In paper [8], designed to aid people suffering from chronic diseases, its purpose is to simplify adherence regular doses of medicine using reminders and planning tools.

With the increasingly apparent trend of global population aging, the proportion of elderly people is continuously rising [9]. As elderly chronic disease patients need to take multiple medications for a long period, taking medication on time and regularly is crucial to improving their health status. Common problems include missing doses, taking incorrect doses, and having a biased understanding of their condition, resulting in medication cessation or reduction [10]. Mobile-based digital tools related to health can activate reminders for medication, maintain medication history, and furnish medication information indicating the capacity to facilitate self-care for chronic illnesses and enhance medication adherence [11]

Due to the ongoing global aging trend, the elderly population faces unique challenges in medicine usage [12]. As a result, many scholars have started focusing on the elderly as target users to study the functions, interfaces, and preferences of applications. Susan L Lakey et al. [13] assessed the current use, knowledge, and preferences of medication management tools and supports among 152 older adults; Leah M Haverhals et al. [14] conducted a study on personal health applications (PHA) and findings showed that reliable information links, clear and concise interface, and user-friendly navigation can improve the efficiency of medication management in the elderly; Andrea M. Russell et al. [15] conducted an experimental study to investigate the functional preferences of mobile applications for medication self-management in the elderly. Jaqueline Donin Noleto et al. [16] compared three medication reminder apps and conducted a senior usability test of the interface to assess its user-friendliness for the elderly. The results showed that these applications lacked design considerations for older adults, and there is a need for improvement in general interface issues. Furthermore, certain applications exhibit subpar interfaces and lack sufficient instructions in recording medication history and setting medication reminders [17].

2.3 Reasons For Low Medication Adherence

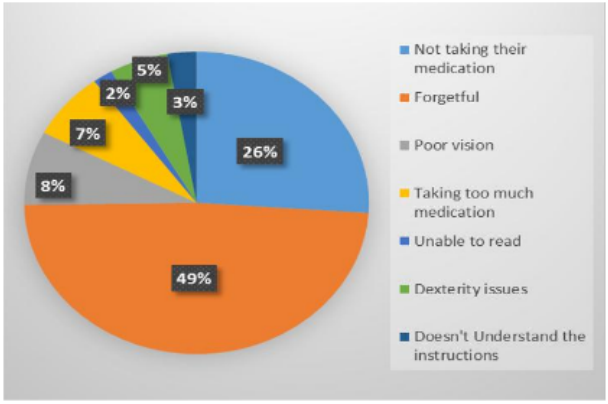

Figure 2.1: Fundamental Research On Medication

Figure 2.1 demonstrates the reason percentage for missing dose of medicine While designing and planning for this thesis, several papers had been gone through to make it possible as it was very challenging to complete the job with a limited knowledge. We asked several peoples about their medication problem, what kind of feasibility they expect about the medication reminder. In Ref. [18], we can see some main reasons that are directly caused for our above-mentioned problems seen in Figure

2.1. This is a quantitative method of finding medical adherence according to a set of elderly people.

2.4 Comparison Between The Existing System and Proposed Developed System

The table below discusses a comparison between proposed system and existing system.

Table 2.1: Comparison of the Proposed Application and Existing Applications

Existing Apps (Medisafe, MedAlert, Pill Reminder)	Proposed App
Medicine Reminder and Medicine Tracker features are implemented simultaneously but Emergency sms system isn't integrated in any of it by which very significant for any critical conditions.	Medicine Reminder, Medicine History Tracker, Emergency sms all are integrated in this one app.
Not any voice input feature for adding medicine is implemented into these existing apps which is bit hassles for handicapped peoples.	Google voice input function is added by which patient can add medicine by their voice.
Sometimes patients need to find nearby medicine shop or nearby hospital ,but this important features not included into the current apps.	Users can easily find nearby Hospital and Medicine Shop through my developed app.
Into some of these existing apps users can store doctor's appointment schedule.	In my app this feature isn't included yet but in future by the necessity of user it can be implemented.

2.5 Conclusion

The literature review section in this chapter demonstrates few of other related works and the comparison between this developed apps and other existing apps.

CHAPTER III

Proposed System Design and Methodology

3.1 Overview

This chapter aims to create a proper structure according to the needs of users. It includes architecture diagrams, data model and a step-by-step research and development methodology with evaluation procedures. This chapter focuses on the diagram, workflow and the core functionalities of the proposed system.

3.2 Application Flow Chart

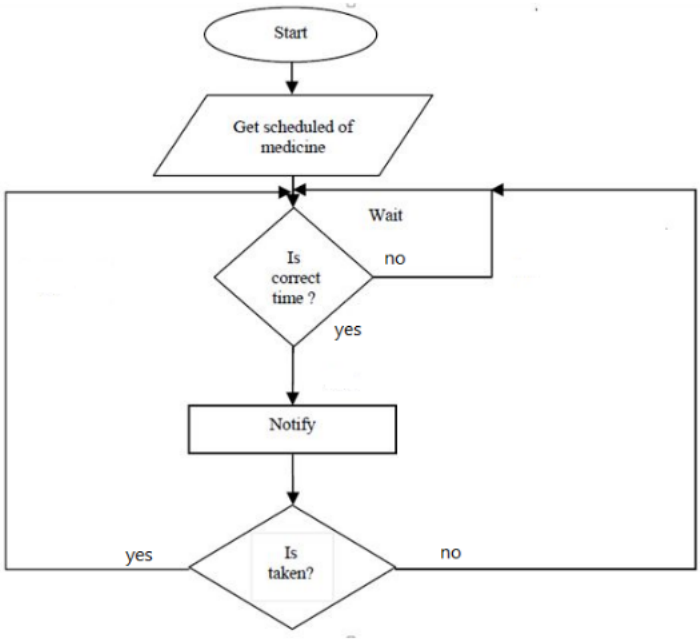

Figure 3.1: Application Flow Chart

Figure 3.1 shows the flow chart showing how the application work from the start then when the user get schedule of medicine then the system enter waiting if isn't a correct time the system back to waiting, if the correct time coming then the system will notify and make sure the medication is taken.

3.3 System Overview

The proposed application is compatible only with smartphones running on the popular Android-based operating system. In this system, the users will have to input the medicine details in the add medicine section. The user will be asked for the details of the medicine to be stored. The application helps to remind patients or users to take their medicine in proper time and proportion using an automated alarm ringing and notification system. It has various modules such as Medicine Reminder, Emergency SOS, Showing Calender, Searching Nearby Hospitals and Medical shop.

Figure 3.2: System Overview of The Proposed Application

Above Figure 3.2 shows the Basic System overview of our Application. The inputs taken by the system are profile details, medicine details and timings. The output given is intake reminders and medicine restocking reminders. If the user forgets to take the pills on time they will be tracked and will be added to the report that will be generated monthly [19].

3.4 System Analysis and Design

3.4.1 Requirement Analysis

The functional requirement defines the behaviors of the system and describes its tasks or activities. Table 3.1 shows the functional requirements of the medicine reminder application.

Table 3.1: Functional Requirements of The Medicine Reminder Application.

Function	Functionalities
Create Account	This function allows new user to create their account with their personal information such as name, phone number, email and password.
Login/Logout	This function allows the users to login or logout from their account.
Add Medicine	This function allows the user to add prescribed medicine with doses by typing or voice input and select prescribed time.
Medicine History	By this function patients can see all the previously taken medicine doses.
Emergency SOS	This function allows user to send any emergency sms through this app to any specific number.
Nearby Medicine shop	This function allows user to search any nearest shop for emergency medicine pick up.
Nearby Hospital	By this user can easily find any hospitals around his location.

3.5 Use Case Diagram

The use case diagram is one of the types of UML diagram that is used to represent the interaction between the users and the system. The roles of users for this application are illustrated by using a use case diagram. The use case diagram is shown in Figure

Figure 3.2 explains the use case diagram of the proposed application. Users can manage the prescribed medicine inventory and reminding alarm system. User can also interacts with every feature of the application directly.

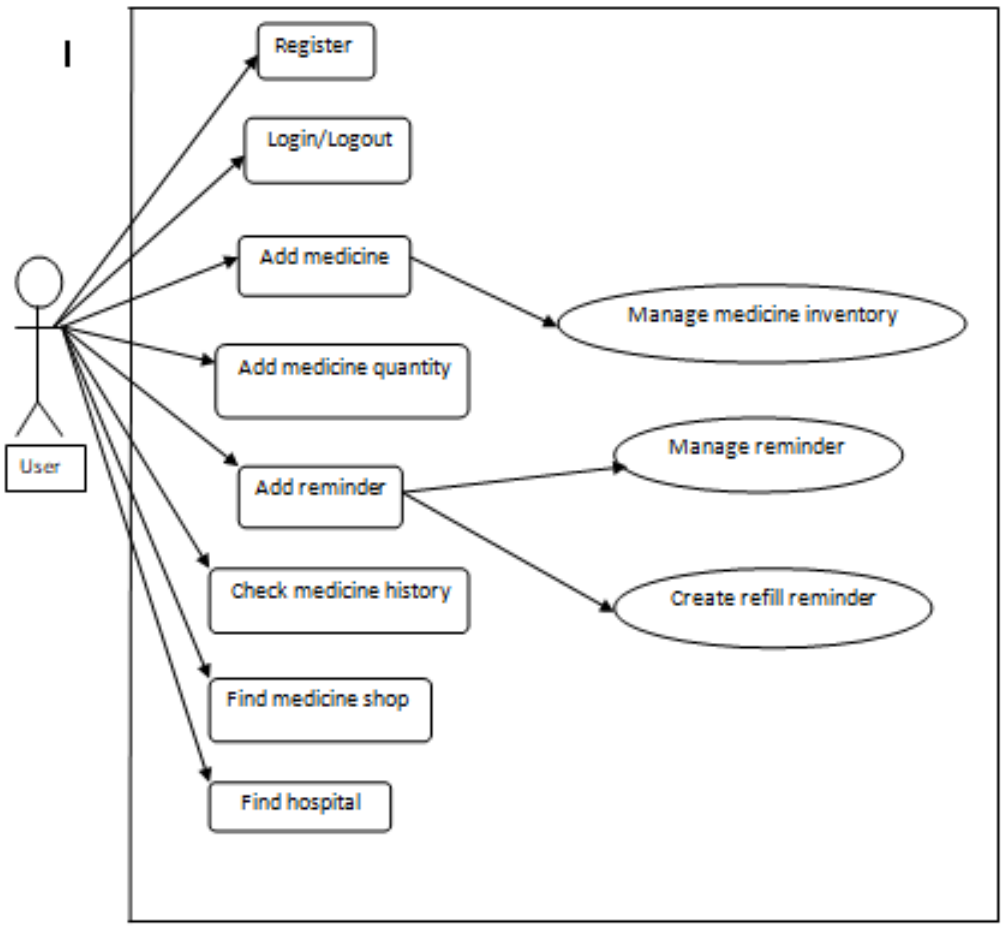

Figure 3.3: Use Case Diagram of The Medicine Reminder Application

3.6 Conclusion

This chapter presents architecture, workflow and all the functional requirements. The use case diagram also shows how a user interacts with all the features of the app.

CHAPTER IV

Implementation and Result Analysis

4.1 Overview

This chapter describes the implementation and result analysis of the Medicine Reminder application. This chapter demonstrates the logical and physical design,technologies used to develop, UI of the apps and final output results for the user.

4.2 User Interfaces

4.2.1 Login/Logout

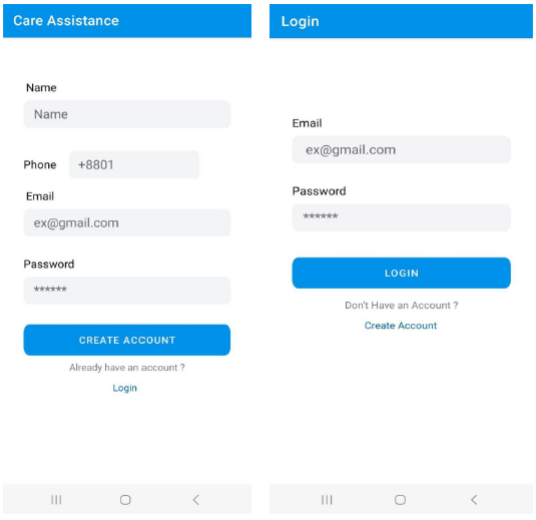

Figure 4.1: Interface of Login/Logout page

Figure 4.1 shows the Login interface of the app. To create a account user needs to insert name, phone number, email and password.

4.2.2 Add Medicine

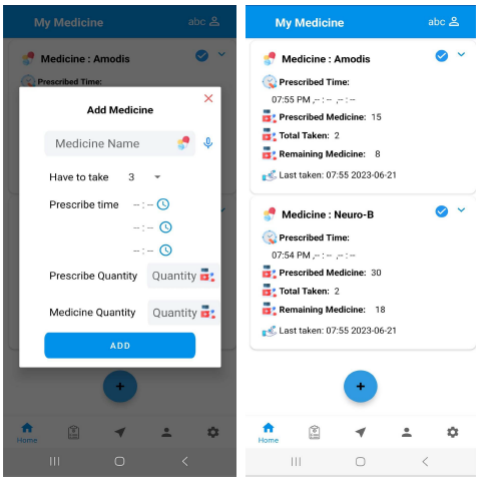

Figure 4.2: Interface of Add Medicine page

Figure 4.2 shows the medicine inventory section where user can add medicine, select the medicine taken time for reminding alarm and can check the amount of medicine.

4.2.3 Medicine History

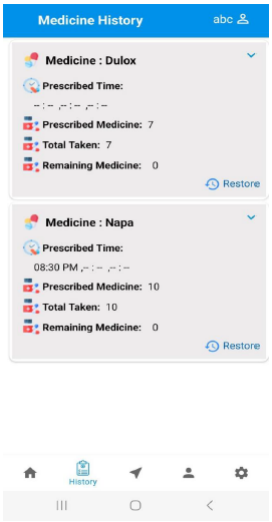

Figure 4.3: Interface of Medicine History page

Figure 4.3 indicates that a patient can easily check all the previously taken medicine doses.

4.2.4 Emergency SOS

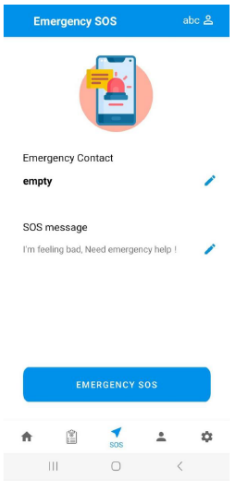

Figure 4.4: Interface of Emergency SOS page

Figure 4.4 shows the Emergency sms function. By this user can send any emergency message to a specific number at any critical condition.

4.2.5 Setting

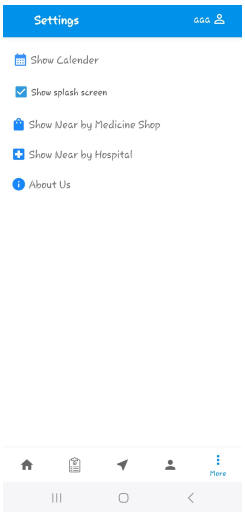

Figure 4.5: Interface of Setting page

Figure 4.5 demonstrates every others feature in this proposed app. User can use the calendar, can find any nearby hospitals and medicine shops.

4.3 Implementation

The Medicine Reminder Application was implemented following the system design specifications outlined in the previous chapter. The implementation process involved the integration of both front-end and back-end modules, database management, and notification handling.

4.3.1 Development Environment

- Programming Language: Java and Xml.
- Database: Firebase Realtime Database.
- Tools and Frameworks: Android Studio, Firebase Cloud Messaging, REST APIs.
- Operating System: Android OS (Version 8.0 and above)
- Testing Environment: Real devices and Android Emulator

4.3.2 Functional Modules

1. User Registration and Authentication

- Allows users to sign up and log in securely.
- Integrated password hashing and Firebase authentication for security.

2. Medicine Scheduling

- Users can input medicine name, dosage, frequency, and duration.
- Data is stored in the database with timestamp mapping.

3. Reminder and Notification System

- Push notifications are triggered based on scheduled time.
- Supports recurring reminders for daily/weekly medicine intake.

4.History and Report Module

- Tracks user's medicine intake compliance.

- Generates a report showing missed and taken doses.

5.User Interface (UI/UX)

- Simple, intuitive design with easy navigation.
- Color-coded alerts for upcoming, ongoing, and missed medications.

4.4 Result Analysis

4.4.1 Testing Methodology

The system was tested using:

- Unit Testing: Verification of individual modules (authentication, scheduling, notifications).
- Integration Testing: Ensuring smooth interaction among modules.
- User Acceptance Testing (UAT): Conducted with 20 participants of different age groups.

4.4.2 Functional Testing Results

The application was tested against the core functionalities defined in the design phase.

- Reminder Notifications: The app successfully sent reminders at the scheduled time with alarming notification.
- Medicine Scheduling: Users were able to add, edit and delete medicine schedules without system errors.
- Database Storage: Medicine records were saved in firebase database system and retrieved accurately.
- User Profile Management: Users could register and manage their personal details securely.

4.4.3 Survey Report Analysis

While performing the survey about this developed Medicine Reminder application 20 users participated. They gave all their feedback and answered all the questions to complete a proper survey. Also collected all the participants prescriptions and signature for a proper authentic survey. [20]

A	B	C	D	E	F	G	H	I	J	K	L	M
Name	Age	Phone number	Prescription	Disease Name	Signature	UI of this app is ___	Text font and Background	Does the Medicine Remi	Does the Emer	How accurately th	After completing a me	Any feedback comments about this app ?
Deepon	31	01521471853	https://drive.google.	Less Platelet (ITP)	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Quite helpful for the patients who need to remind their several medicine doses.
Anamika Parveen	45	01719503801	https://drive.google.	Gallbladder Surgery	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Very useful and this app helps to take medicine timely.
Md.Abul Hossain	64	01718810220	https://drive.google.	Thyroid	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Not satisfy	Yes, properly	Very helpful for patients who can't remind their time to time medicine taken time.
Mrs. Nila	32	01719470342	https://drive.google.	PCOS (Gynee issue)	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Very helpful and even those who can't use their hand can use the voice input feat
Sumaiya Jahan	26	01785979865	https://drive.google.	Skin disease	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	It's an effective app.I'm satisfied with it's service.
Hasan Masud	32	01316010609	https://drive.google.	Tumor Surgery	https://drive.google.	Need to improve	Need to improve Color	Yes, consistently	Yes	Satisfy	Yes, properly	Very good app, with effective features.
Mrs. Saba	43	01687110909	https://drive.google.	Acidic and Abdominal Pain	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	It's a very Helpful software.
Mrs.Putul	50	01794710542	https://drive.google.	Fever and Cold allergy	https://drive.google.	Need to improve	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Useful application to take medicine timely.
Ishrat Jahan	45	01949132393	https://drive.google.	Throat pain and Blocked ear	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Good and helpful software
Fayzunnesa	50	01779147514	https://drive.google.	Diabetes	https://drive.google.	User friendly	Need to improve Color	Yes, consistently	Yes	Satisfy	Yes, properly	After using this app , I have found it quite effective.
Afruza	45	01917794891	https://drive.google.	Cough and Fever	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Helpful software
Ashraf Hossain	40	01741793968	https://drive.google.	Back pain and Thyroid	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Very good	Yes, properly	Very good apps with useful features.
Ramen Kumar Das	35	01919933351	https://drive.google.	Migraine issue	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Effective and convenient specially for those who need to take huge amount of me
Rabbi Hasan	48	01558332700	https://drive.google.	Irregular Period	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Not satisfy	Yes, properly	good and useful software
Sudipto Sarker	44	01757231172	https://drive.google.	High blood pressure and Diabetes	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	By using this app it's easy to remind all the medicine doses and easy to check all
A.H.Gazi	64	01718283908	https://drive.google.	Back pain	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Help to maintain dose properly
Nasima Yeasmin	62	01719970475	https://drive.google.	Dislocated Shoulder	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Misdose issue has been solved
Md.Habibur Rahman	54	01913231299	https://drive.google.	Piles	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	As lots of features in one app therefore more convenient than other similiar apps.
Nilufar Yeasmin	48	01716405232	https://drive.google.	Dental root canal	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Effective to maintan regular medicines.
Tamzeed Hossain	31	01517264628	https://drive.google.	Allergy and Nasal blockage	https://drive.google.	User friendly	Eye soothing	Yes, consistently	Yes	Satisfy	Yes, properly	Helpful for elder patients who forgets often.

Figure 4.6: Survey Report Sheet

4.5 Conclusion

The implementation of the Medicine Reminder Application demonstrates its capability to reduce missed doses and improve medication adherence. Testing results confirm its effectiveness, with high notification accuracy, positive user feedback, and competitive performance compared to existing solutions.

CHAPTER V

Conclusion and Future Works

5.1 Conclusion

The medicine reminder application has been developed to make it easier for users to take their medications. The application also increases the health awareness level of the users indirectly by maintaining their health condition. By providing timely reminders, dosage information, and an easy-to-use interface, the application aims to minimize the risk of missed doses, overdose, and medication mismanagement. The system improves patient responsibility and supports caregivers in monitoring treatment schedules effectively. The results of the study indicate that such applications can contribute significantly to better health outcomes, particularly for elderly patients, individuals with chronic illnesses, and those managing multiple medications. The application's features, such as scheduling, notifications, and record-keeping, enhance convenience while reducing the likelihood of human error. Alongside with these features, in any emergency cases patients can also check nearest hospital and medicine shop location.

Despite its usefulness, the application has some limitations such as dependency on smartphone availability, internet connectivity, and user familiarity with mobile devices. Nonetheless, the system establishes a solid foundation for integrating digital solutions into healthcare management.

5.2 Future Works

While the current developed application fulfills its primary objectives, there are several opportunities for improvement and expansion in future research and development:

- AI-Based Personalization – Implementing artificial intelligence to analyze user behavior and adjust reminders, suggest dosage patterns or provide predictive alerts based on health data.
- Multi-Language Support – Expanding language options to make the application accessible to a wider demographic, especially in regions with diverse linguistic groups.
- OCR Implementation - The optical character recognition function to add medicine directly from prescription by scanning through the camera.
- Doctors Appointment - Integrating Doctors appointment schedule.
- Smart Refill and Pharmacy Connectivity - Future enhancements may include automatic medicine stock alerts, integration with local pharmacies for online ordering and prescription refills.

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