

Medication Tracker

By

Abdulkarim Mohammed Alasmari | 1945357.

Ali Dahl Mahnshi | 1945668.

Abdulaziz Alghamdi | 2040368.

**Computer Science and Artificial Intelligence
Department.**

**College Of Science and Computer Engineering.
Jeddah University.**

**Supervisor
Dr. Skander Htiouech.**

(October 2023).

Content

List Of Figures

1 General Presentation

1.1 Introduction.....	7
1.2 General Context.....	7
1.3 Problem definition.....	8
1.4 Aims.....	8
1.5 Objective.....	8
1.6 Proposed Solution.....	9
1.7 Report Outline.....	9
1.8 Project Plan.....	10

2 Related Works

2.1 Introduction.....	12
2.2 Background.....	12
2.3 Existing System.....	12
2.4 Comparison.....	13

3 General Analysis

3.1 Introduction.....	15
3.2 Requirements gathering.....	15
3.3 Functional requirements.....	21
3.4 Non-functional requirements.....	22
3.5 Conclusion.....	23

4 Sprint 1 Design & Development

4.1 Introduction.....	25
4.2 Use case part 1.....	26
4.2 Use case Part2.....	27
4.2 Scenarios of the use cases diagram.....	28

4.2 Scenarios of the use cases diagram 2.....	29
4.2 Scenarios of the use cases diagram 3.....	30
4.2 Scenarios of the use cases diagram 4.....	31
4.2 Scenarios of the use cases diagram 5.....	32
4.3 Sequence Diagrams.....	33
4.3 Sequence Diagrams 2	34
4.3 Sequence Diagrams 3	35
4.3 Sequence Diagrams 4	36
4.3 Sequence Diagrams 5	37
4.3 Sequence Diagrams 6	38

List Of Figures

1.1 Project Plan.....	8
3.3 Figure 3.1: Do you often forget to take the medication on time?.....	14
3.3 Figure 3.2: Do you need reminders to take the medication?.....	14
3.3 Figure 3.3: Do you have difficulty keeping track of the quantity of the medication?.....	15
3.3 Figure 3.4: Would you benefit from an application that can track the medication intake?.....	15
3.3 Figure 3.5: Would you use a medication tracking application if it could also track vital bodily functions?.....	16
3.3 Figure 3.6: Would you be more likely to use a medication tracking application if it was compatible with smart devices?.....	16
3.3 Figure 3.7: Do you feel that a medication tracking application that provides health tips based on your medication and intake history would be useful?.....	17
3.3 Figure 3.8: Do you think a medication tracking application with a community or forum feature, where users can share experiences and support, would be beneficial?.....	17
3.3 Figure 3.9: Would you find it helpful if a medication tracking application could interact with your pharmacy for prescription refills?.....	18
3.3 Figure 3.10: Would you like a medication tracking application to offer information and tips about your medication and related health conditions?.....	18
4.2 Figure Part 1 4.1: Use case.....	24
4.2 Figure Part 2 4.1: Use case.....	25
Figure 4.3 Medication Reminders.....	33
Figure 4.4 Medication Quantity Tracking.....	33
Figure 4.5 Vital Function Tracking.....	35
Figure 4.6 Health Tips and Information.....	36

Figure 4.7 Community/Forum Feature.....	37
Figure 4.8 Pharmacy Interaction.....	38
Figure 4.9 Medication Tracker Class Diagram.....	39

Chapter 1

General Presentation

1.1 Introduction

In this project, we will explore a prevalent issue in healthcare: medication management. We aim to simplify this process through a medication tracking System. The System will enable users to register medications, record intake and quantity, and receive timely notifications regarding medication expiration and completion. The integration of this System with smart devices, such as watches, will further aid in tracking vital bodily functions, thereby enhancing overall patient care.

1.2 General Context

In the modern era, technology has become an integral part of healthcare management. With the increasing reliance on numerous medications for various health conditions, there is a growing need for effective medication management. This need is even more pronounced among the aging population and those with chronic diseases who often have complex medication regimes. Mismanagement of medication can lead to severe health consequences, including preventable hospital admissions. Our project resides within this context, aiming to simplify medication management and promote better health outcomes.

1.3 Problem definition

The problem we aim to address is the complexity and risk associated with medication management. The mismanagement of medication can result in missed doses, overdoses, and inappropriate drug combinations, all of which can lead to severe health implications. This problem is compounded by a lack of effective tools to manage medication intake, particularly for those with multiple medications and complex schedules.

1.4 Aims

The primary aim of this project is to develop a user-friendly medication tracking System that simplifies the process of medication management, thereby reducing the risks associated with medication mismanagement.

1.5 Objectives

Design an intuitive user interface for easy registration and tracking of medications. Implement a notification system for timely medication intake and alerts on medication expiration. Integrate the application with smart devices for tracking vital bodily functions such as heart rate, blood pressure, and blood sugar levels.

1.6 Proposed Solution

To address the identified problem, we propose the development of a medication tracking System. The System will allow users to register their medications, track their quantities and intake, and receive timely notifications. The System will be designed with a user-friendly interface and will be integrated with smart devices for additional health tracking features.

1.7 Report Outline

Chapter 2, "Related Works," will present an exploration of existing literature and technologies related to medication management and tracking applications, providing a comprehensive understanding of current solutions, and identifying gaps that our project aims to fill.

Chapter 3, "General Analysis," will delve into the analysis and design of the proposed solution, discussing the requirements, design principles, and methodologies that will guide the development of the medication tracking System.

1.8 Project Plan

The Figure 1.1 gives the details on the project plan with the allocated duration for each chapter.

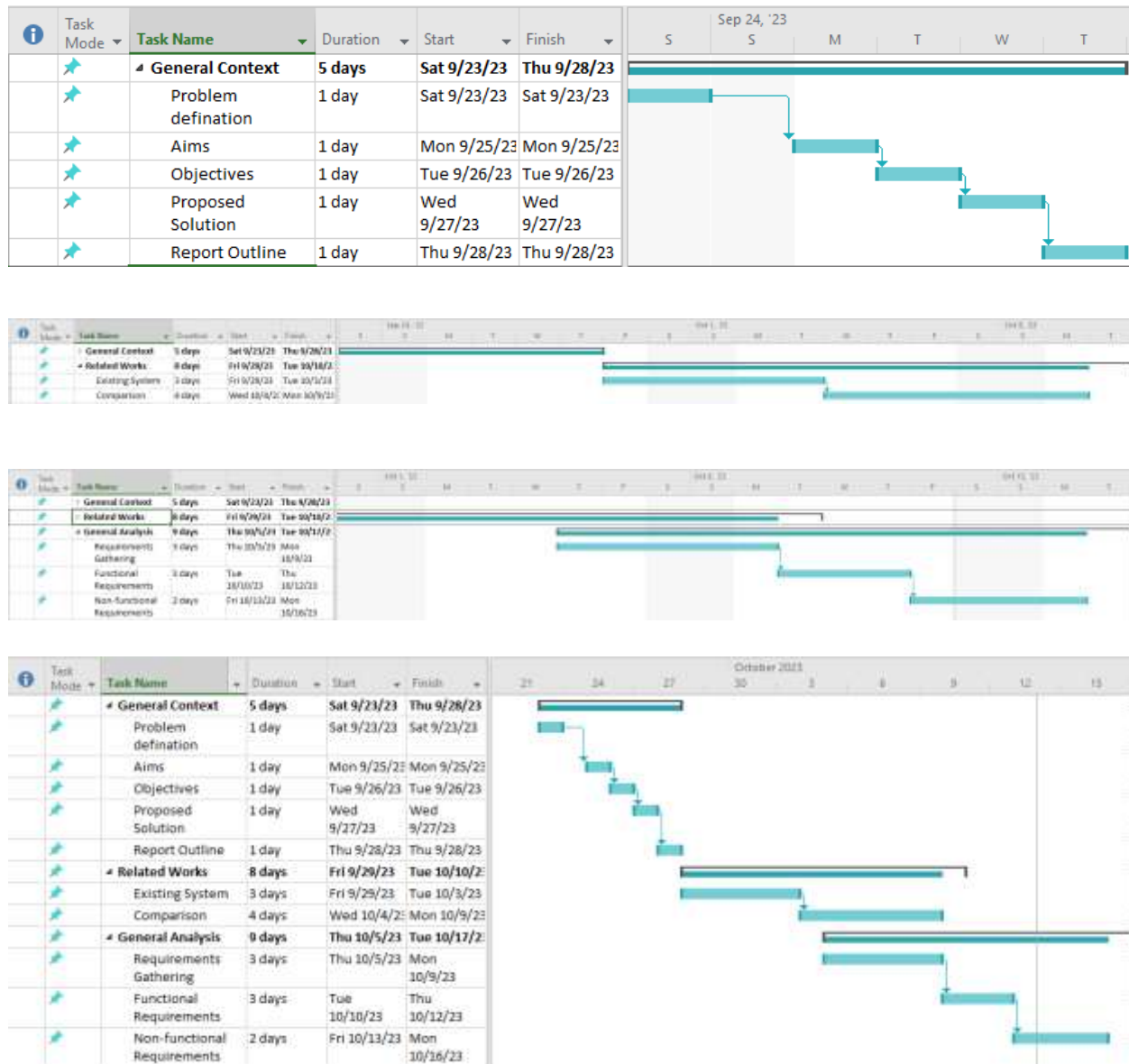


Figure 1.1: Project plan with duration of each chapter's completion.

Chapter 2

Related Works

2.1 Introduction

With the rise of digital health, numerous works have explored the development and utility of medication tracking System. These System aim to enhance medication management and adherence, a crucial aspect of healthcare, especially for individuals with chronic conditions requiring long-term medication use.

2.2 Background

1. Healthcare and Pharmacology: The System is rooted in the healthcare domain
2. Software Development: This domain is essential for the actual creation of the System.
3. Data Science: Data science plays a role in processing and analyzing the data collected by the app
4. Digital Health and Wearable Technology: As the application is envisioned to integrate with smart devices and health apps for tracking vital signs

2.3 Existing Systems

1. Round Health: offers a unique approach to medication reminders. In addition to standard fixed time reminders
2. CareZone: is a comprehensive health management application that includes a robust medication tracking module. It simplifies the process of adding medications by allowing users to take pictures of their medication labels, which it then translates into text and stores.
3. MyMeds: is a medication reminder and education application. It focuses on improving medication adherence through personalized reminders, reasons for taking each medication, and potential side effects.

2.4 Comparison

Feature	CareZone	MyMeds	Round Health	Medication Tracker
Medication Tracking and Reminders	Yes	Yes	Yes	Yes
Quantity and Expiration Tracking	Yes	No	Yes	Yes
Integration with Smart Devices	No	No	No	Yes
Health Metrics Monitoring	No	No	No	Yes
User Interface and Experience	Good	Good	Excellent	To be determined

Chapter 3

General Analysis

3.1 Introduction

This chapter aims to provide a comprehensive analysis of the requirements of the Medication Tracking System. The purpose of this analysis is to ensure the System meets the users' needs and the objectives of the project. This involves an in-depth examination of the current systems' limitations, the proposed objectives, and the functional and non-functional requirements of the new system.

3.2 Requirements gathering

To understand the limitations of current systems and gather feedback on the proposed objectives, we conducted surveys and questionnaires. Detailed analysis of the responses from these tools revealed key limitations in current systems and informed the design of the new system.

1- Do you often forget to take the medication on time?

هل تنسى في كثير من الأحيان تناول دوائك في الوقت المحدد؟

111 responses

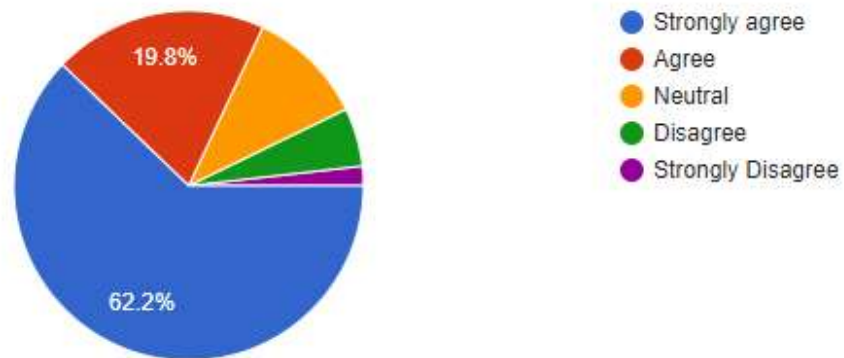


Figure 3.1: Do you often forget to take the medication on time?

2- Do you need reminders to take the medication?

هل تحتاج إلى تذكير لتناول الدواء؟

111 responses

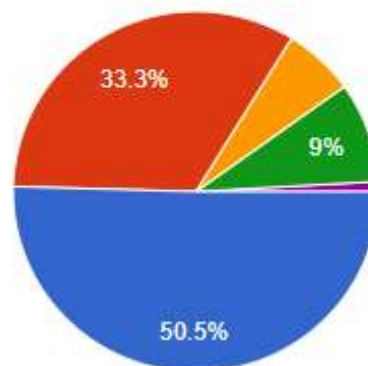


Figure 3.2: Do you need reminders to take the medication?

3-Do you have difficulty keeping track of the quantity of the medication?

هل تجد صعوبة في متابعة كمية الدواء؟

111 responses

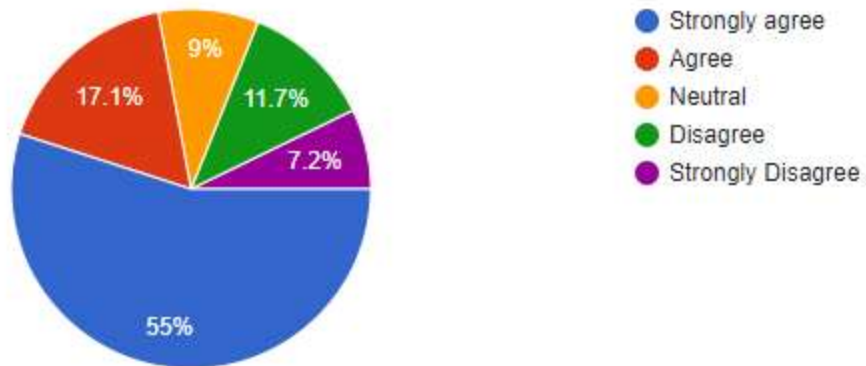


Figure 3.3: Do you have difficulty keeping track of the quantity of the medication?

4-Would you benefit from an application that can track the medication intake?

هل ستستفيد من تطبيق يمكنه تتبع تناول الدواء؟

111 responses

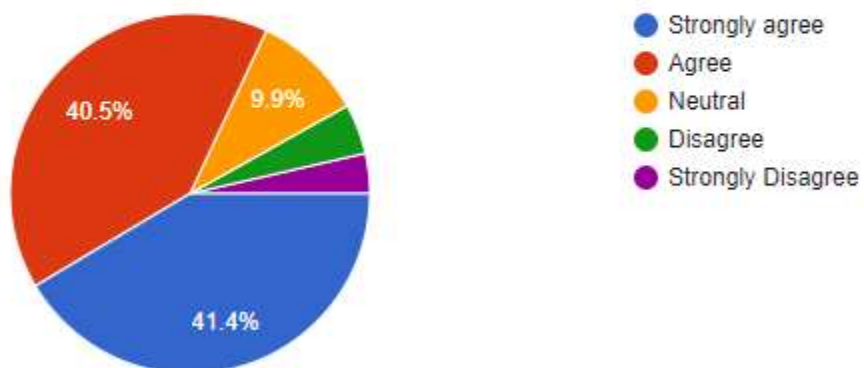


Figure 3.4: Would you benefit from an application that can track the medication intake?

5-Would you use a medication tracking application if it could also track vital bodily functions?

هل ستستخدم تطبيقًا لتتبع الأدوية إذا كان بإمكانه أيضًا تتبع وظائف الجسم الحيوية؟

111 responses

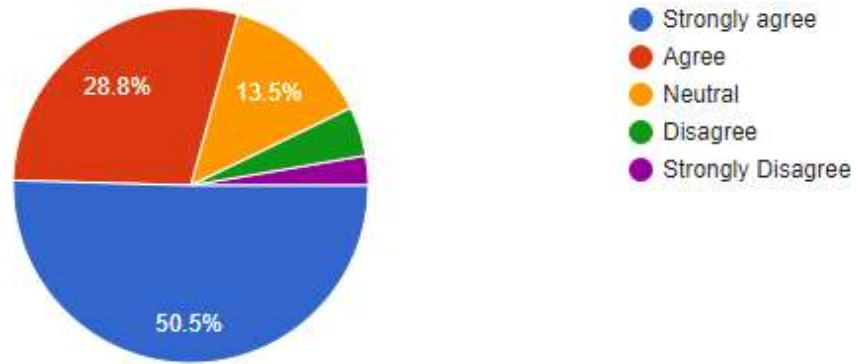


Figure 3.5: Would you use a medication tracking application if it could also track vital bodily functions?

6-Would you be more likely to use a medication tracking application if it was compatible with smart devices?

هل من المرجح أن تستخدم تطبيقًا لتتبع الأدوية إذا كان متوافقًا مع الأجهزة الذكية؟

111 responses

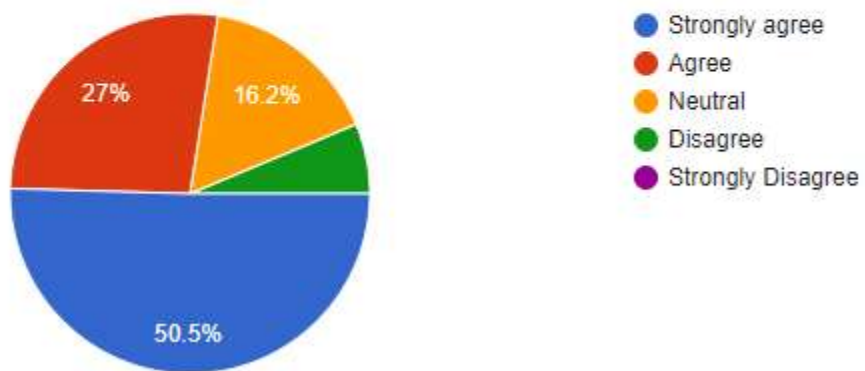


Figure 3.6: Would you be more likely to use a medication tracking application if it was compatible with smart devices?

7-Do you feel that a medication tracking application that provides health tips based on your medication and intake history would be useful?

هل تشعر أن تطبيق تتبع الأدوية الذي يقدم نصائح صحية بناءً على أدويةك وتاريخ تناولك سيكون مفيداً؟

111 responses

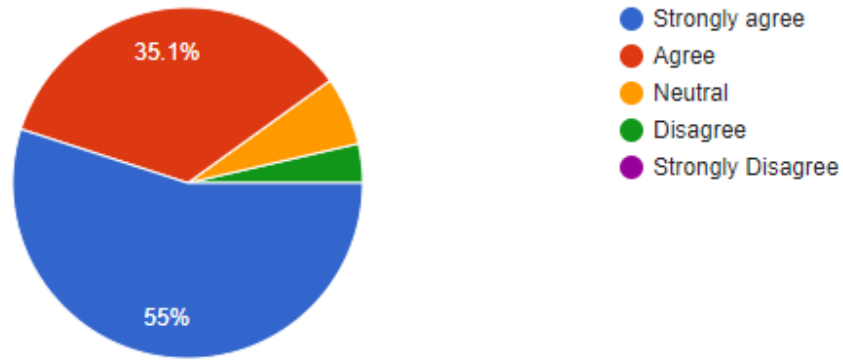


Figure 3.7: Do you feel that a medication tracking application that provides health tips based on your medication and intake history would be useful?

8-Do you think a medication tracking application with a community or forum feature, where users can share experiences and support, would be beneficial?

هل تعتقد أن تطبيق تتبع الأدوية مع ميزة المجتمع أو المنتدى، حيث يمكن للمستخدمين تبادل الخبرات والدعم، سيكون مفيداً؟

111 responses

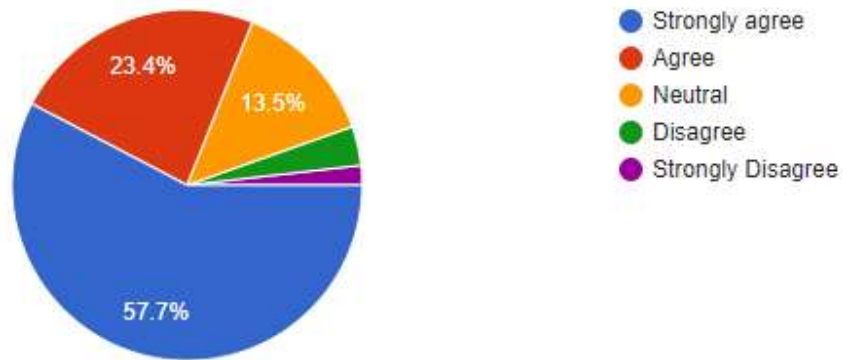


Figure 3.8: Do you think a medication tracking application with a community or forum feature, where users can share experiences and support, would be beneficial?

9- Would you find it helpful if a medication tracking application could interact with your pharmacy for prescription refills?

هل تجد أنه من المفيد أن يتفاعل تطبيق تتبّع الأدوية مع الصيدلية الخاصة بك لإعادة صرف الوصفات الطبية؟

111 responses

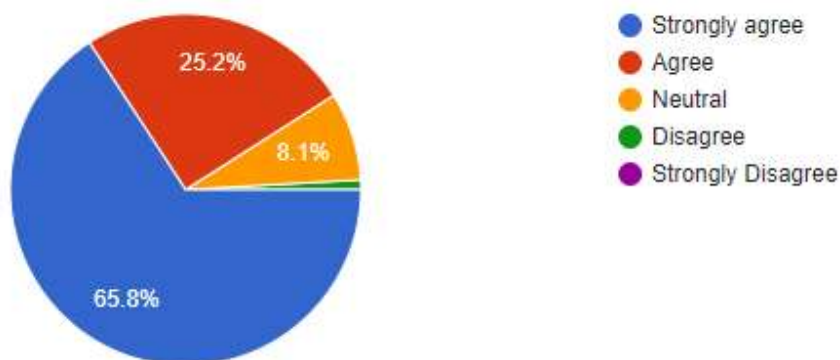


Figure 3.9: Would you find it helpful if a medication tracking application could interact with your pharmacy for prescription refills?

10- Would you like a medication tracking application to offer information and tips about your medication and related health conditions?

هل ترغب في أن يقدم لك تطبيق تتبّع الأدوية معلومات ونصائح حول أدويةك والحالات الصحية ذات الصلة؟

111 responses

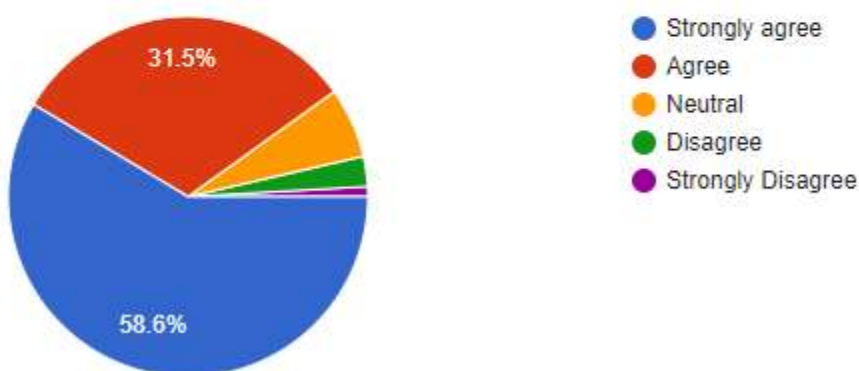


Figure 3.10: Would you like a medication tracking application to offer information and tips about your medication and related health conditions?

3.3 Functional requirements

The Medication Tracking System will have several functional requirements at basic, intermediate, and advanced levels to satisfy the project objectives:

- **Basic-Level Functional Requirements Medication Reminders:** The System must have the ability to set up and send reminders for medication intake. **Medication Quantity Tracking:** The System should offer a feature to track the quantity of medication and alert the user when it's time to refill the prescription.
- **Intermediate-Level Functional Requirements Vital Function Tracking:** The System should be compatible with smart devices or health apps to record and monitor vital signs like heart rate, blood pressure, and blood sugar levels. **Health Tips and Information:** The System should include an informational feature that provides relevant tips and details about medications.
- **Advanced-Level Functional Requirements Community/Forum Feature:** A community or forum feature where users can share experiences and support each other. Adding such a feature can increase user engagement and provide additional support to the users. **Pharmacy Interaction:** A feature that could facilitate communication or requests with pharmacies for prescription refills.

3.4 Non-functional requirements

The Medication Tracking System will also have non-functional requirements to ensure its usability, performance, and reliability:

Usability: The System should have an intuitive and user-friendly interface.

Compatibility: The System needs to be compatible with smart devices, as users indicated they would be more likely to use the System if it was compatible with the devices they already use.

Security and Privacy: The System should securely store user data and comply with healthcare data privacy regulations.

Reliability: The System should provide accurate reminders and health tracking, ensuring users can rely on it for their health management.

Performance: The System should respond quickly to user interactions to provide a smooth user experience. This includes short loading times and efficient processing of tasks and requests.

Scalability: The system should be designed to handle an increasing number of users or data volume without negatively impacting performance.

Availability: The System should be available for use whenever users need it, implying high uptime requirements. This is particularly important for users who need to always access their medication information.

3.5 Conclusion

In conclusion, the project presents an opportunity to leverage technology to address a major health-related issue. The careful analysis of existing systems and clear identification of requirements sets a solid foundation for the development of a medication tracking System. The aim is to create a comprehensive tool that not only helps manage medications but also integrates with smart devices to provide a holistic view of the user's health.

Chapter 4

Sprint 1 Design & Development

4.1 Introduction:

In this chapter, we delve into the first sprint of the design and development phase of our project. The initial sprint is a critical part of the software development lifecycle, setting the foundation for the entire project. During this sprint, we focus on defining the system's requirements and modeling them through diagrams. This allows us to visualize the system's architecture and behavior, facilitating understanding and communication among team members and stakeholders.

4.2 Use Case diagram:

Part 1:

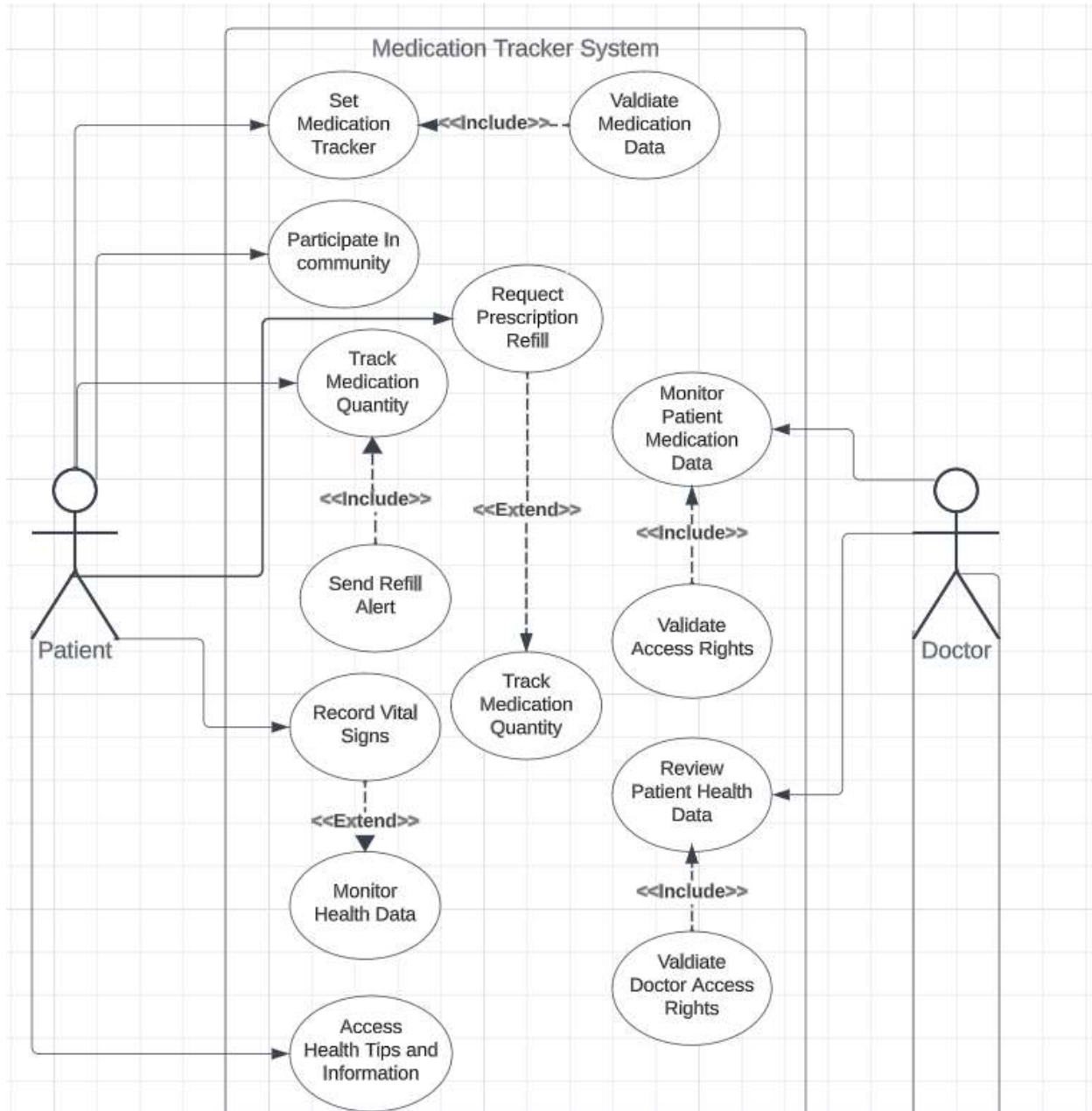


Figure Part 1 4.1

Part 2:

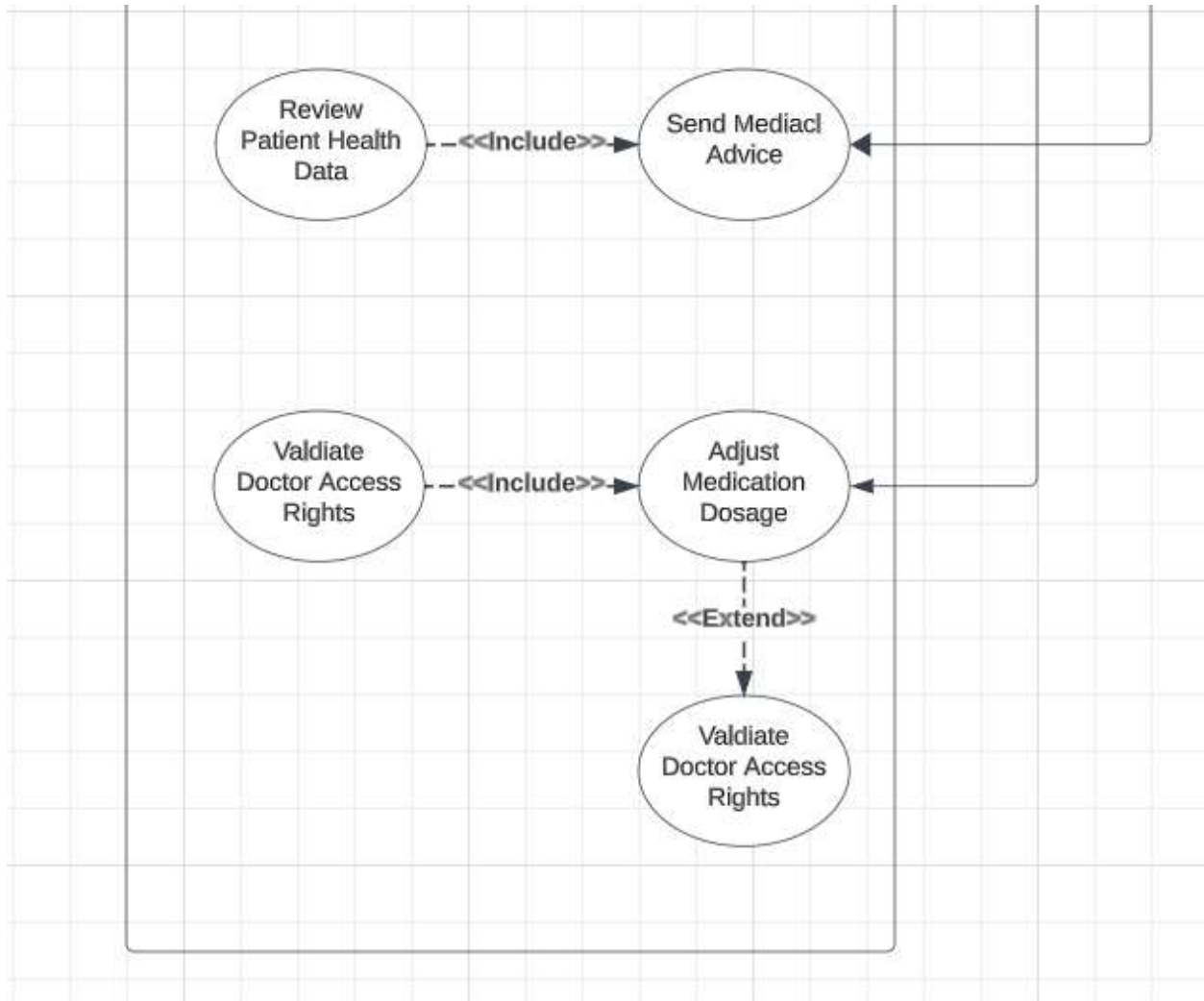


Figure Part 2 4.2

4.2 Scenarios of the use cases diagram1:

1. Use Case: Set Medication Reminder (Actor: Patient)

Scope: Health Management System

Level: User Goal

Primary Actor: Patient

Includes: "Validate medication data" use case

Stakeholders and Interests: Patient

Scenario:

The Patient inputs the medication and the time to take it into the system.

The System validates the medication data.

The System sets a reminder for the Patient to take the medication.

2. Use Case: Track Medication Quantity (Actor: Patient)

Scope: Health Management System

Level: User Goal

Primary Actor: Patient

Includes: "Send refill alert" use case

Stakeholders and Interests: Patient

Scenario:

The Patient inputs the quantity of medication they have left into the system.

The System tracks the quantity and sends a refill alert when the medication is running low.

4.2 Scenarios of the use cases diagram 2:

3. Use Case: Record Vital Signs (Actor: Patient)

Scope: Health Management System

Level: User Goal

Primary Actor: Patient

Extends: "Monitor health data" use case

Stakeholders and Interests: Patient

Scenario:

The Patient records their vital signs, such as heart rate, blood pressure, and temperature, in the system.

The System monitors and stores these data for further health tracking.

4. Use Case: Access Health Tips and Information (Actor: Patient)

Scope: Health Management System

Level: User Goal

Primary Actor: Patient

Stakeholders and Interests: Patient

Scenario:

The Patient navigates to the health tips and information section in the system.

The System displays relevant health information and tips to the Patient.

5. Use Case: Participate in Community/Forum (Actor: Patient)

Scope: Health Management System

Level: User Goal

4.2 Scenarios of the use cases diagram 3:

Primary Actor: Patient

Stakeholders and Interests: Patient, other community members

Scenario:

The Patient logs into the community/forum section in the system.

The Patient interacts with other community members by posting questions, responding to threads, or sharing experiences.

6. Use Case: Request Prescription Refill (Actor: Patient)

Scope: Health Management System

Level: User Goal

Primary Actor: Patient

Extends: "Track medication quantity" use case

Stakeholders and Interests: Patient, Doctor

Scenario:

Based on the system's medication tracking, a refill alert is triggered when the medication is low.

The Patient requests a refill of the prescription through the system.

7. Use Case: Monitor Patient Medication Data (Actor: Doctor)

Scope: Health Management System

Level: User Goal

Primary Actor: Doctor

Includes: "Validate access rights" use case

Stakeholders and Interests: Doctor, Patient

4.2 Scenarios of the use cases diagram 4:

Scenario:

The Doctor logs into the system and navigates to the Patient's profile.

The Doctor reviews the Patient's medication data and monitors any changes or anomalies.

8. Use Case: Review Patient Health Data (Actor: Doctor)

Scope: Health Management System

Level: Goal, Primary Task

Primary Actor: Doctor

Precondition: The Doctor should be authorized, and the Patient's health data should be in the system.

Stakeholders and Interests: Doctor, Patient

Scenario:

The Doctor logs into the system.

The Doctor selects a Patient whose health data they wish to review.

The System retrieves and displays the Patient's health data including vital signs and medication adherence data.

9. Use Case: Send Medical Advice (Actor: Doctor)

Scope: Health Management System

Level: Goal, Primary Task

4.2 Scenarios of the use cases diagram 5:

Primary Actor: Doctor

Precondition: The Doctor should be authorized, and the Patient's health data should be in the system.

Stakeholders and Interests: Doctor, Patient

Scenario:

The Doctor logs into the system.

The Doctor reviews a Patient's health data.

The Doctor writes medical advice based on the review.

The Doctor sends the medical advice to the Patient through the system.

10. Use Case: Adjust Medication Dosage (Actor: Doctor)

Scope: Health Management System

Level: Goal, Primary Task

Primary Actor: Doctor

Precondition: The Doctor should be authorized, and the Patient's health data and current medication information should be in the system.

Stakeholders and Interests: Doctor, Patient

Scenario:

The Doctor logs into the system.

The Doctor reviews a Patient's health data and current medication information.

The Doctor decides to adjust the Patient's medication dosage based on the review.

4.3 Sequence Diagrams:

1. Basic-level Functional Requirements:

- Medication Reminders:

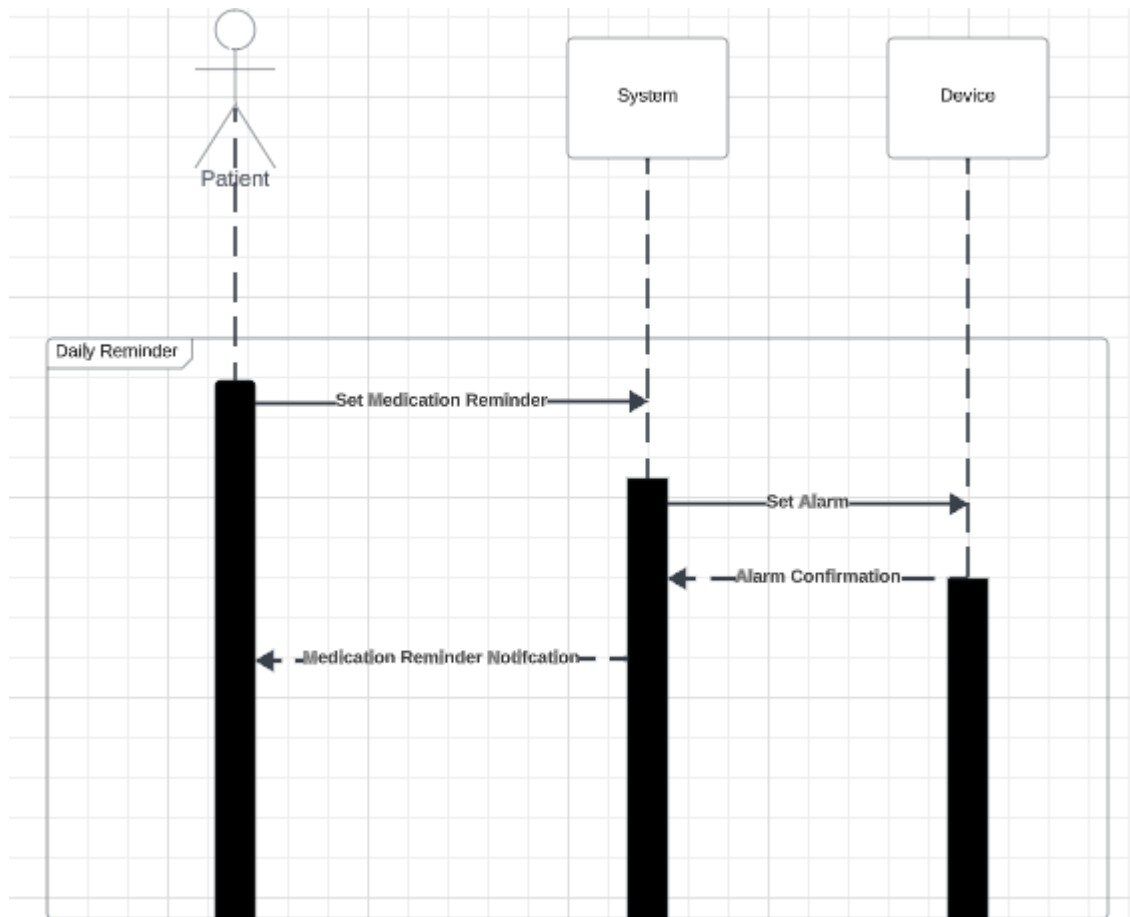


Figure 4.3 Medication Reminders

4.3 Sequence Diagrams 2:

1.2 Basic-level Functional Requirements 2:

- Medication Quantity Tracking:

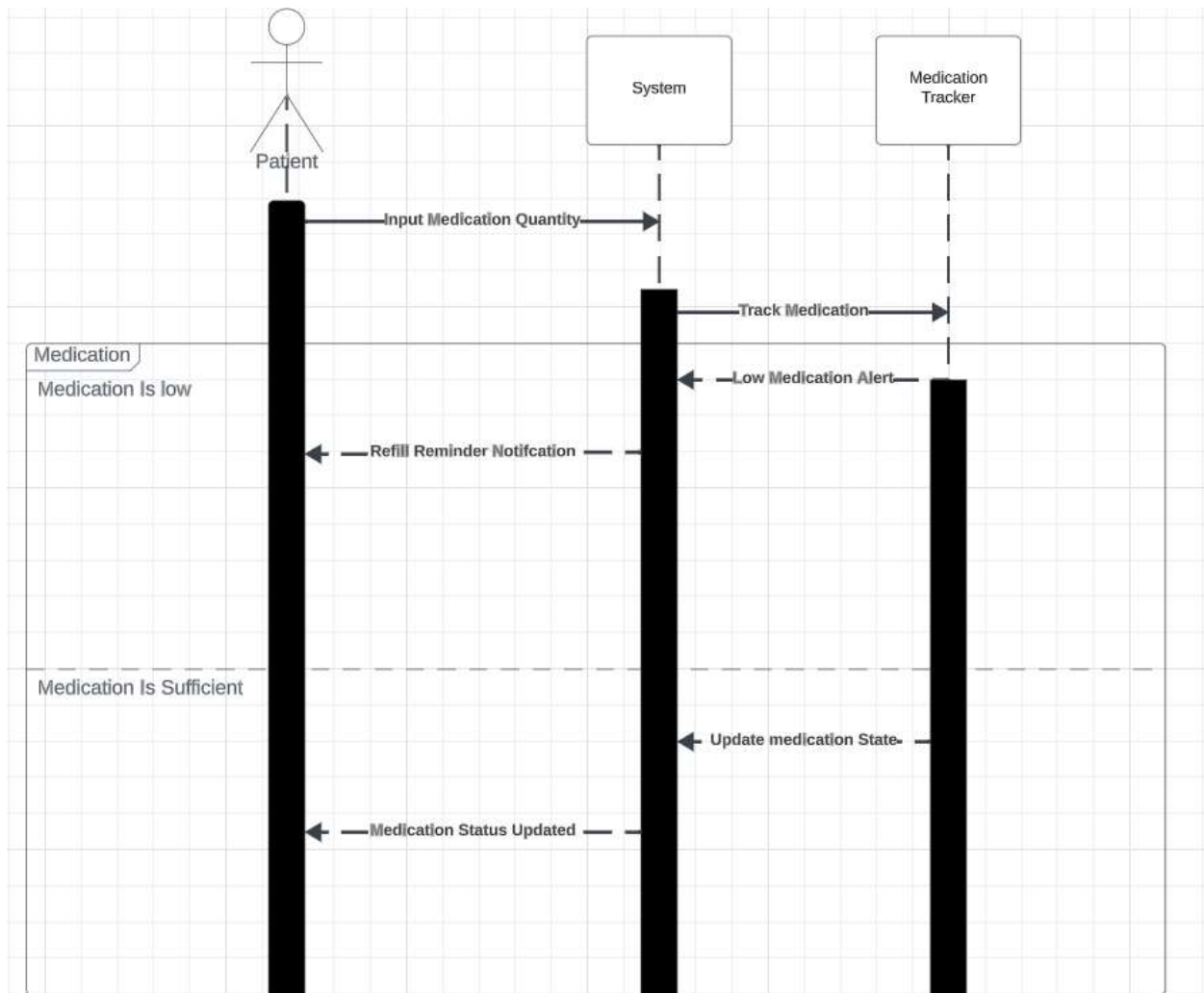


Figure 4.4 Medication Quantity Tracking

4.3 Sequence Diagrams 3:

2. Intermediate-level Functional Requirements:

- Vital Function Tracking

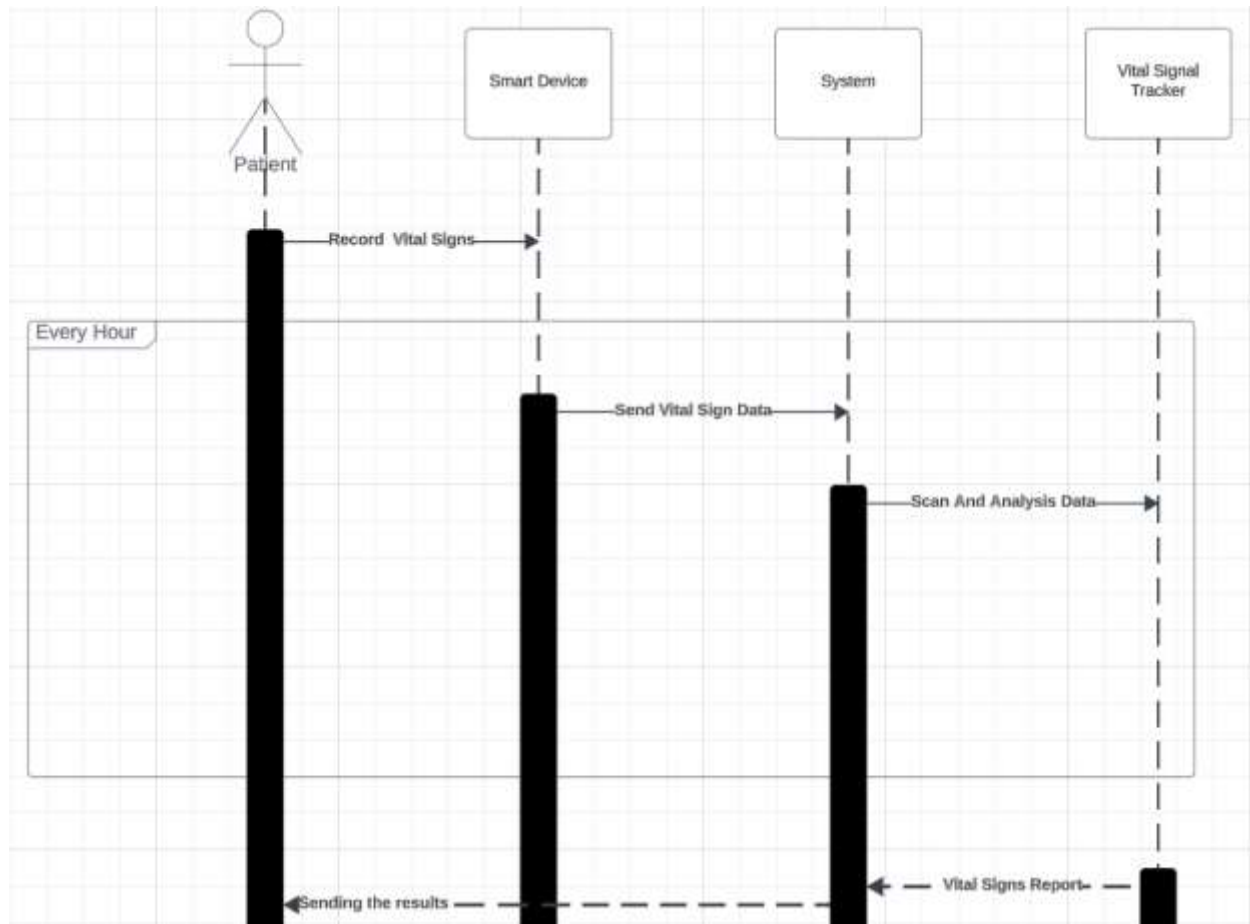


Figure 4.5 Vital Function Tracking

4.3 Sequence Diagrams 4:

2. Intermediate-level Functional Requirements:

- Health Tips and Information

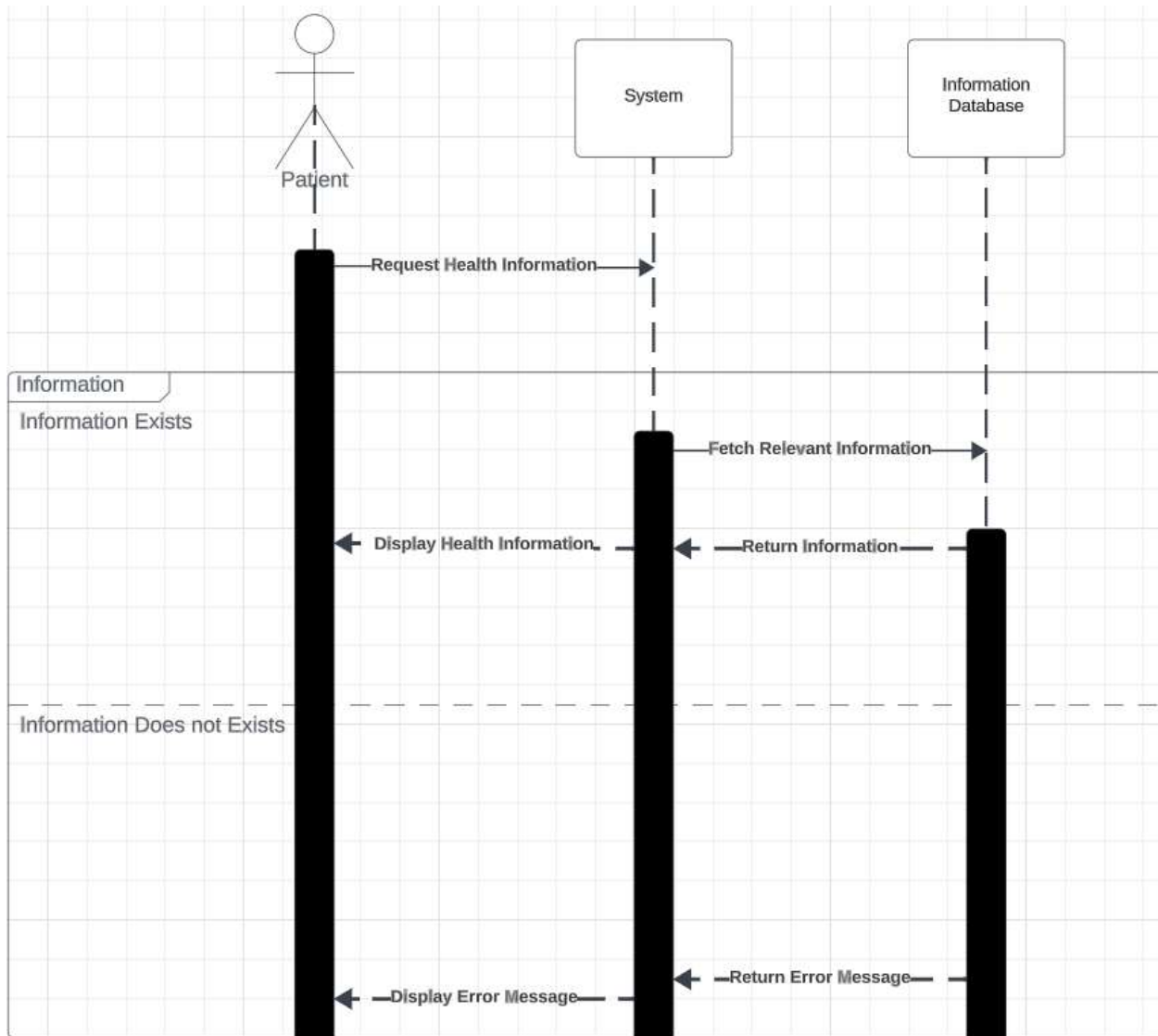


Figure 4.6 Health Tips and Information

4.3 Sequence Diagrams 5:

3. Advanced-Level Function Requirements:

- Community/Forum Feature

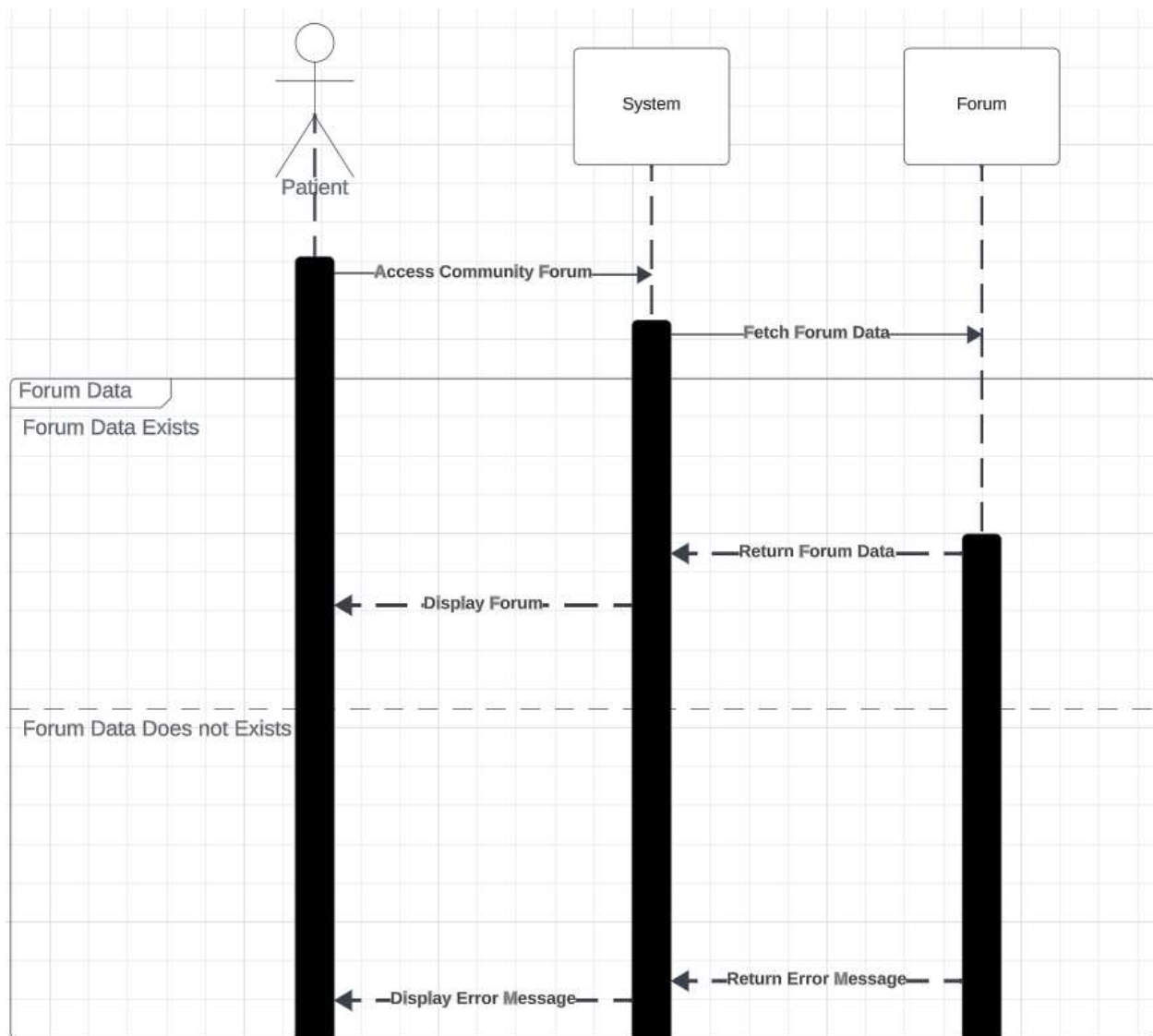


Figure 4.7 Community/Forum Feature

4.3 Sequence Diagrams 6:

3. Advanced-Level Function Requirements:

- Pharmacy Interaction

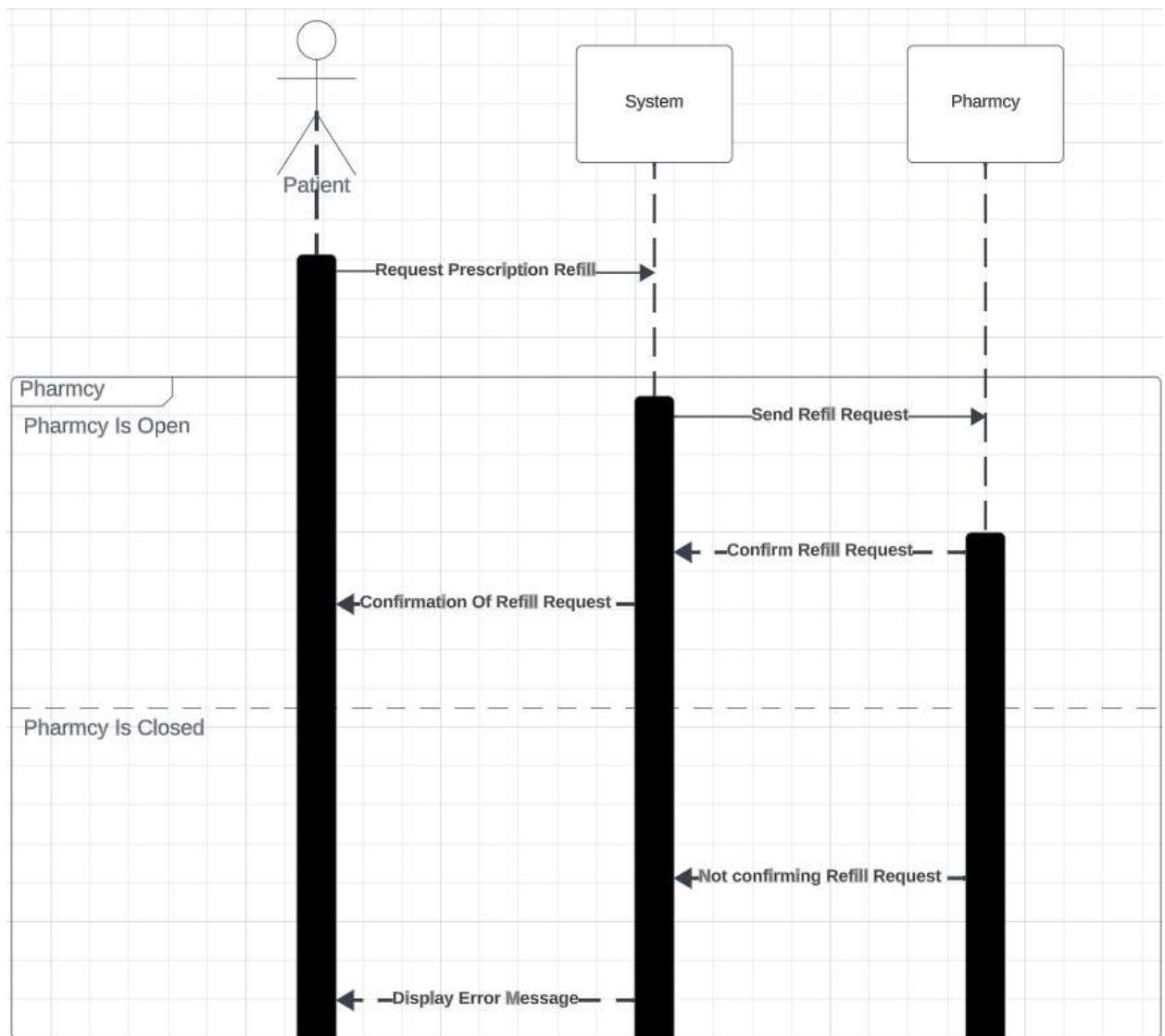


Figure 4.8 Pharmacy Interaction

4.4 Class Diagram

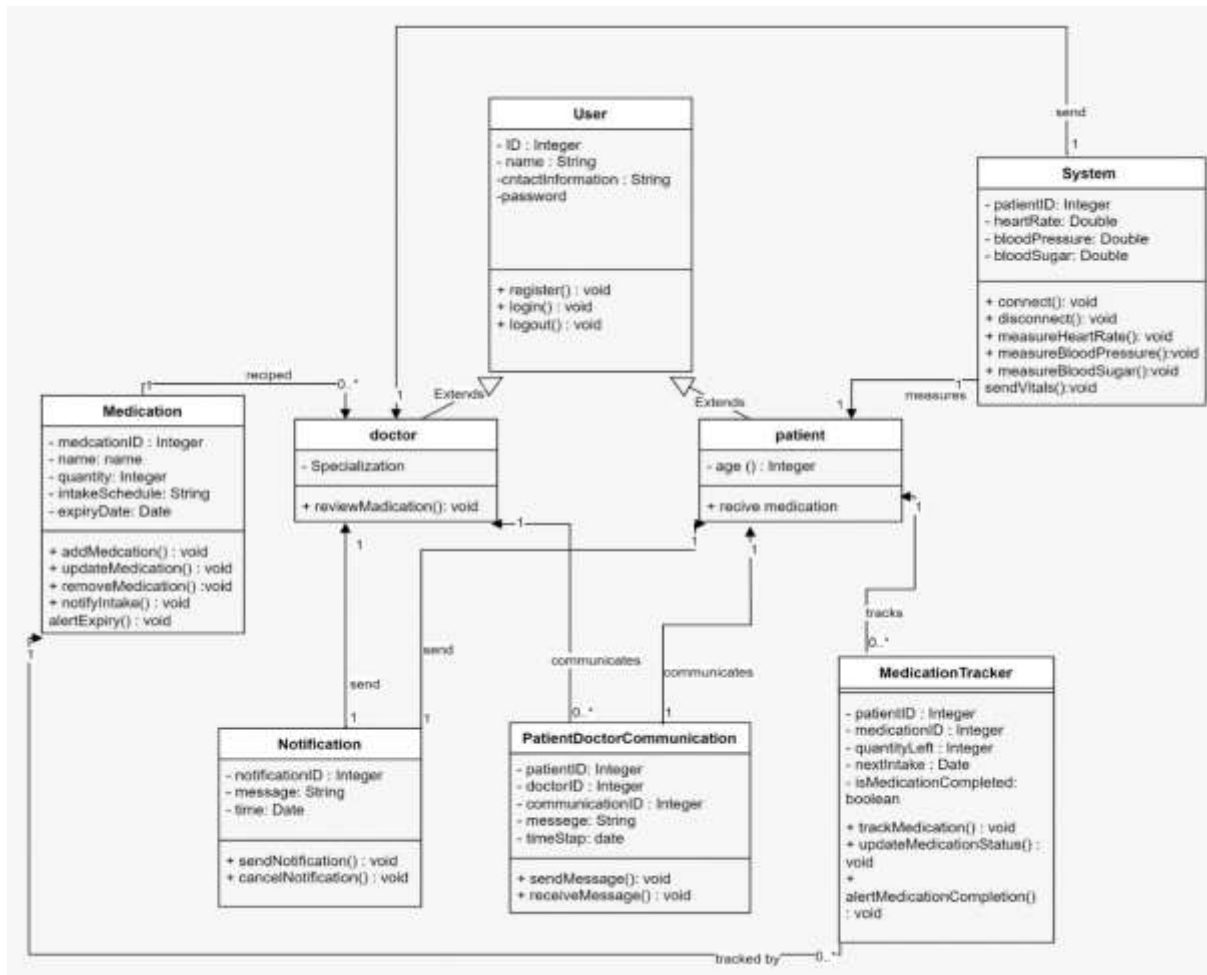


Figure 4.9 Medication Tracker Class Diagram

This class diagram for Medication Tracker

User : represent the user of the system with tow childs Patient and doctor

Patient: Represents a patient with attributes like ID, name, email, and password. It also has actions/behaviors such as register, login, and logout.

Doctor: Represents a doctor with attributes like ID, name, specialization, and contact information. It has similar behaviors to the patient, with the addition of a 'reviewMedication' operation.

Medication: Represents a medication with ID, name, quantity, intake schedule, and expiry date. It has operations to add, update, remove, provide intake notifications, and alert about expiry.

Notification: Represents a notification system with ID, message, and time. It has operations to send and cancel notifications.

MedicationTracker: Tracks a patient's medication with attributes like patientID, medicationID, quantity left, next intake, and whether the medication is completed. It has operations to track medication, update medication status, and alert when medication is completed.

System: Represents a system that measures patient vitals like heart rate, blood pressure, and blood sugar with operations to connect, disconnect, measure vitals, and send vitals.

UserDoctorCommunication: Facilitates communication between a patient and a doctor with attributes like patientID, doctorID, communicationID, message, and timestamp. It has operations to send and receive messages.

The lines with numbers and asterisks between classes indicate the relationships and cardinality between them. Here's what they mean:

patient "1" -- "0..*" MedicationTracker: tracks: This means that one patient can track zero or more instances of MedicationTracker.

Doctor "1" -- "0..*" UserDoctorCommunication: communicates: This means that one doctor can have zero or more instances of UserDoctorCommunication.

Medication "1" -- "0..*" MedicationTracker: isTrackedBy: One medication can be tracked by zero or more instances of MedicationTracker.

Notification "1" -- "0.." patient: notifies and Notification "1" -- "0.." Doctor: notifies: One notification can notify zero or more patients and doctors.

System "1" -- "1" patient: measures: The system measures the vitals of one patient.

UserDoctorCommunication "1" -- "1" patient: communicates: One instance of UserDoctorCommunication communicates with one patient.

Conclusion

In conclusion, this sprint has laid a solid foundation for the system's design and development. The diagrams we have created serve as blueprints that guide the coding, testing, and integration of system components. As we move on to the next sprint, we will build on this foundation, adding more details to our design, refining our understanding of the system, and starting the actual implementation.