


# WOLKITE UNIVERSITY

## COLLEGE OF COMPUTING AND INFORMATICS

## DEPARTMENT OF SOFTWARE ENGINEERING

## Clinic Management System for Wku Students Clinic

**Submitted to Department of Software Engineering in Partial Fulfillment of the Requirement for the Degree of Bachelor of Science in Software Engineering**

## Group members


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**Advisor Mr Alene D.**

**Wednesday May 26,2021**

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**May 26,202**

## Approval Form

This is to confirm that the project report entitled Clinic Management for Wolkite University submitted to Wolkite University, College of Computing and Informatics Department of Software Engineering by: Betelhem Mulugeta, Kidist Kidane and Ruhama Tadele is approved for submission.

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| Examiner 1 Name | Signature | Date |
| --- | --- | --- |
| Examiner 2 Name | Signature | Date |
| --- | --- | --- |
| Examiner 3 Name | Signature | Date |
| --- | --- | --- |

# DECLARATION

This is to declare that this project work which is done under the supervision of **Instructor Alene Desyalew** and having the title Clinic Management System for Wolkite University is the sole contribution of: **Betelhem Mulugeta, Kidist Kidane and Ruhama Tadele.**

No part of the project work has been reproduced illegally (copy and paste) which can be considered as Plagiarism. All referenced parts have been used to argue the idea and have been cited properly. We will be responsible and liable for any consequence if violation of this declaration is proven.

Date: _____

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| Kidist Kidane | _____ |
| Ruhama Tadele | _____ |

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## ABSTRACT

*WKU clinical management is a type of health care service management that probably will develop in the next future. It is a powerful tool that can offer a better health assistance (in its technical, economic and patient's satisfaction components). The health manpower formation in the basic theory of clinical management is necessary today. But it is also important to establish a correct information health system previously to start any clinical management pathway. These information systems are now developed to the quantification of hospital activity, and not to clinical department level (micro-management). It is also necessary to collect indicators of clinical departments. These indicators would be relevant and we could compare them between different hospitals. The development of standardized process activity, and relevant process indicator is probably a responsibility of scientific societies in the future. Now in our country, the development and introduction of clinical management is not the same between different geographical regions, hospital and clinical departments. We think that it is necessary to use more this tool in daily clinical practice, because it is a very good opportunity to improve the quality of our health assistance.*

# CHAPTER ONE

# INTRODUCTION

Clinics and Hospitals deals with the life and health of their patients. Good medical care relies on well-trained doctors, nurses, high quality facilities, and equipment's. Good medical care also relies on good record keeping. Without accurate, compressive and up to date and accessible patient notes, medical personnel may not offer the best treatment or may in fact misdiagnose the condition, which can have a serious consequence. Good records can also ensure the health care centers administration runs smoothly; unneeded records are transformed or destroyed regularly, keeping storage areas clear accessible; and key records can be found quickly; saving time and resources. Records also provide evidences of the health centers accountability for its action and they form a key source of data for medical research, statistical reports and health information systems. (Ferdinand, 2020)

## 1.1. Background of the Organization

Wolkite University is one of the third generation universities in Ethiopia. The University is cited in the SNN regional state, Gurage zone, about 150 km west of the capital.

Wolkite University Student Clinic is one of Academic sector that provides direct support to the teaching learning and research activities for the university. It established on 2004 E.C on Gubre main campus. The purpose of this clinic is to give medical service for Wolkite University's students. At the beginning, the Wolkite university Clinic gives all medication service such as, family planning, medications, Consultation service, HIV testing, etc. There are about 34 employees that work in the Wolkite University Clinic.

## 1.2. Statement of the Problem

The system which we want to generate is proposed to eliminate the problem of redundant, error full and incomplete data that was escalating the inefficiencies in data retrieval these limitations were mainly caused by the fact that data, under the existing manual recording system was entered into paper files and was later stored in overcrowded storage rooms that make retrieval of archival records close to impossible.

Due to this manual system, it is difficult to answer questions like-

- How many patients was recorded per time?
- How many patients sent to laboratory?
- How many patients sent to pharmacy?
- How many drugs are there in the pharmacy?
- What kind of drugs are there in the pharmacy?
- When will be the drugs expired?

In addition, the clinic suffers from these problems: -

- Patient information loses
- Redundant patient data
- Time consuming service

## 1.3. Objectives

### 1.3.1. General Objective

To design and develop clinic management system for wku students' clinic.

### 1.3.2. Specific objectives

- To develop the system that can ensure the overall security issue of all information by using database constraints.
- To develop the system that can reduce the workload of staff members.
- To develop the system that can reduce the number of lost all clinic records by replacing paper by database-based system.
- To develop the system that can easily maintain and retrieve the record of patient, Lab report and Drug.
- Designing back-end database that can hold all the information of the system users.
- To develop the system that can generate report to check and balance.
- To develop the system that can permanently save profile of all employees uniquely.

## 1.4. Feasibility analysis

### 1.4.1. Technical feasibility

Deals with the evaluation determine whether the technology needed for the proposed system is available or not.

Required technologies to develop this system are available on our hands now. Any resource to develop, test, debug, and required manpower, hardware and software tools are available. In addition, group members will use ASP.NET to develop the proposed system because it is a great framework to use when developing web application. It is reliable, fast, easy to use, free and widely known. Therefore, because of this our system is technically feasible.

### 1.4.2. Operational feasibility

Mainly concerned with issues like whether the system will be used if it is developed and implemented?

Our project is operationally feasible because: -

The management supports the project. They have an interest to change the manual system because it is so costly, time-consuming and stay behind system.

Users are not happy with the existing system. The main users of wku students' clinic are students and they have many compliant about the system so they are the main supporters for our proposed system.

Moreover, the proposed system is-

- It is easy to use
- It is time saving

### 1.4.3. Economic feasibility

More commonly known as cost/benefit analysis the procedure is to determine the benefit and saving that are expected from a system and compare them with costs, decisions is made to design and implement the system. It involves the cost incurred on the system development team, estimated cost of hardware and software, cost of performing feasibility study and so on. Since the university is

well equipped with the required hard ware and software, the project was found to be economically feasible.

## 1.5. Scope and Limitation of the project

### 1.5.1. Scope of the project

The system exclusively proposed for Wolkite university students' clinic. It will cover most of the functions listed below.

- Using this system, the clinic can distribute medication to patients.
- Using the system, the pharmacist can check whether or not the medication is available.
- The pharmacist can also Check whether the medicine is expired (out of date) or not.
- Record patient personal information on the system.
- Check whether the patient had record before or not.
- Check if the patient has doctor appointment.
- Send Prescription for laboratory on the system.
- Send Prescription for pharmacy on the system.

### 1.5.2. Limitation of the project

- The project can be used only by the clinic; students cannot use the system by themselves.
- The system is web based but it can only be accessed in the university.

## 1.6. Significance of the project

The significance of this study is to create efficient and effective working system for all the workers and the target users. Generally, as we are under information and technology age using computerized system is more advantageous than that of using manual system to decrease the complexity of the worker.

The system will do different activities for different units of the wolkite university students clinic:

- Customers information can be stored and searched easily.
- Allow sharing information using the system without moving from place to place.

- It saves money for the clinic and save time for the customers and also for the workers in the clinic.
- Centralized medication distribution to patients.

## 1.7. Beneficiary of the project

The system will be so helpful and beneficiary for stakeholders in different level

**Wku students' clinic:** - this system provides an Easy and efficient way of handling recording system for the clinic. Therefore, the clinic will have smug working environment.

**Students (Patients):** - the service that is given by using this system satisfy the students by saving their time and it exclude the exertion.

**Doctors**: - Will be able to easily access their patients' information and easily prescript the medicine.

**Developers:** - the developers may earn experience from this project for their next carrier. Also after this project is implemented, it will be sold for many organizations in need so that the developers will be benefited by it.

## 1.8. Methodology of the project

### 1.8.1. Data collection tools/techniques

Data collection is the most important part of the project to find the main requirement of the system and to understand how the system works. We are going to use different methods to collect data. Among the methods, we use the following: -

**Document analysis**: To get more information about the project we use earlier documents that help us to develop the project. During the analysis of documents, we give a special consideration to those documents, which can bring more features to the project.

**Interviews**: we use specific questions and ask some group of people which are related to the clinic in order to gather information about the existing system, problems in the existing system and the customers need.

**Internet**: aids us to see the available sample on the internet and to download different types of software, tutorials and documents that help us in developing the project.

### 1.8.2. System Analysis and design

In our project, we apply the concept of object oriented system Analysis and design development methodology, because it is best way to construct, manage and assemble objects that we are going to implement in our system, and the composition of objects and collaboration between objects on the system. It Models the functions of the system (use case modeling), organize the objects and the relationship between them and finally model the behavior of the objects. It also shows object interactions and behaviors that support the use case and scenario, and finally update object model to reflect the implementation environment. We choose this approach because of the following advantages:

- Increased reusability: object oriented system support reusability of system.
- Increased extensibility: to add and change the existing module without affecting the rest of the program.
- Improved quality: introduces user participation, which improves quality of the project.
- Managed complexity: the object oriented method solves software complexity in the following way, designing the software with the expectation that it will need to be modified and being able to respond quickly when requirement or environment changed

### 1.8.3. System development model

We are going to use waterfall model because the implementation phase will be done after the documentation of the project is fully finished.

This model is used when the requirements are very well known, fixed and clear. In addition, the project scope stays relatively static. It is also easy to understand and use.

### 1.8.4. System Testing Methodology

#### 1.8.4.1. Unit testing

We will use unit testing during the development (coding phase) of an application in order to isolate a section of code and verify it correctness. Unit testing is done at the source or code level for language-specific programming errors such as bad syntax, logic errors, or to test particular functions or code modules.

#### 1.8.4.2 Integration testing

It used to verify the performance of the complete system of the software. Basically units of software are added together to create modules. Then these modules of software are integrated together into complete system and that is what we are testing.

#### 1.8.4.3. Acceptance testing

In this testing stage, we will evaluate the systems compliance with the business requirement and verify if it has met the required criteria for delivery to end user. The customer will participate on the acceptance testing of the system. According to system requirements and other resources (documentation, source code, user manual) test cases are generated to determine (validation and verification) whether the system satisfies users need and expectation to solve user's problem.

### 1.8.5. Development tools and technologies

#### 1.8.5.1 Front end tools

- HTML
- JavaScript
- CSS

#### 1.8.5.2 Back end tools

- MYSQL server
- PHP

# CHAPTER TWO

# DESCRIPTION OF THE EXISTING SYSTEM

## 2.1. Introduction of Existing System

Defining system requirements is the initial step of constructing the whole system. It is a description of that we have been gathering and analyzing. Without requirements, the goal is unclear and the construction may be off track (out of the path). Stating these requirements explicitly helps ensure that any potential miscommunications are corrected at an early stage. Even though the clinic uses a manual approach system to perform each task. When we see the clinic from the patient perspective the current system does not provide effective information for the patient.

## 2.2 Existing System Description

Accessing patient files and records at the wku clinic is done manually on all working processes makes it very labor-intensive and inefficient. Before moving into the major system design building blocks of the new system we need to analyze the existing system and identify their weakness. The existing medical system and drug prescription in wku clinic involve manual activities. It has been observed that to receive medical treatment in most of this clinic the patients queue according for several hours in the sequence of first come first serve(FCFS) through, a new patient usually registers into the clinic by filling patients form which signifies that the person is officially patient of the clinic. Also, this patient will have manual folder which stored information about the diagnosis and drug prescribed to him. Before examining the patient and carry out the appropriate therapy which is either he referred the patient to the laboratory unit for a lab test or to the pharmacy unit to obtain prescribed drugs.

But, any treatment offered to the patient by the doctor must be recorded on the patient's folder to avoid inappropriate therapy. This process involves very large amount of data, consuming a lot of time. The problem of data retrieval, loss of information results since the nurse or the person involved in the data search with many files for different years. This trend is good to be dealt out with for better service to the patients, in clinics. This process has so many inconsistencies and inconveniences like patients losing their cards or their files being misplaces. The other problem is that the communication between the record officer to doctor, doctor to laboratory technician, and

the doctor to the pharmacy is not in a computerized way. Patients are treated by concerned doctors, the record officer should directly go to the doctor and gives the patients files to the doctor. On the other hand, if the doctor wants to order a laboratory test, he should order the test by the manual lab form and the lab technician also manually give the result. This process is the same in the communication between doctors and pharmacists. This will lead to a high cost to papers and also the information's will be difficult to manage by the manager. Therefore, an automated system will help to keep track of patient's records and making an easy way of communication within the clinic. (Mohamad, 2021)

## 2.3 users of existing system

**Managers**: - the clinic's administrator or manager is responsible for controlling all activities of the clinic to ensure high uptime of the clinic, manage accounts and for handling all data restore activities. That means he/she can control all the clinic's work, and generate the overall clinic report.

**Doctors:** - a person skilled or specializing in healing arts, the one who is trained and licensed to heal and treat the sick person. Also have the following activities in wku students' clinic: -

- Patient diagnosing
- View patient information
- Take physical test
- Order laboratory test
- Order medicine
- Medical advice
- Record patient history
- Inject medicines
- Give physical treatment write refer to when the medicine is not found in the clinic
- Generate medical certificate

**Patient:** - a person who has some medical problems or need medical advice from the clinics. They have the following activities: -

- Take treatment
- Wait for their turns

**Record officer: -** a person who works in the card room whose responsibility is: -

- Registering the patient
- Store registered files across a shelf
- Search existing patient and
- Process patient information for health care

**Laboratory Technician: -** a person who works in a laboratory room

- Take a sample from the patient
- Test the sample
- Return the result of the patient to the doctor
- View lab order
- Generate lab reports of the patient

**Pharmacist: -** a person who works in pharmacy room he/she is responsible for the following activities: -

- Store the medicines
- View medicine order
- Give medicine to the patient
- Generate pharmacy reports
- Register the medical instruments
- Avoid expired medicine
- Respond to the doctor when the medicine is not found in the store

## 2.5. Major Functions of the Existing System

**Patient registration**

- When the patient arrives at registration, the record officer should ask the patient's name (first name, father's name and grandfather's name) and then look for an existing registration number in the book which holds the university's student information. This should be done whether the patient reports that he/she has been to the clinic before or not.

- If the patient is already registered, the record officer should facilitate the retrieval of the existing file from the file cabinet in the record room. A runner/transistor should retrieve the patient's file and then take the file to the area to the area where the patient is to be treated.
- If the previous registration number cannot be found, the record officer should generate a new registration number to the patient.
- The new registration number should be issued in a straight numeric sequence, without skipping any numbers.
- Each registration number should be assigned to one and only one patient.
- All patients- regardless of which service they will access-should be registered at central registration site.

**Retrieving existing medical record for a returning patient**

- If the patient knows his/her registration number, then the registration number can be used to find the registration number can be used to find the patient's record from the file cabinet.
- Retrieving file by name or id number, if the patient does not remember their registration number.

**Storage of medical records**

- All active patient files should be filed in a single, centralized file room i.e. card room.
- The files should be filed according to the registration number.
- All patient files should be stored together.

**Giving medical treatment with prescription**

- If it is necessary, the doctor will order a laboratory tests to the patient or he/she will order drugs to him/her.
- The patients get medication from doctors.

**Reporting laboratory results for patients**

- The laboratory technician makes laboratory testing and finally reports either for patients or to the doctor.
- Then he/she will resend the result to the doctor.

**Deliver drugs to the patient with a prescription**

- The pharmacist will accept drug orders from the doctor then will provide the ordered type of drugs to the patient.

## 2.6. Forms and Other Documents of the Existing Systems

In the existing system, they use different forms and reports to manipulate different records associated with different activities. Among them the followings are some of the documents used in the existing system are: -

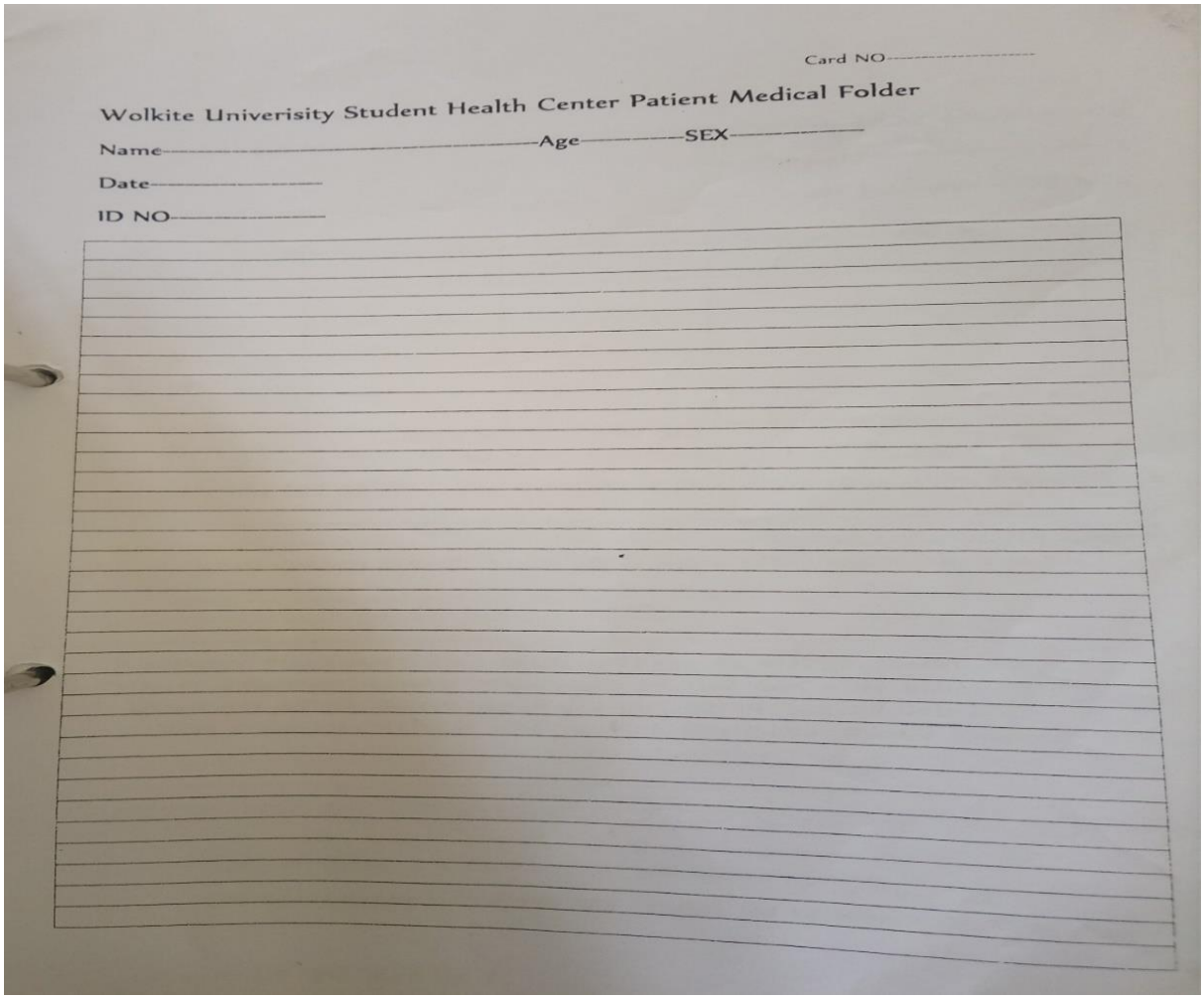



Figure 2. 1 Patients' Medical Folder

The above figure is from Wolkite university students' clinic. It is the patient information form. It contains all of information about the patient like age, Name, sex, ID no, symptoms, blood pressure and so on.

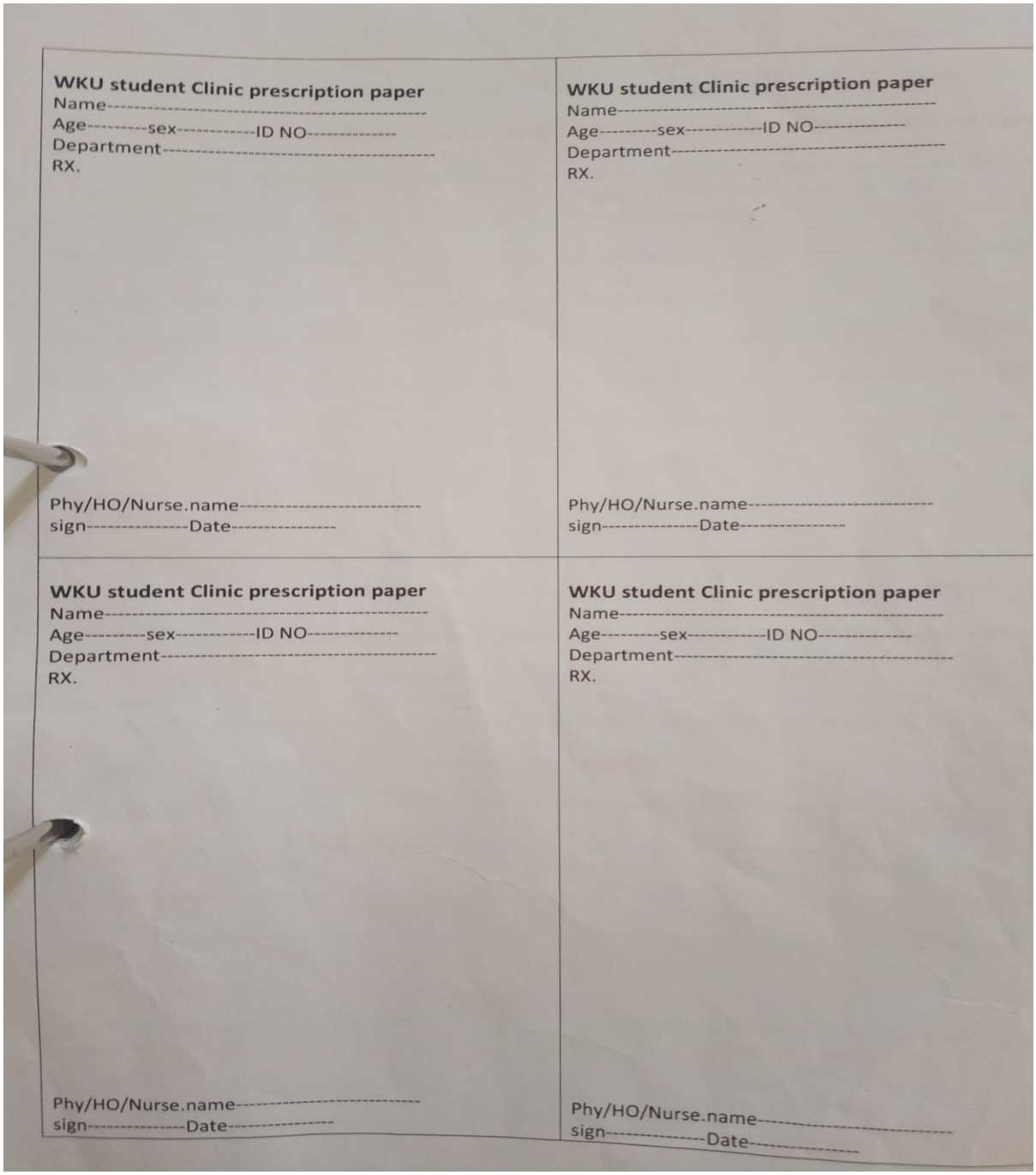
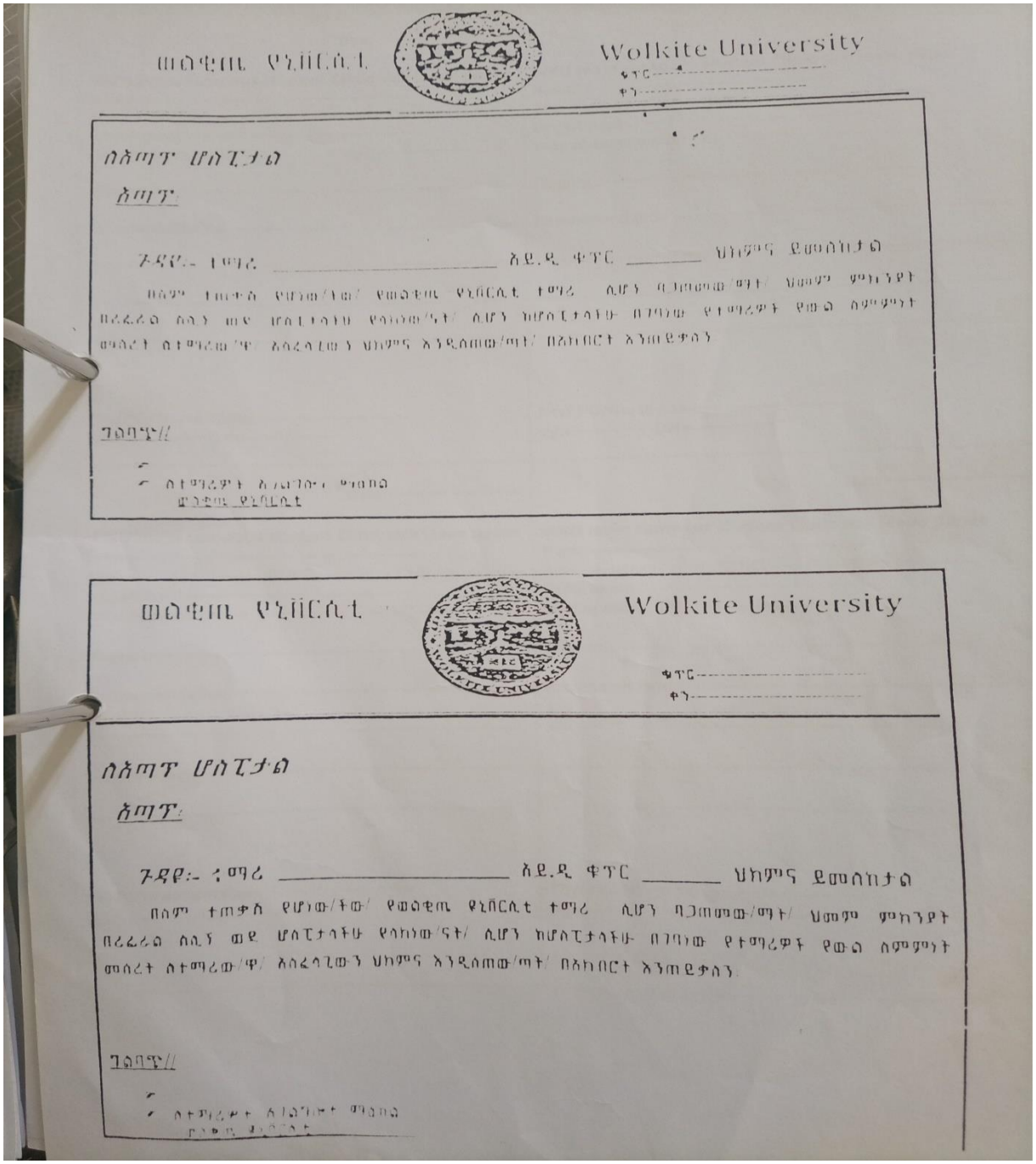



Figure 2. 2 Drug Prescription Paper

This image is from wolkite university students' clinic. It is the drug prescription paper, the doctor give this paper to the patient so the patient can get medicine from the pharmacist.


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ለአጣጥ ሆስፒታል

አጣጥ

ጉዳዩ፡- ተማሪ _____ አይ.ዲ ቁጥር _____ ህክምና ይመለከታል

በሰም ተጠቃሽ የሆነው/ትው/ የወልቂጤ ዩኒቨርሲቲ ተማሪ ሲሆን ባጋጠማው/ማት/ ህመም ምክንያት በረፈረል ሰሊኝ ወደ ሆስፒታላችሁ የላከነው/ናት/ ሲሆን ከሆስፒታላችሁ በገባነው የተማሪዎች የውል ስምምነት መሰረት ለተማሪው/ዋ/ አስፈላጊውን ህክምና እንዲሰጠው/ጣት/ በአክበሮት እንጠይቃለን

ግልባጭ//

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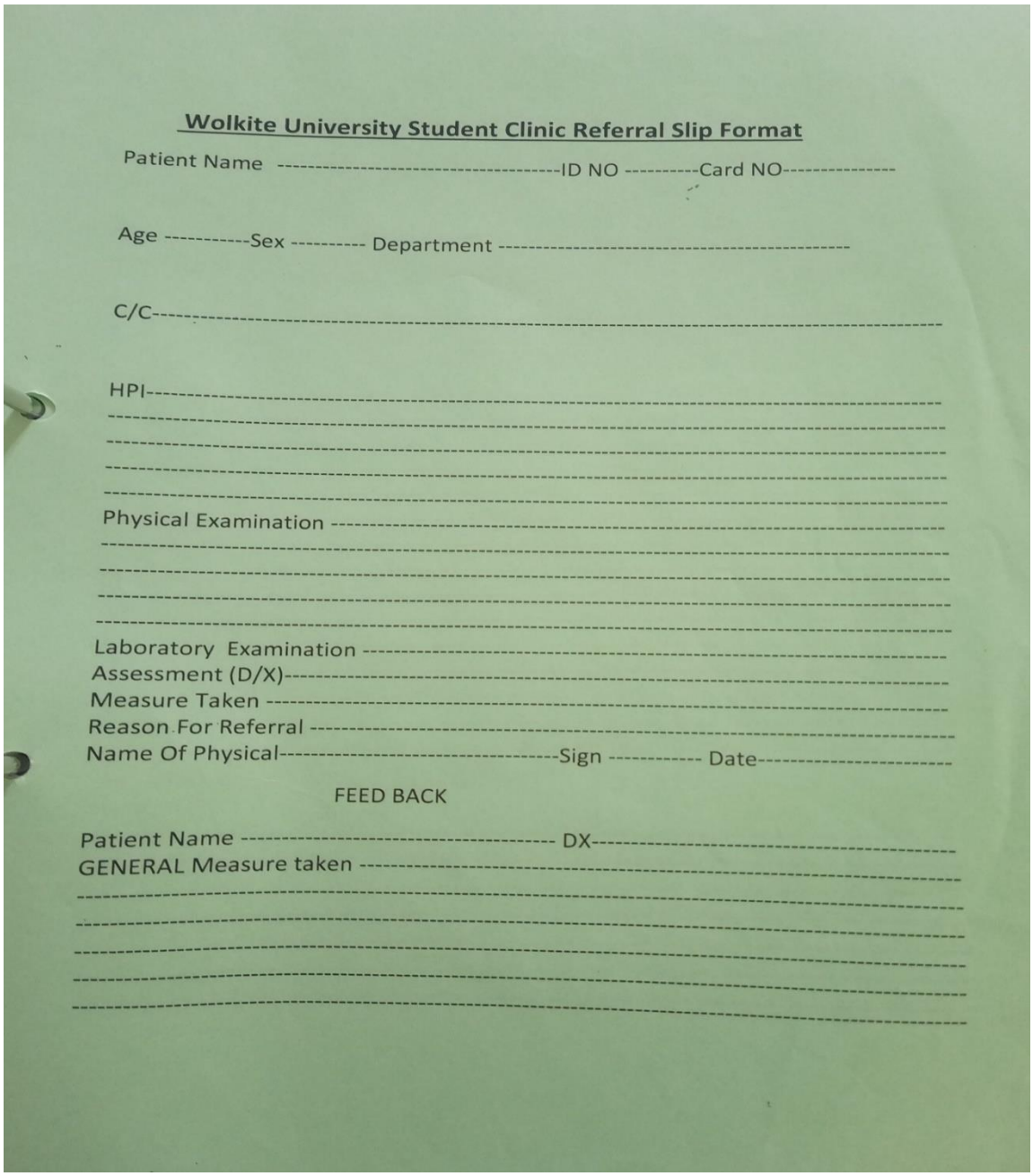
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Figure 2. 3 Referral Paper

The above figure is referral paper from Wolkite university students' clinic. When the patient case is out of the clinics potential the clinic will send the patient with this referral form to ATAT hospital.



**Wolkite University Student Clinic Referral Slip Format**

Patient Name ----------ID NO ----------Card NO----------

Age ----------Sex ---------- Department ----------

C/C----------

HPI----------

Physical Examination ----------

Laboratory Examination ----------
Assessment (D/X)----------
Measure Taken ----------
Reason For Referral ----------
Name Of Physical----------Sign ---------- Date----------

FEED BACK

Patient Name ---------- DX----------
GENERAL Measure taken ----------

Figure 2. 4 Referral Paper

The above figure is the patients' full information send to ATAT hospital with referral paper.

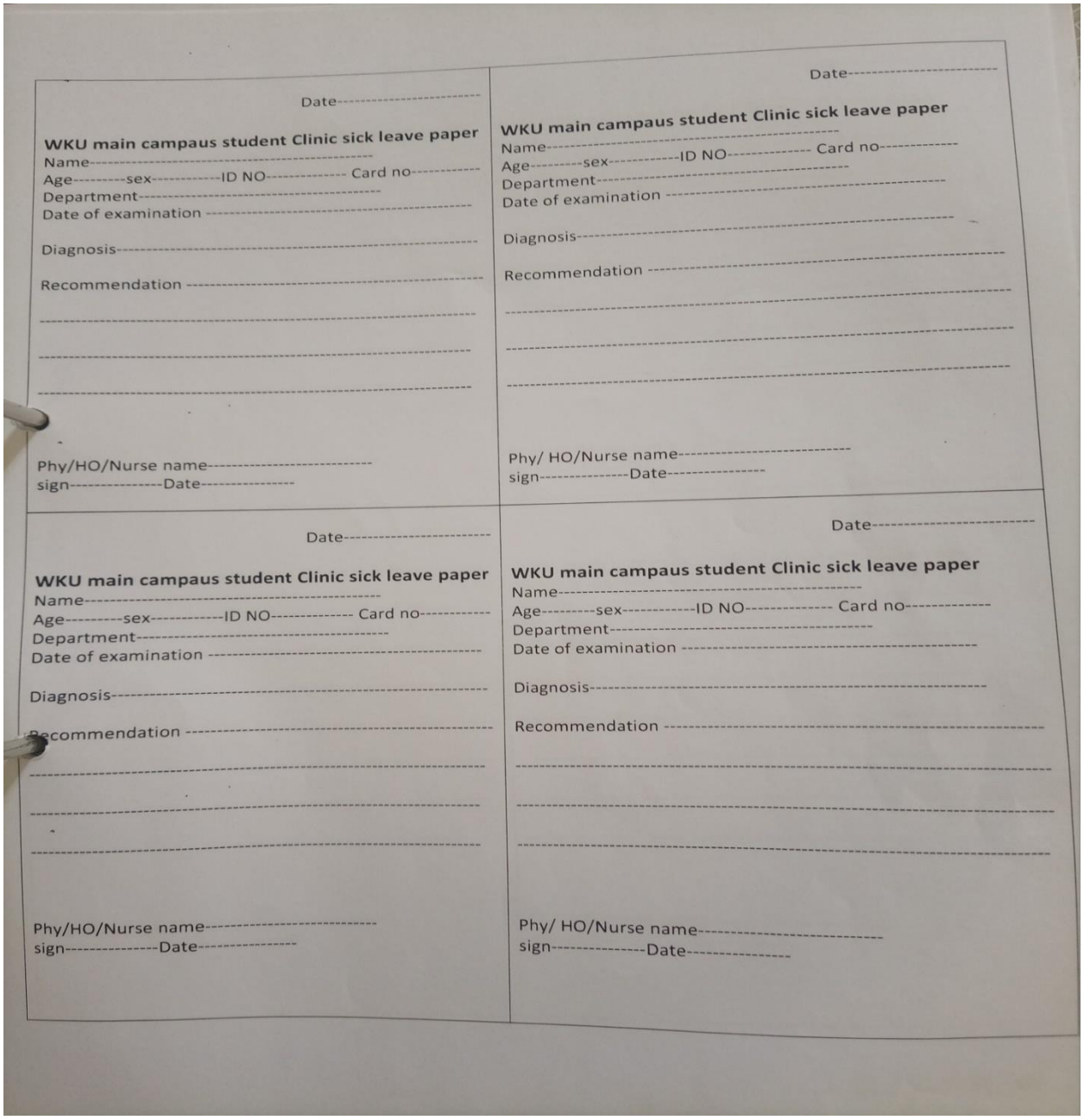
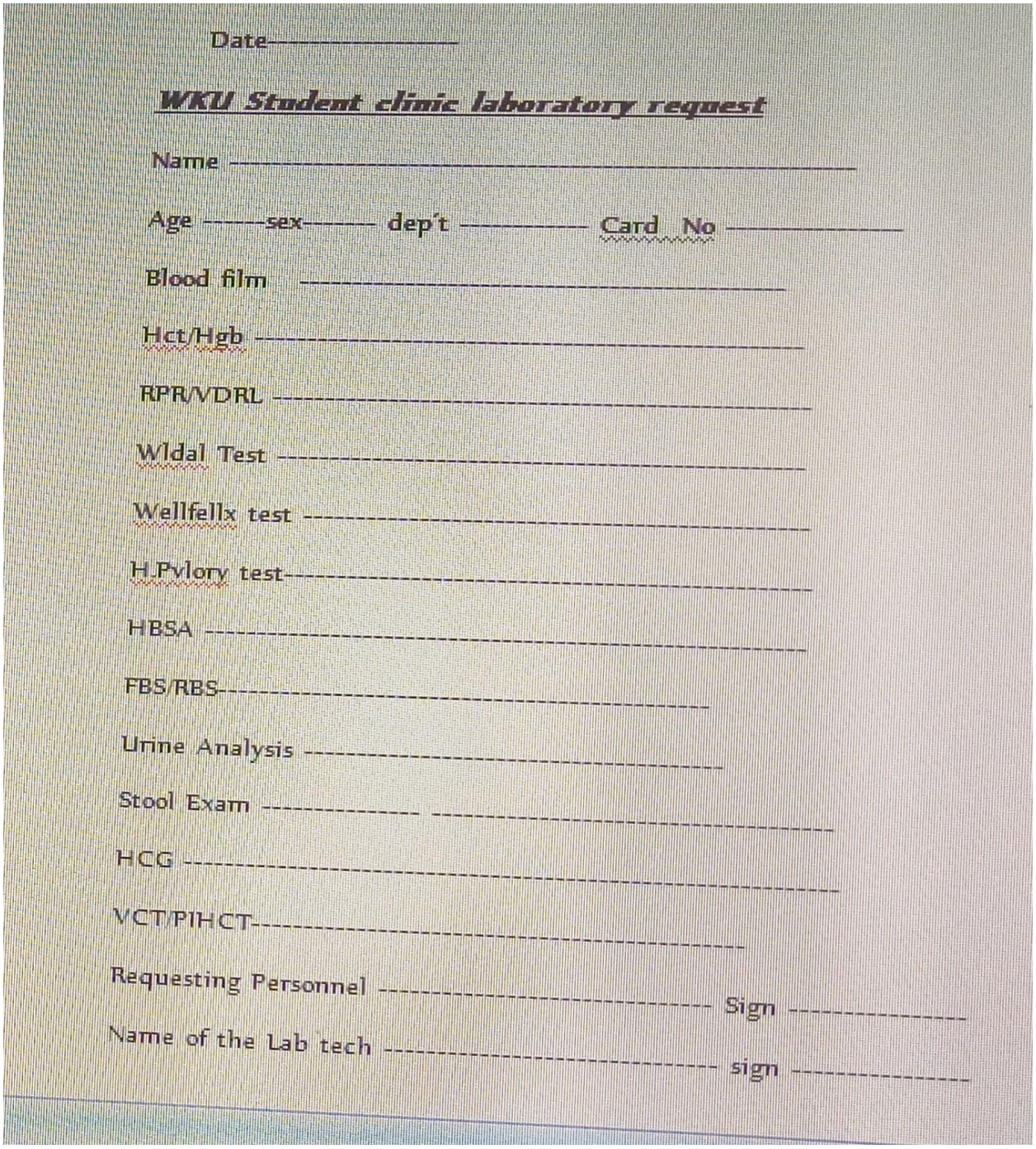



Figure 2. 5 Sick Leave Paper

The image here is the sick leave paper for patients in case the student has any academic activity on that day. This paper will be evidence for the student



Date_____

WKU Student clinic laboratory request

Name _____

Age _____sex_____ dep't _____ Card No _____

Blood film _____

Hct/Hgb _____

RPR/VDRL _____

Widal Test _____

Wellfellx test _____

H.Pylory test_____

HBSA _____

FBS/RBS_____

Urine Analysis _____

Stool Exam _____ _____

HCG _____

VCT/PIHCT_____

Requesting Personnel _____ Sign _____

Name of the Lab tech _____ sign _____

Figure 2. 6 Laboratory Form Paper

The figure above is laboratory request paper which the doctor gives to the patient so that the patient can get all the tests on the paper.

## 2.7. Drawbacks of the Existing System

It has many problems that affect a compliment of tasks easily, efficiently and effectively, some of the drawbacks are listed as follow: -

- **Takes time while recording and registering information or data**

The clinic records the necessary information in the paper-based form. Since the files may be misplaced and sometimes the record of the patient may be wrongly filled. This results in inconvenience and wastage of time. And also lack of immediate information storage, the information generated by various transactions takes time and effort to be stored in the right place. A lot amount of records need much place to save.

- **It is difficult to update and modify the data**

The information which is stored in the file room will be not flexible for updating or modifying if any mistakes occur so this will lead to an impure collection of data.

- **Difficult for reporting**

Since the information which is found in the file room is not well organized so to generate and prepare timely reports will be much difficult.

- **Data redundancy**

If there is no well-organized collection of data it will occur data redundancy, because of the registration room have no structured data it will be difficult to check whether the patient has registered his information or not. Especially this type of limitations occurred at the time of the patient do not remember the registration number and lie to the clerk that he/she doesn’t come here previously.

- **Cost**

The clinic records the necessary information in the paper-based form. The usage of traditional paper-based forms to record information has several drawbacks since the university will provide the papers to the clinic by demanding a high cost to it. And also, the file cabinet included this type of drawback of the existing way of giving service because the papers will need may space to be stored so additional file cabinets and space will be needed to store the information.

- **Time consuming**

- The patient has to wait a long time until other patients to take the service.

- Searching patients' previous information takes more time.

- Communication between doctors, pharmacy and record officer also take time.

## 2.8. Business Rules of the Existing System

Business rules are rules that are used as a guide to performing all tasks according to the rules and regulations. The following are some of the business rules of the clinic in the current time.

- One patient should have one registration number(RN)
- The patient should finish the registration process before any treatment except in the case of emergency in these case the patient should get first aid(service).
- Patient must come to the clinic for getting treatments from the clinic
- All information of the patient should be kept in one record office
- Patients should not take their medical card to their home by any means
- Only the concerned body can see the medical card
- The drug could not be given without a prescription from the doctor
- Lab tests could not be taken unless there is an order from the doctor
- A patient who has an appointment can get treatment only on the appointment
- All staff in the clinic must be registered or members of a clinic-based perspective roles.
- The patient goes to pharmacy (clinic pharmacy) and get prescript medicine from the pharmacy
- The doctor can prescribe the medicine to the patient depend on the examination report and diagnosis
- The doctor can write a diagnosis report for patient, this diagnosis report is like sick leave, referral, and withdrawal reports.

# CHAPTER THREE

# PROPOSED SYSTEM

## 3.1 Introduction

The proposed system is to develop a web-based clinic management system for Wolkite University. the main objective of this system is to change the manual system to computerized system by designing and implementing an effective, efficient, reliable and more secure system. it eliminates the drawback of the existing system and handle easily all the work done in the existing system. after observing the current manual Wolkite university clinic management system and understanding all the problems, we desired to design a system that solve the problems of the existing system. the proposed system has features like reduce the work load, give better service, store patients' data accurately. The proposed system design will help the management to use the computer system to gain information about the patients. All data regarding patient information is stored at the central database server. Accuracy is maintained, as the computer information will yield an accurate result. There will not be much congestion in the clinic, as system developed will assist patients to be treated and the information stored. The proposed system is flexible and can be accessed at any time. Also the login system must be present and secured by password and logout. The proposed system register and order medicines by them expire date and also shown how many medicines are there and how many days are left for the expiry date. The proposed system will also have some other features like:

- Reduce the workload
- Store patients' medical data
- Security of data
- Ensure data accuracy
- Better service
- Fast rate of operation and excellent response time
- User-friendliness and interactive

- Register and order medicines by their expiry date. the system has shown how many medicines are there and how many days left for the expiry date.
- Improve time-wasting and faster retrieval system.

In general, the proposed system handles all the data and work done efficiently and effectively than the current existing system and also solve the problems that are occurred in the current existing system. after all it reduces the work load and give better service for the user.

## 3.2 Functional requirements

Functional requirement is a description of the service that the software must offer.it describe a software system or its component.it describe what the system do. they are functions that developers must implement to enable users to accomplish their tasks. Our system has a lot of functional requirement to fulfill among those:

- The system shall register Patients
- The system shall search patient files
- The system shall Update patient medical file
- The system shall Manage user accounts
- The system shall Store laboratory order
- The system shall Store laboratory result
- The system shall Store medicine order
- The system should check expiry date of drug
- The system should register an appointment for the patient
- The system should register, update, and delete drug type

## 3.3. Nonfunctional requirements

Nonfunctional requirements define system attributes such as security, reliability, performance, maintainability, scalability, and usability. They describe how the system works. They focus on the quality of the application system needed to be developed from a different point of view. They ensure the usability and effectiveness of the entire system. It is a specification that describe the system’s operation capabilities and constraints that enhance its functionality. These requirements do

not directly affect the performance of the system but they are even so important. Our system uses some nonfunctional requirements.

### 3.3.1. User Interface and human factors

Because of the system is directly connected to the user the user must know how to interact with the computer application so that

- The user interface should be attractive.
- The interface should be user -friendly.

The system should support the error-handling mechanism that displays the graphic approach and the system guide the user what will be the next action.

### 3.3.2. Security issues

The system is designed to be very secure so that it has a login feature that authenticates the user using its user name and password and the user will be able to login to his/her respective pages and use the system as required. The system will be secured as much as possible so that there is permissible information flow regarding who can do that. Adding, deleting, retrieving and updating information patient is not allowed for unauthorized user. Only certain activities are permitted for authorized once(controlled) by the system. Whenever a modification is necessary the system support such process by authorized user.

- We will use password encryption.
- Login will have maximum of five attempts, then it will shut down the system.
- The system should not leave any cookies on the student's computer containing any of the user password and confidential information.

### 3.3.3. Performance consideration

- The system is capable of carrying a huge amount of data with one database and will provide fast access to the customer according to their privilege.
- The system responds on time on minimum space.
- The system should search for the given thing quickly.

- The system shall take initial load time depending on internet connection strength which also depends on the media from which the system is run.

### 3.3.4. Error handling and validation

- Our system handles errors in a very efficient manner. It can tolerate to wrong inputs and prompts the users to correct the inputs. It gives notifications as and when required, guiding the users to properly utilize it.
- Response to error when the users enter incorrect user account or mismatch fields.

### 3.3.5. Usability

- Is the ease of use and learning ability of a human made object? He proposed system website is highly user friendly and all the interfaces are interactive.
- The system should easy and understand for the user.
- The system interfaces easily understand to use the system.
- The system interfaces should develop by bootstrap because of easily understandable by the user.

### 3.3.6. Portability

- The system can run and browse in a different browser.
- Example internet explorer, Mozilla Firefox, Google, chrome …

### 3.3.7. Reliability

- The system facilitates functions successfully and is reliable.

# CHAPTER FOUR

# SYSTEM ANALYSIS

## 4.1. System Model

## Introduction

In this phase of the Wolkite university clinic management system it deals with analyzing the proposed system, the project development approach that is implemented using an object-oriented system development methodology. Because the object system development approach gives easier and natural way to break down problems into simple, small and manageable components so that it reduces the vague appearance of the big problem and by using different UML analysis modeling techniques such as use case diagrams, the use case description(scenarios), sequence diagrams, activity diagrams, and user interface prototype. After identifying the actors and use cases, the use case descriptions(scenarios), sequence diagrams, activity diagrams, and user interfaces prototype. After identifying the actor and use case, the use cases are developed and textual descriptions (scenarios) are stated. The sequence diagram id depicted based on the use cases which are developed for the proposed system. Activities will be represented by the activity diagrams. The major activities described in this chapter are constructing a use case model, documenting the use case course of events, constructing sequence and activity diagram analysis level class diagram and so on.

### 4.1.2 Use Case Model

Use case diagrams give an outsider's view of a system. It depicts a collection of use case, actors, system boundary box and their interaction. Use case also describes a sequence of actions that are measurable value to an actor. Here is some information about our system use case: -

Actors

- Manager
- Doctor
- Record officer
- Pharmacist
- Laboratory technician
- Patient

Use cases

- Log in
- Register patients
- Assign bed
- Order lab
- Generate refer
- Generate medical certificate
- Order drug
- View lab results
- Create account
- Delete account
- Update account
- Register employees
- Delete employees
- View report
- View lab order
- Send lab result
- Register drug
- View drug order
- Approve drug order
- Manage medical order
- Check expiry date
- View information
- Generate report

### 4.1.2.1 Use case diagrams

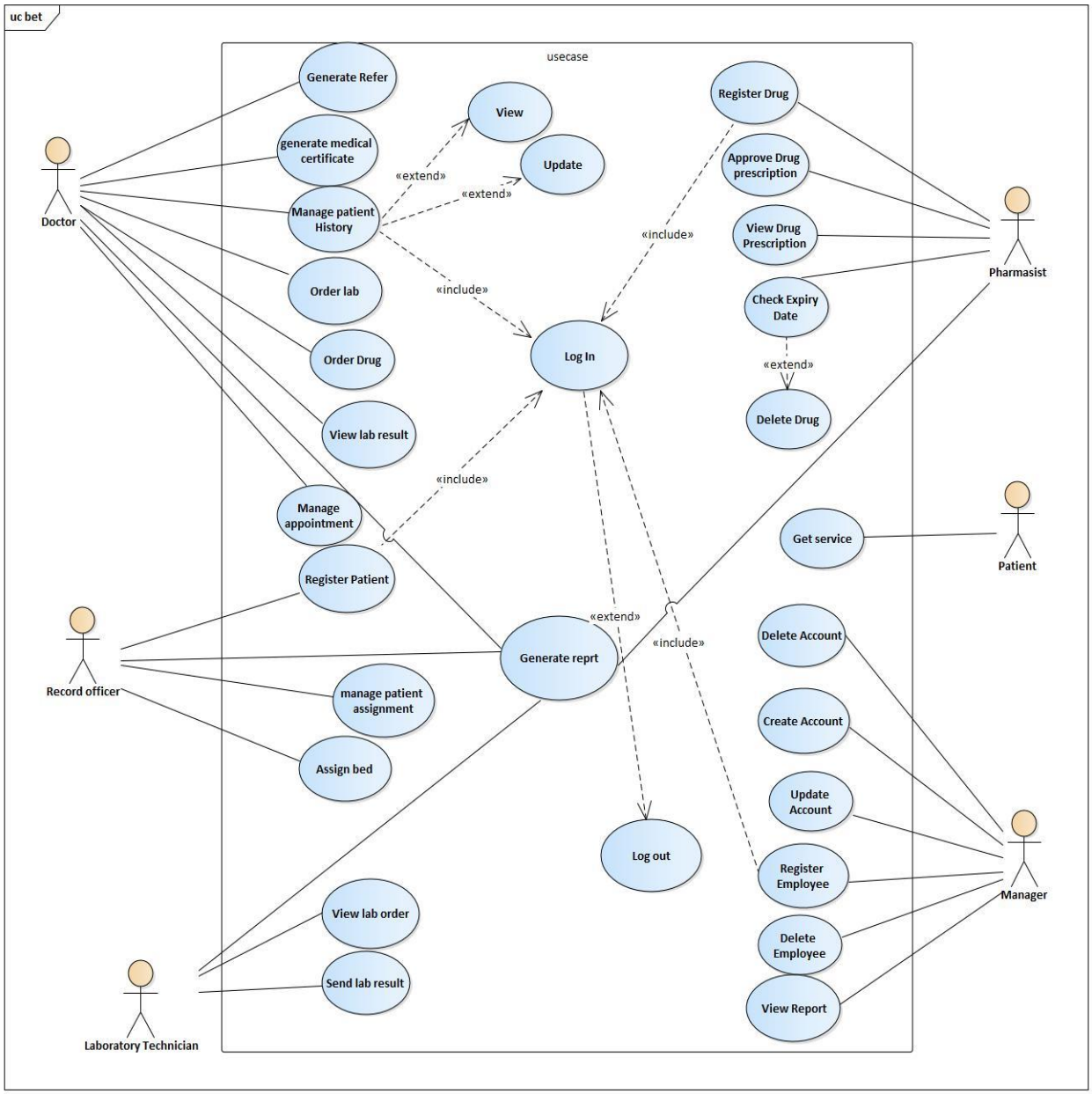



Figure 4. 1 Use Case Diagrams

#### 4.1.2.2 Use case description

The actors that interact with the system are- manager, doctor, record officer, pharmacist, and laboratory technician we describe each actor and use the cases as follows

Table 4. 1 Login Use Case Description

| | | |
|---|---|---|
| Use case id | UCID | |
| Use case name | login | |
| Description | Validate the user to enter the system. | |
| Actor involved | Manager, record officer, laboratory technician, pharmacist, and Doctor | |
| Post condition | The actor's login to their privileged page | |
| Basic course of action | **User action** | **Basic course of action** |
| | **1**.Users are on the homepage and press the login button. | **2**. the system displayed the login form. |
| | **3.**The user fills his or her user name and password | **4.** The system checks the validity and if it is valid logged in successfully |
| | **5.**Use case ends | |
| The alternative course of action(if the user enters the wrong user ID and/or password) | If the user name and password is not valid at step 4 of the basic course of action | |
| | User action | System action |
| | | **4.1**. The system displays an error message |
| | **4.2.**The user views the error message click the ok button | **4.3**.Go to step 2 of the basic course of action |

*Table 4. 2 Registers Patient Use Case Description*

| | | |
|---|---|---|
| Use case id | UC02 | |
| Use case name | Register patient | |
| Actor involved | Record officer | |
| Precondition | The record officer must have a username and password. | |
| Post condition | The user gets access to the system according to his/her predefined system and his/her medical file. | |
| Basic course of action | **User action** | **Basic course of action** |
| | **1.**The user click on manage patient link | **2**.The system will display a register, delete update links |
| | **3.**The user selects register button click on manage patient link | **4.**The system will display registration form |
| | **5.**The users fills the form and click on submit button | **6**.The system checks the validity of the input then adds it to the database |
| | **7.**The system display the welcome page | |
| | | **8**.The use case ends |
| An alternative course of action | If the input is not valid in step 4 basic course of action | |
| | **User action** | **System action** |
| | | **4.1**.The system displays an error message |
| | **4.2.**The user views the error message and click the ok button | **4.3.**Go to step 2 of the basic course of action |

*Table 4. 3 Create Account Use Case Description*

| | | |
|---|---|---|
| Use case id | Uc03 | |
| Use case name | Create an account | |
| Actor | Manager | |
| Pre-condition | User must be login to the system first | |
| Basic course of action | **User action** | **Basic course of action** |
| | **1.**The user first click on add link | |
| | | **2.**The system will display the create account page |
| | **3.**The user fills the form and click on add button | |
| | | **4**.The system checks the validity of the input then adds it to the database. |
| | | **5**.End use case |
| An alternative course of action (if the user enters the wrong user id and/password) | If the input data are invalid in step 4 of the basic course of action | |
| | **User action** | **System response** |
| | | The system display error message |
| | The user views the error message and clicks the ok button | |
| | | Go to step 2 of basic course of action |

Table 4. 4 Update Account Use Case Description

| | | |
|---|---|---|
| Use case id | Uc03 | |
| Use case name | Update account | |
| Actor | Manager | |
| Description | To update stored information's | |
| Precondition | There should be stored information | |
| Basic course of action | **User action** | **System response** |
| | **1.**The manager has to login to the system | **2.**The system display available page |
| | **3**.The manager selects update link | **4**.The system displays the users update account form |
| | **5.**The user enters the staff id and press search button | **6.**The system checks the existence and display the information |
| | **8**.User fill the form again and click the update button | **9**.The system checks the validity of the input and update the information |
| | | **10**.End use case |
| An alternative course of action(if the user enters the wrong user ID and/or password) | If the input data are invalid in step 6 of the basic course of action | |
| | **User action** | **System response** |
| | | **6.1**.The system display error message |
| | **6.2.**The user views the error message and clicks the ok button | **6.3**.Go to step 3 of the basic course of action |

Table 4. 5 Assign Patient Use Case Description

| | | |
|---|---|---|
| Use case ID | UC05 | |
| Use case name | Assign patient | |
| Actor | Record officer | |
| Precondition | The patient file must found from the system | |
| post condition | The patient is assigned to a doctor | |
| Basic course of action | **User action** | **System response** |
| | **1.**Actor click on the patient assign button | **2**.The system will display a patient assign form |
| | **3**.The user fills out the form and click the assign button | **4.**The system checks if the form is filled out correctly |
| | **5**.The use case ends | **6.**The system displays an acknowledgment message |
| An alternative course of action | The form is not field out correct in step 3 | |
| | **User action** | **System response** |
| | | **3.1.**The user inform the user that the form has not been filled out correctly |
| | **3.2.**The use case continues at step 3 of the basic flow of event | |

Table 4. 6 Manage Patient Medical File Use Case Description

| | | |
|---|---|---|
| Use case ID | UC06 | |
| Use case name | Generate refer | |
| Actor | Doctor | |
| Description | The process begins when the system user needs to give referral | |
| Precondition | The actor should be properly authenticated | |
| Post condition | The doctor gives the refer | |
| Basic course of actin | **User action** | **System response** |
| | **1.**The doctor initiates the system to generate a medical certificate | **2.**The system shows option/refer medical certificate |
| | **3**.The doctor selects refer | **4**.The system display referral form |
| | **5**.The doctor fills the form | |
| | | **6.**The system validates and displays a confirmation |
| | **7**.The doctor order print | **8.**The system print filled referral form |
| An alternative course of action | System displays error message the request to retry | |
| | **User action** | **System response** |
| | | The system displays an error message |
| | The user views the error message and clicks the ok button | Go to step 2 of the basic course of action |

Table 4. 7 Order Lab Test Use Case Description

| | | |
|---|---|---|
| Use case ID | UC07 | |
| Use case name | Order lab | |
| Actor | Doctor | |
| Description | Informing the lab technician to test the investigation | |
| Precondition | The disease must require laboratory examination | |
| Post condition | The patient's information sends to the laboratory technician for examination | |
| Basic course of action | **User action** | **System response** |
| | **1**.A doctor click lab order link | |
| | | **2**.The system display the order lab form |
| | **3.**The doctor fill the form and click send button | |
| | | **4.**The system checks the validity of the input and sends to the laboratory technician |
| | | **5.**Use case ends |
| An alternative course of action | If the input data are invalid in step 4 basic course of action | |
| | **User action** | **System response** |
| | | **4.1**.The system displays an error message |
| | 4**.2**.The user views the error message and clicks the ok button | **4.3**.Go to step 2 of the basic course of action |

Table 4. 8 Order Drug Use Case Description

| | | |
|---|---|---|
| Use case ID | UC08 | |
| Use case name | Order drug | |
| Actor | Doctor | |
| Description | Informing the pharmacist to delegate appropriate drug to the patient | |
| Precondition | The doctor must login to the system | |
| Post condition | The patient receive the drug from the pharmacist | |
| Basic course of actin | **User action** | **System response** |
| | **1**.A doctor click on order drug link | |
| | | **2.**The system display the order drug form |
| | 3**.**The doctor fills the form and clicks the submit button | |
| | | **4**.The system checks the input data are correct and if it is correct send to the pharmacist |
| | | **5**.End use case |
| An alternative course of action (if the doctor fulfills the form incorrectly) | If the input data are invalid in step 4 of the basic course of action | |
| | **User action** | **System response** |
| | | The system display error message |

Table 4. 9 Approve Drug Order Use Case Description

| | | |
|---|---|---|
| Use case id | UC09 | |
| Use case name | Approve drug order | |
| Actor | Pharmacist | |
| Description | The user approves the requested drug order from the doctor | |
| Post condition | The information will be stored to the patient history | |
| Basic course of action | **User action** | **System response** |
| | **1.**User clicks on the drug order link | |
| | | **2.**The system displays the orders from the doctor |
| | **3**.User see the order and click on accept request link | |
| | | **4.**The system stored the accepted order to the database |
| | | **5**.Use case end |

Table 4. 10 View Drug Order Use Case Description

| | | |
|---|---|---|
| Use case ID | UC10 | |
| Use case name | View drug order | |
| Actor | pharmacist | |
| Description | The pharmacist will receive drug order from the doctor | |
| Precondition | The order should be sent from an authorized doctor | |
| Post condition | The pharmacist checks the order and gives the drug to the patient according to the order | |
| Basic course of actin | **User action** | **System response** |
| | **1**.The user clicks on the view order page | |
| | | **2.**If there is a new order from the doctor the system display the order |
| | | **3.**End use case |
| An alternative course of action | If there is no new order form the doctor in step 2 basic course of action | |
| | **User action** | **System response** |
| | | **2.1**.The system will display a message there is no new order |
| | **2.2.**The user views the error message and clicks the ok button | **2.3**.Use case ends |

Table 4. 11 Manage Patient Medical File Use Case Description

| | | |
|---|---|---|
| Use case ID | UC11 | |
| Use case name | Manage patient medical file | |
| Actor | Doctor | |
| Precondition | The actor must be login to the system first | |
| Basic course of actin | **User action** | **System response** |
| | **1**.The doctor selects the medical file link | **2**.The system display the available page |
| | **3**.The doctor selects the medical file link | **4.**The system display form |
| | **5**.The user enters the patient's id and clicks the search button | **6**.The system searches the patient's name |
| | **7.**The doctor views the file and gives the treatment | **8**.The system checks availability in the database displays the medical file o patient |
| | **9.**The doctor selects the update button | **10**.The system displays the patient file update form |
| | **11.**The doctor enters the result and clicks the submit button | **12**.The system saves the patient history in the patient medical file |
| | | **13**.Use case ends |
| An alternative course of action (if doctor fulfil the name incorrectly) | If the input is not valid in step 5 basic course of action | |
| | **User action** | **System response** |
| | | **5.1**.The system displays an error message |
| | **5.2**.The user views the error message and clicks the ok button | **5.3**.Go to step 2 of the basic course of action |

Table 4. 12 Employee Registration Use Case Description

| | | |
|---|---|---|
| Use case ID | UC12 | |
| Use case name | Employee registration | |
| Actor | Manager | |
| Description | Register the information of the workers in the clinic | |
| Precondition | Access the system | |
| Post condition | The user gets access to the system according to his/her predefined system and his/her medical file | |
| Basic course of actin | **User action** | **System response** |
| | **1.**The manager clicks in the register employee link | **2.**The system will display a registration form |
| | **3.**The manager fills the necessary information of the employee and clicks on the register button | **4.**Then the system validates will generate a successfully registered message |
| | | **5.**The use case ends |
| An alternative course of action | If the input is not valid in step 4 basic course of action | |
| | **User action** | **System response** |
| | | **4.1**.The system displays an error message |
| | **4.2.**The user views the error message and clicks the ok button | **4.3**.Go to step 2 of the basic course of action |

Table 4. 13 Delete Employee Use Case Description

| | | |
|---|---|---|
| Use case ID | UC14 | |
| Use case name | Delete employee | |
| Actor | Manager | |
| Description | Delete the employee when it is necessary | |
| Precondition | Access the system | |
| Post condition | Return to home page | |
| Basic course of actin | **User action** | **System response** |
| | **1.**The manager click on delete employee link | **2.**The system displays the delete employee form |
| | **3.**The manager enters the id no of the employee and click on the delete button | **4.**Then the system validates and will generate a successfully delete message |
| | | **5.**The use case ends |
| An alternative course of action | If the input is not valid in step 4 basic course of action | |
| | **User action** | **System response** |
| | | **4.1**.The system displays an error message |
| | **4.2.**The user views the error message and clicks the ok button | **4.3**.Go to step 3 of the basic course of action |

Table 4. 14 Drug Registration Use Case Description

| | | |
|---|---|---|
| Use case ID | UC15 | |
| Use case name | Register drug | |
| Actor | Pharmacist | |
| Description | Registering the new drug from the store into the database | |
| Precondition | Initiate the system<br>Have a user name and password | |
| Post condition | Store drug | |
| Basic course of actin | **User action** | **System response** |
| | **1.**The pharmacist clicks on register drug link | **2.**The system displays the register drug form |
| | **3.**The pharmacist will enter the attributes of the drug and click on submit button | **4**.Then the system validates and will generate a successfully registered message |
| | | **5**.The use case ends |
| An alternative course of action | If the input is not valid in step 4 basic courses of action | |
| | **User action** | **System response** |
| | | **4.1**.The system displays an error message |
| | **4.2**.The user views the error message and clicks the ok button | **4.3.**Go to step 3 of the basic course of action |

Table 4. 15 Check Expired Date Use Case Description

| | | |
|---|---|---|
| Use case ID | UC15 | |
| Use case name | Check expired date | |
| Actor | Pharmacist | |
| Description | To check the drug that is the verge of the expired data | |
| Precondition | Initiate the system<br>Have a user name and password | |
| Post condition | Delete drug | |
| Basic course of actin | **User action** | **System response** |
| | **1.**The pharmacist click on the check expired date link | **2**.The system displays the form |
| | **3.**The pharmacist enters the expired date of the drug and click on the search button | **4**.The system validate and displays the list of the drug that is inserted in its date |
| | **5**.The pharmacist clicks on the clear button | **6.**Then the system will respond successfully deleted message |
| | | **7**.The use case ends |
| An alternative course of action | If the input is not valid in step 4 basic course of action | |
| | **User action** | **System response** |
| | | **4.1.**The system displays an error message |
| | **4.2.**The user views the error message and clicks the ok button | **4.3**.Go to step 3 of the basic course of action |

Table 4. 16 Generating Report

| | | |
|---|---|---|
| Use case ID | UC16 | |
| Use case name | Generate report | |
| Actor | Doctor | |
| Description | The process begins when the system user needs to report to the manager | |
| Precondition | The actor should be properly authenticated | |
| Post condition | The prepared report should be submitted successfully | |
| Basic course of actin | **User action** | **System response** |
| | **1.**Doctor requests system to display report window | |
| | | **2.**The system displays the report window |
| | **3.**The doctor fills attributes on the report window and clicks report | **4**.The system validates input and send to manager |
| | | **5.**The system displays successfully reported message |
| An alternative course of action | If the input is not valid in step 4 basic course of action | |
| | **User action** | **System response** |
| | | **4.1.**The system displays a error message then reque to retry |
| | **4.2**.The user views the error message and clicks the ok button | **4.3**.Go to step 3 of the basic course of action |

Table 4. 17 View Report

| | | |
|---|---|---|
| Use case ID | UC17 | |
| Use case name | View report | |
| Actor | Manager | |
| Description | The process begins when the system user needs to view reports | |
| Precondition | The actor should be properly authenticated | |
| Post condition | The manager views report | |
| Basic course of actin | **User action** | **System response** |
| | **1.**Manager initiates the system for view report | |
| | | **2.**The system displays the report window |
| | **3**.The manager selects the type of reports and clicks ok | **4.**The system displays the department's report form that is requested |
| | **5.**The manager views the report and clicks on the ok button | **6.**The system displays the report |
| An alternative course of action | If the input is not valid in step 4 basic course of action | |
| | **User action** | **System response** |
| | | **4.1**.The system displays an error message then request to retry |
| | **4.2**.The user views the error message and clicks the ok button | **4.3**.Go to step 3 of the basic course of action |

#### 4.1.2.3 use case scenario

- Login use case scenario

Let assume Mr. Daniel is doctor, and if he wants to log in to the system the first step will be entered to the system home page then he should have login password and user name if he has he will click to the login link on the home page then after the login page will be opened for him. Then he will enter his username and password and click on login button the system will validate his authentication and will open his privileged page.

- Create account use case scenario

Let assume Mr. Amsalu is a manager of the clinic, and if he wants to register an employee and create an account for him/her he will first login to the system and then he will click on the manage account link, the system will open for him a page which has their option (create, update, search) then she will click on create account button and the system will display a form for him, then he will fill all the field and give him/her a username and password.

- Register Patient Use Case Scenario

Let assume Mr. Markos is Doctor in the clinic, and if one patient who should take a lab test comes to the clinic the doctor will send the order through the system. To do this activity the Doctor first log in to the system and the click on the lab order link, then the system will display a form to fill, the doctor fills required fields and then click on send button.

- Send Lab Result Use Case Scenario

Let assume Mr. Abera is laboratory technician of the clinic, and view the request from the doctor and tests the patient the returns back the results of testing to the doctor by clicking send lab result link.

- Dr. Solomon is doctor of wolkite university student clinic so he treats patients according to their illness therefore as the recording officer send the patient to the doctor. The doctor will treat the patient and send him if necessary for laboratory test then as the doctor receives laboratory result will order drug for the patient, therefore, the patient will receive the drug from pharmacist finally the Doctor will report to the Manager.

## 4.2 object model

### 4.2.1 Class Diagram

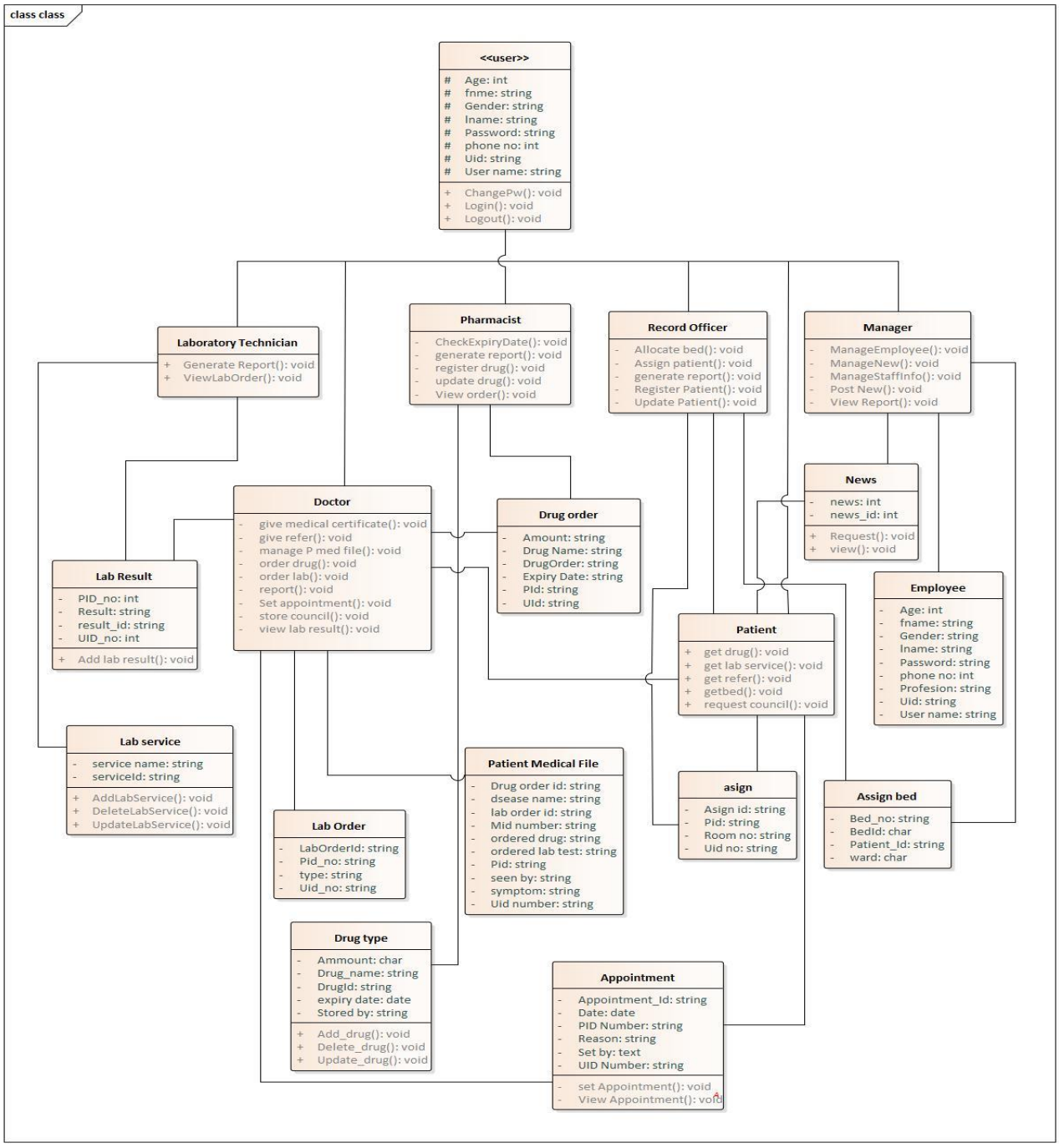



Figure 4. 2 Class Diagram

**4**.2.1.1 Data Dictionary

User

Table 4. 18 Data Dictionary For Staff Attributes

| Attribute | Data type | Format | Key constraint | constraint |
|---|---|---|---|---|
| UID Number | Varchar | CSID-000-000 | Primary key | Not Null |
| First Name | String | Text | | Not Null |
| Last Name | String | Text | | Not Null |
| Gender | String | 'Female/Male' | | Not Null |
| Phone Number | Integer | +2519----- | | Not Null |
| Type | String | Text | | Not Null |
| Age | Integer | 000 | | Not Null |
| username | String | Text | | Not Null |
| Password | String | Text | | Not Null |

Appointment

Table 4. 19 Data Dictionary For Patient Appointment Attributes

| Attributes | Data type | Data size | Format | Key constraint | Constraint |
|---|---|---|---|---|---|
| Appointment Id | Varchar | 255 | AP-0000/000 | Primary key | Not Null |
| Date | Date | 30 | DD MM YYYY | | Not Null |
| Appointment Description | Text | 500 | Text | | Not Null |
| Set by | Text | 200 | Text | | Not Null |
| PID Number | String | 50 | WKU-0000-0000/00 | | Not Null |
| UID Number | String | 50 | CSID-000/000 | Foreign key | Not Null |

Lab Service

Table 4. 20 Data Dictionary For Lab Service Attributes

| Attributes | Data Type | Data size | Format | Key Constraint | Constraint |
|---|---|---|---|---|---|
| Service Id | Varchar | 255 | LBS-000-000 | Primary key | Not Null |
| Service Name | Integer | 255 | Text | | Not Null |

Lab Order

Table 4. 21 Data Dictionary For Lab Order Attribute

| Attributes | Data type | Data size | Format | Key Constraint | Constraint6;…….. |
|---|---|---|---|---|---|
| Order Id | Varchar | 255 | LBO-000/000 | Primary key | Not Null |
| Type | String | 50 | Text | Result From lab technician | Not Null |
| PID Number | String | 50 | WKU-0000-0000/00 | Foreign key | Not Null |
| UID Number | String | 50 | CSID-000/000 | Foreign key | Not Null |

Lab Result

Table 4. 22 Data Dictionary For Lab Result Attributes

| Attributes | Data type | Data size | Format | Key constraint | constraint |
|---|---|---|---|---|---|
| PID Number | Varchar | 255 | WKU-0000-0000/00 | Primary Key | Not Null |
| Result | String | 255 | Text | Result From lab technician | Not Null |
| RID Number | String | 50 | RT-000/000 | Foreign key | Not Null |

| | | | | | |
|---|---|---|---|---|---|
| UID Number | String | 50 | CSID-000/000 | Foreign key | Not Null |

Drug Order

Table 4. 23 Data Dictionary For Drug Order Attribute

| Attribute | Data Type | Data Size | Format | Key Constraint | constraint |
|---|---|---|---|---|---|
| Drug Order ID | Varchar | 20 | DRO-000/000 | Primary key | Not Null |
| Amount | String | 30 | 00 | | Not Null |
| Expiry Date | date | 30 | DRO-000/000 | | Not Null |
| PID Number | integer | 50 | WKU-0000-0000/00 | Primary key | Not Null |
| UID Number | integer | 50 | CSID-000/000 | Primary key | Not Null |

4.3 Dynamic Model

4.3.1 Sequence Diagram

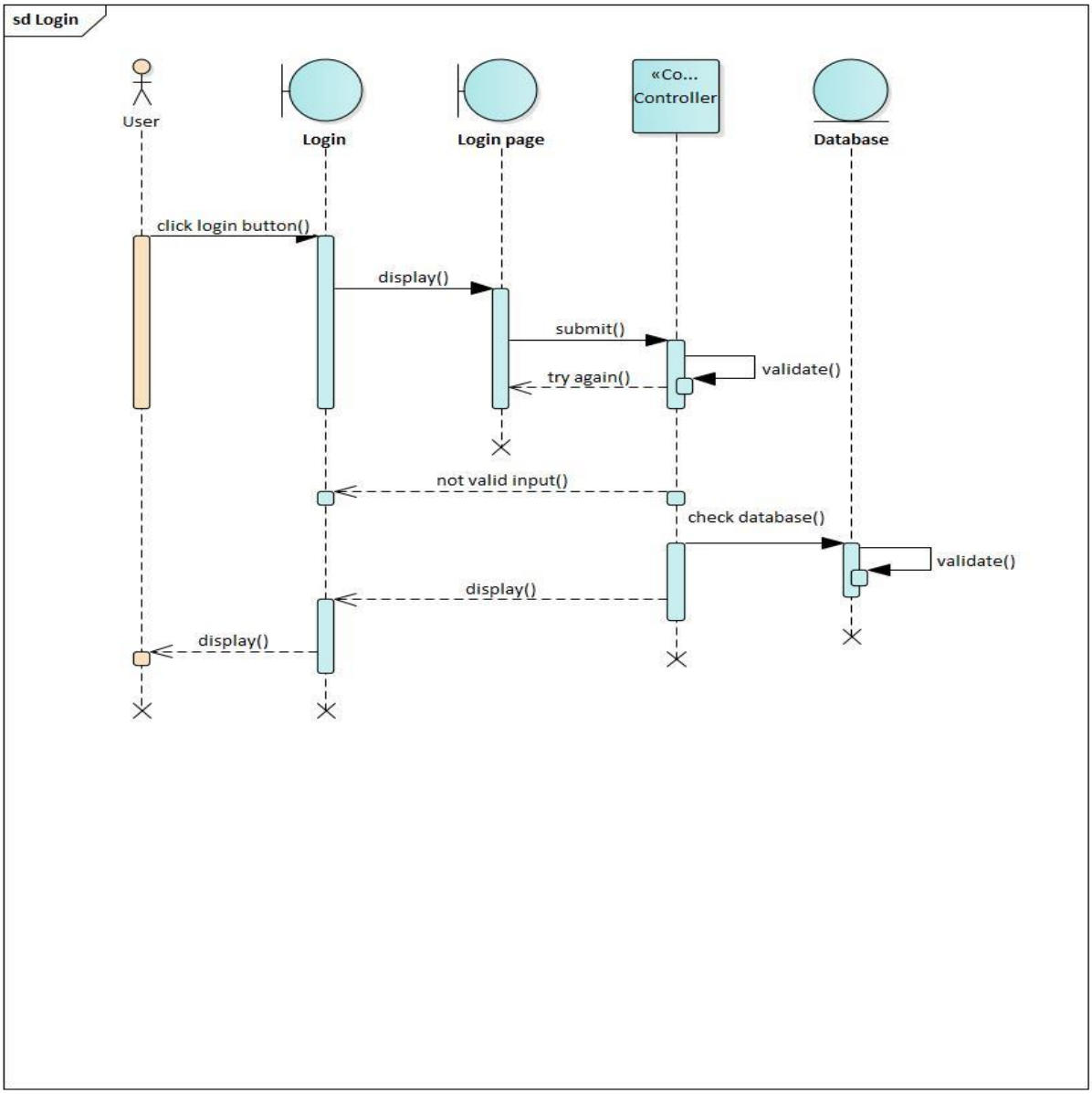



Figure 4. 3 Sequence Diagram For Login

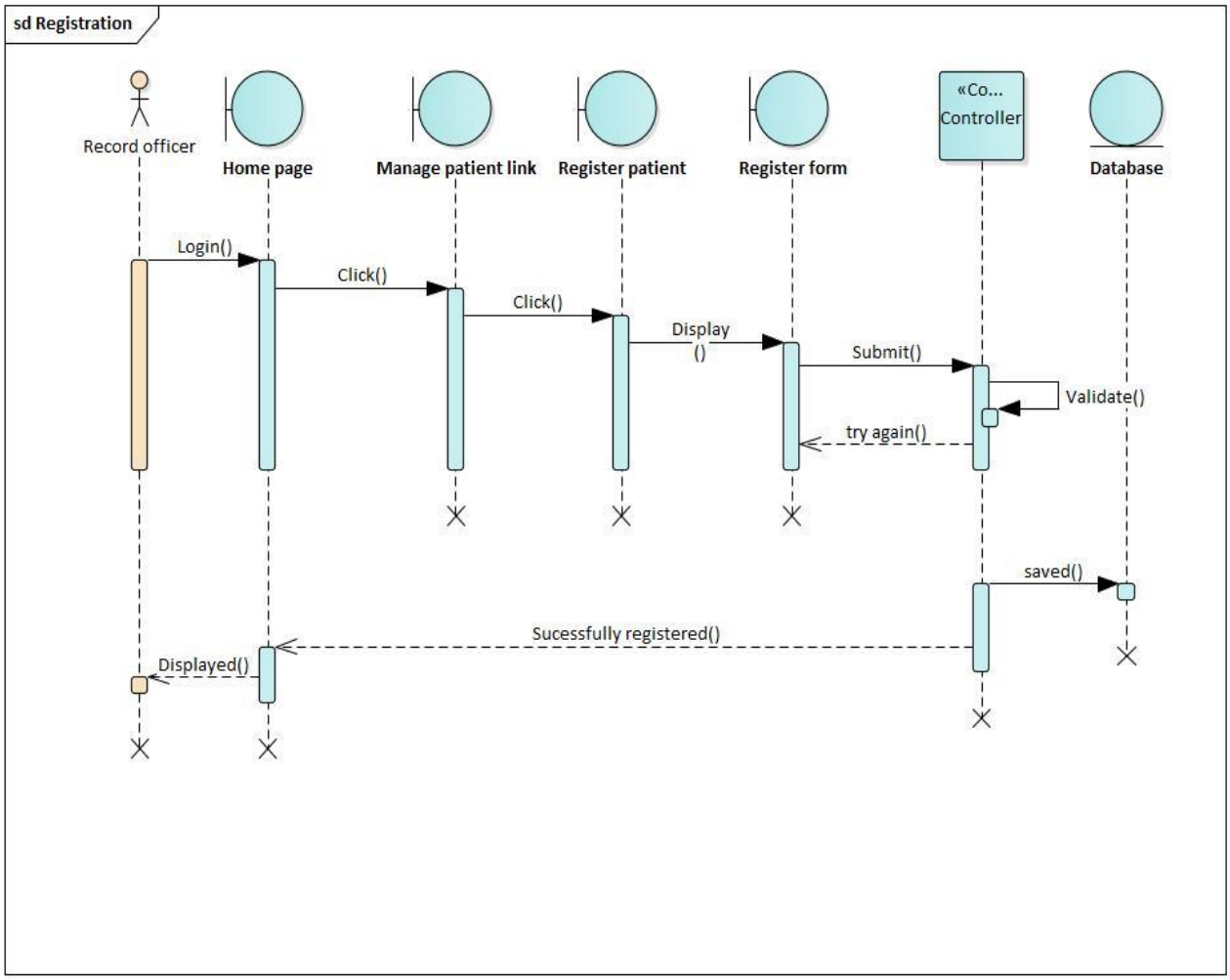



Figure 4. 4 Sequence Diagram For Register Patient

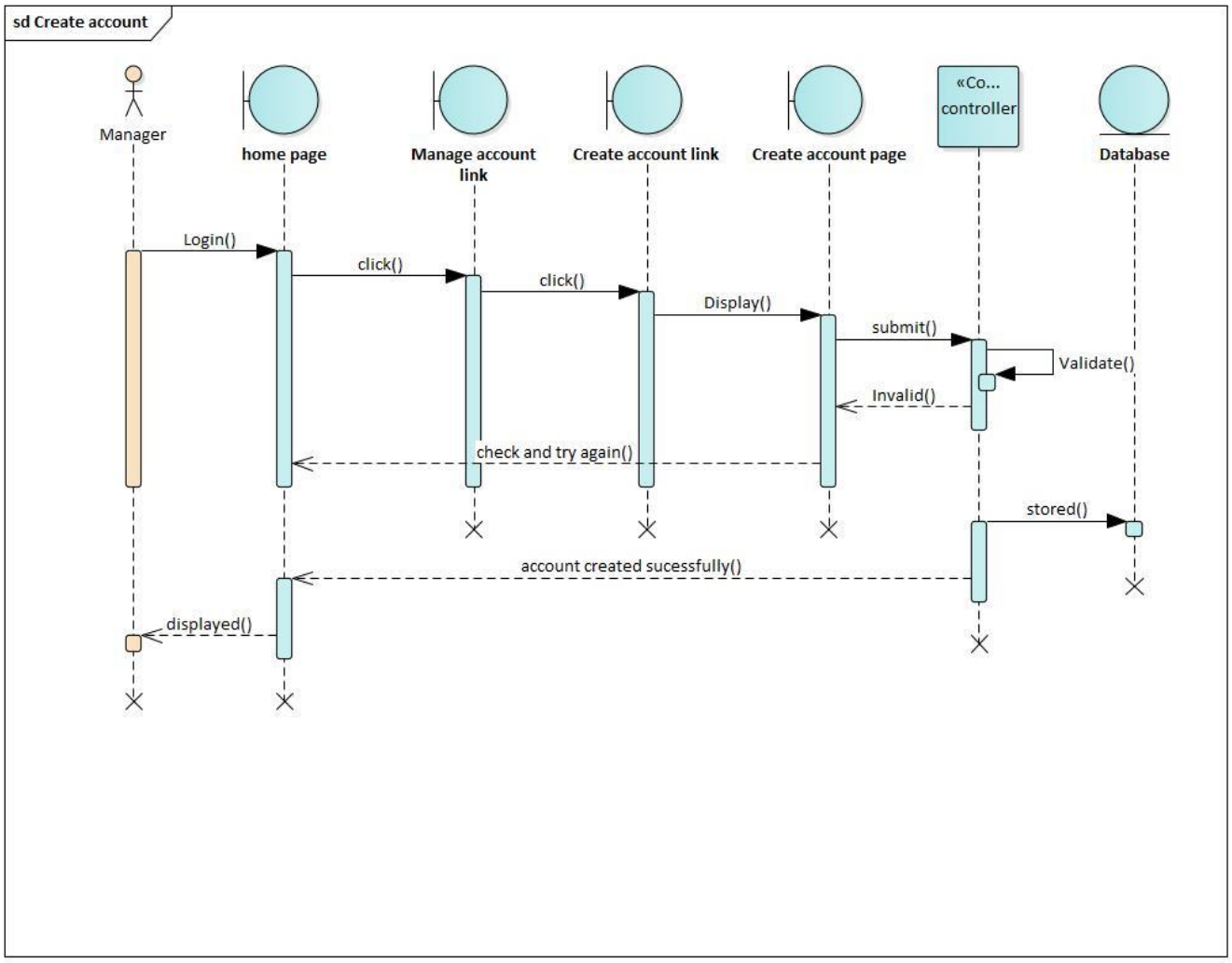



Figure 4. 5Sequence Diagram For Create Account

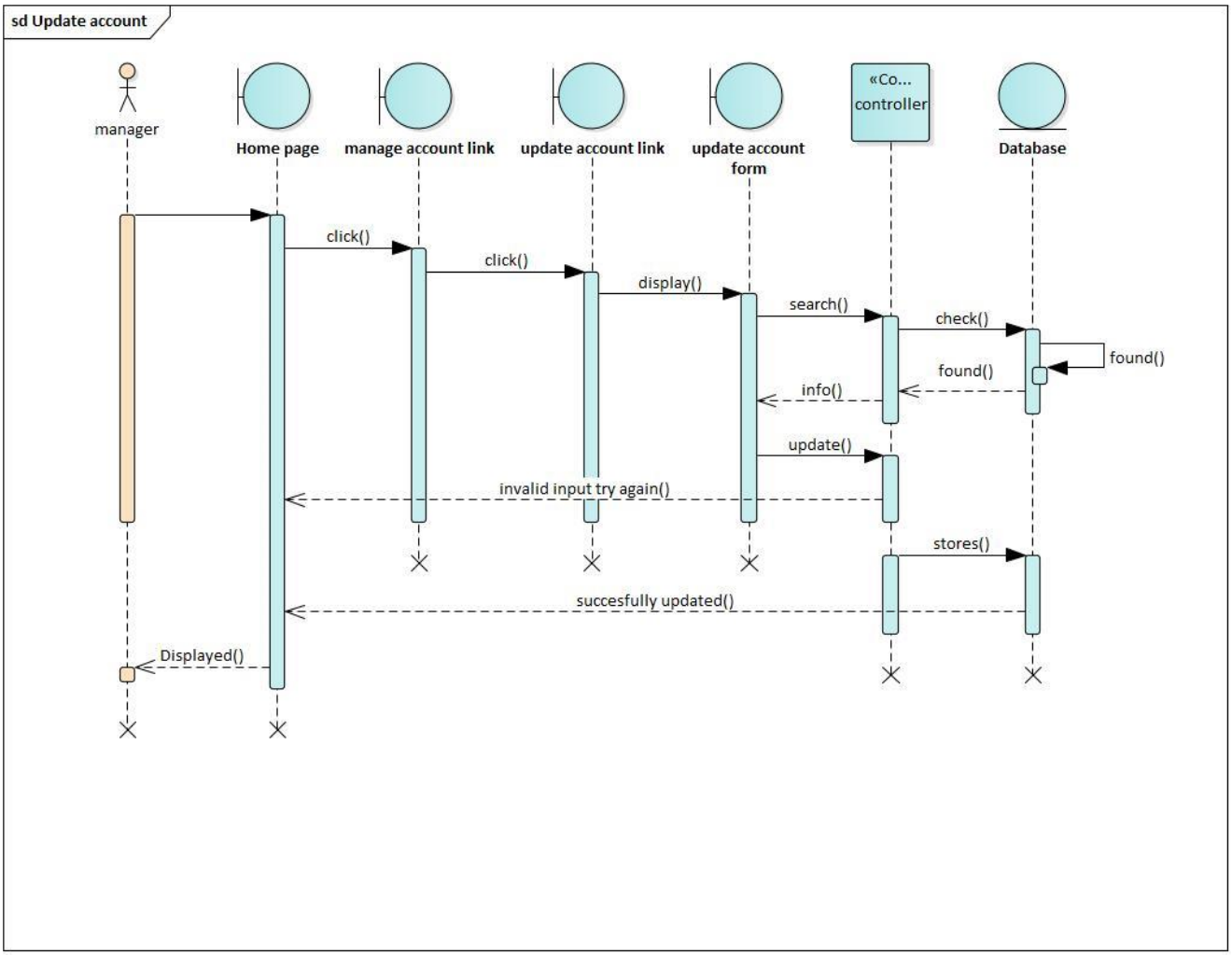



Figure 4. 6Sequence Diagram For Update Account

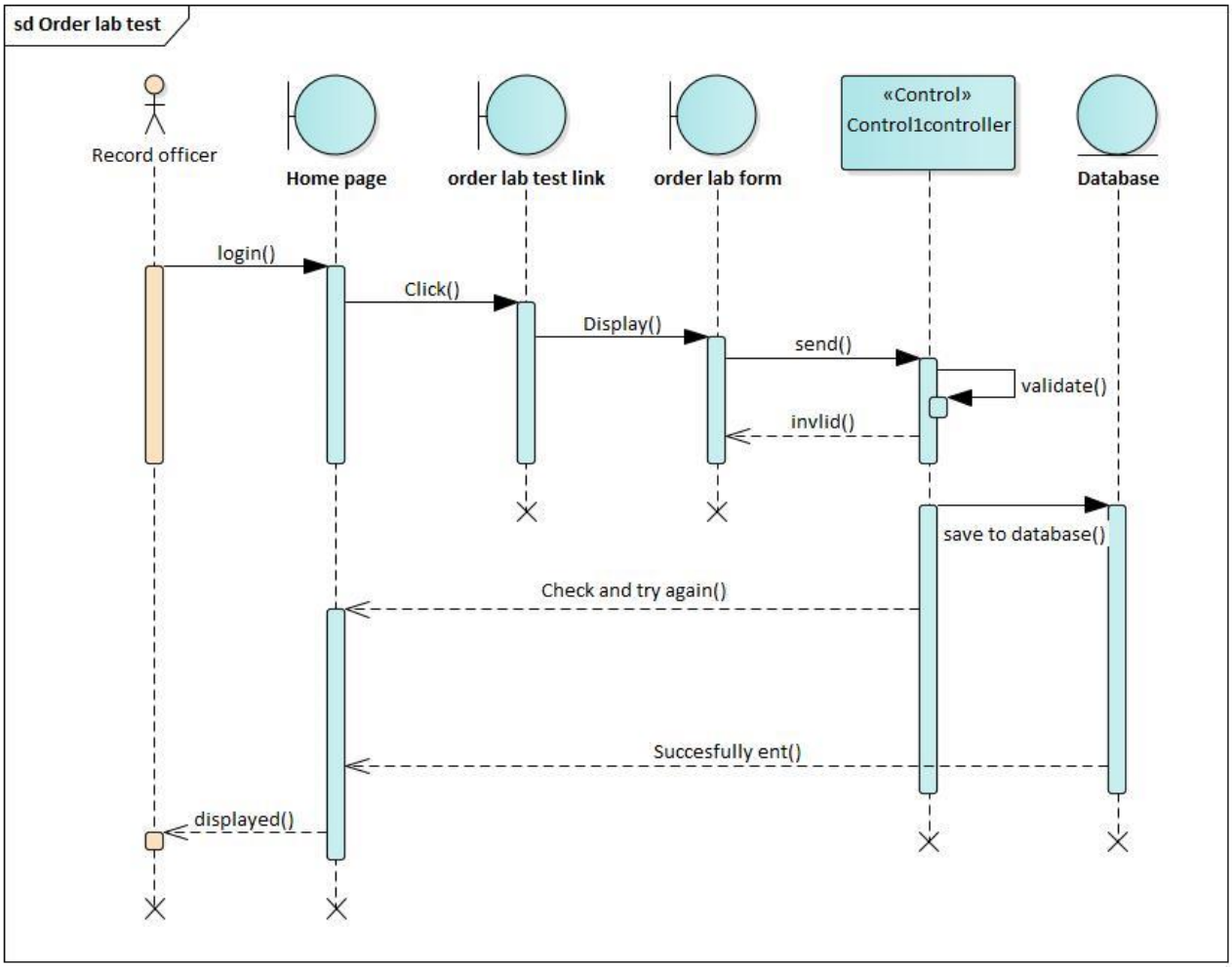



Figure 4. 7 Sequence Diagram Order Lab Test

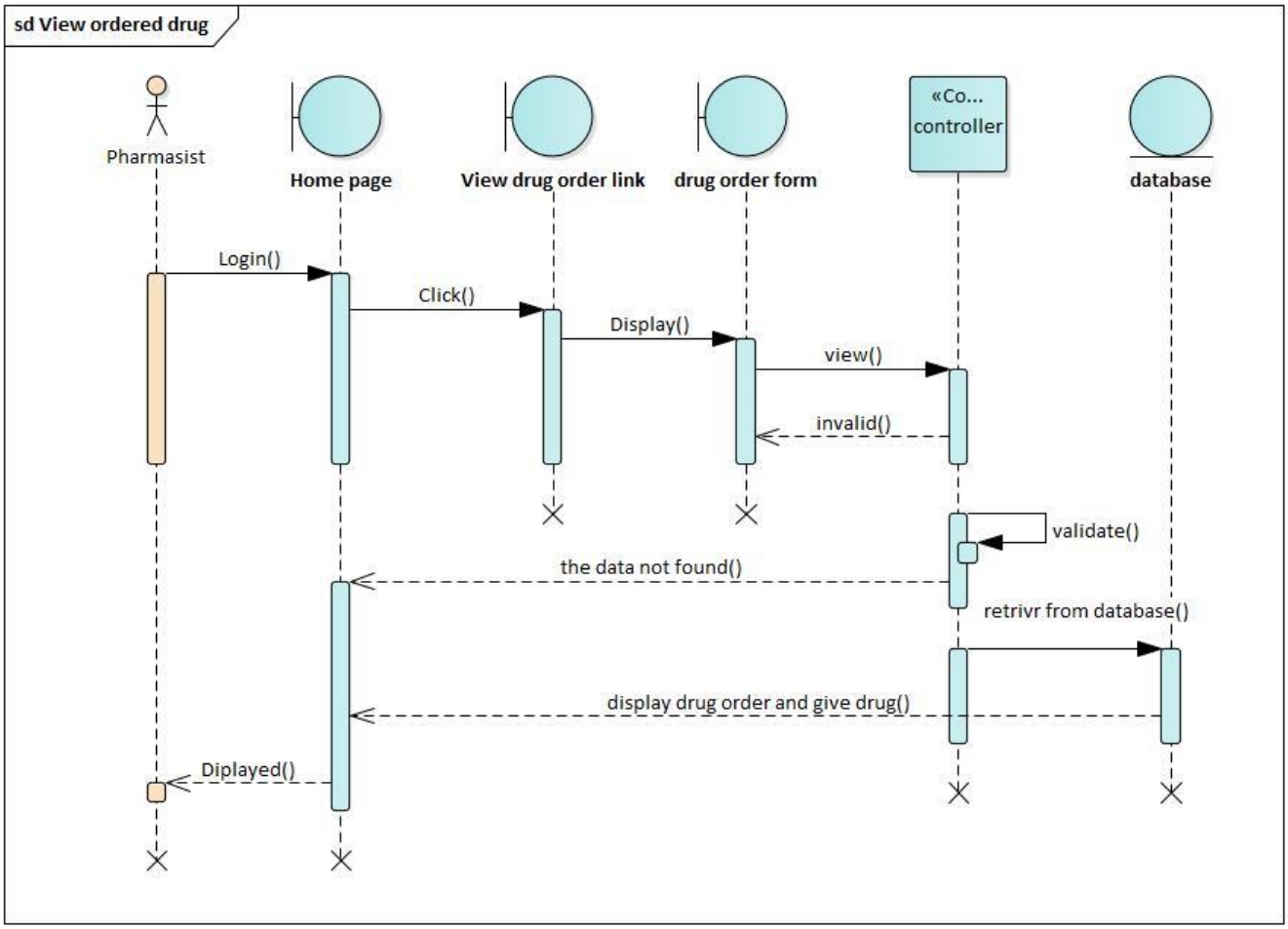



Figure 4. 8 Sequence Diagram For View Drug Order

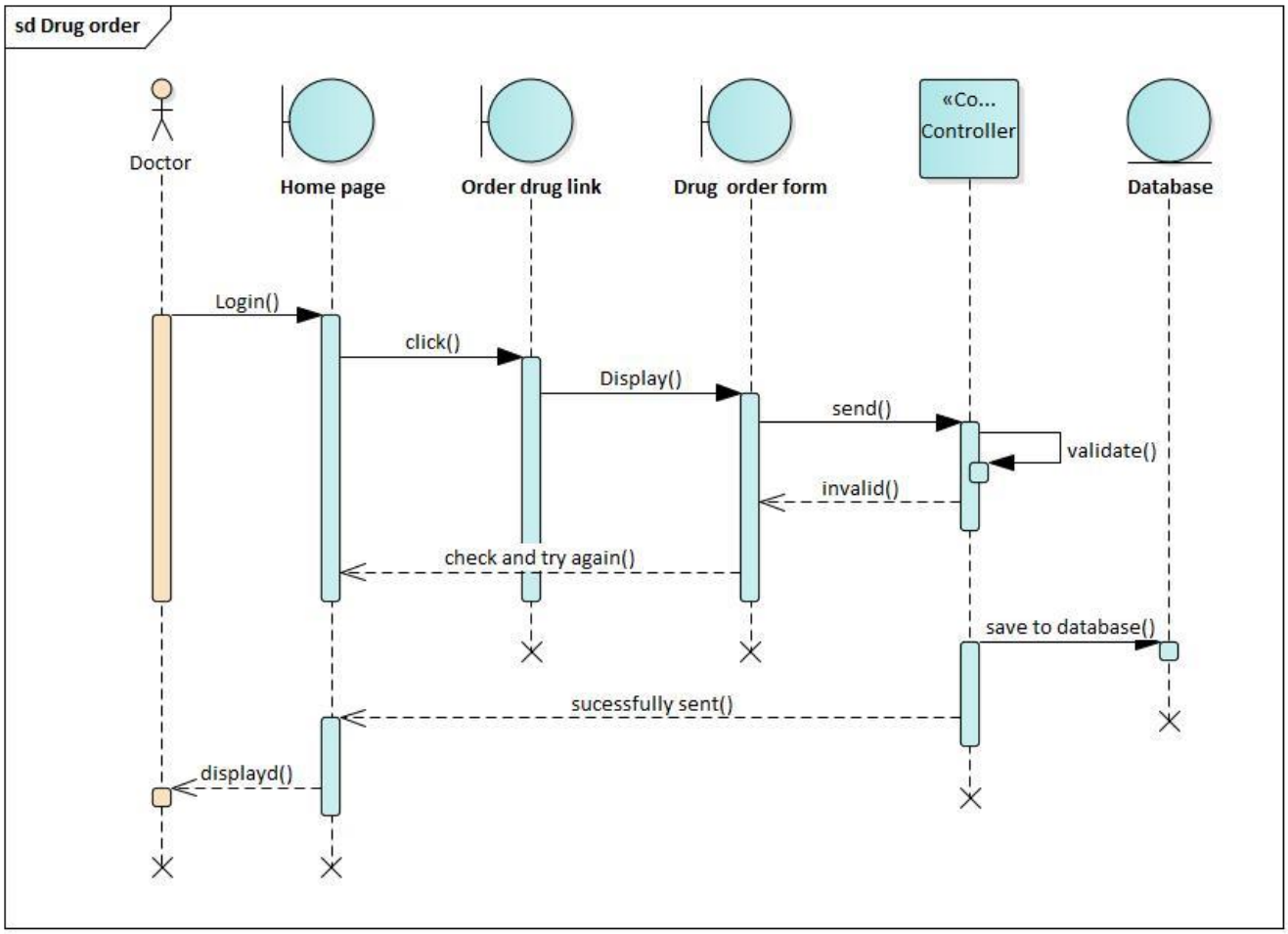



Figure 4. 9 Sequence Diagram For Drug Order

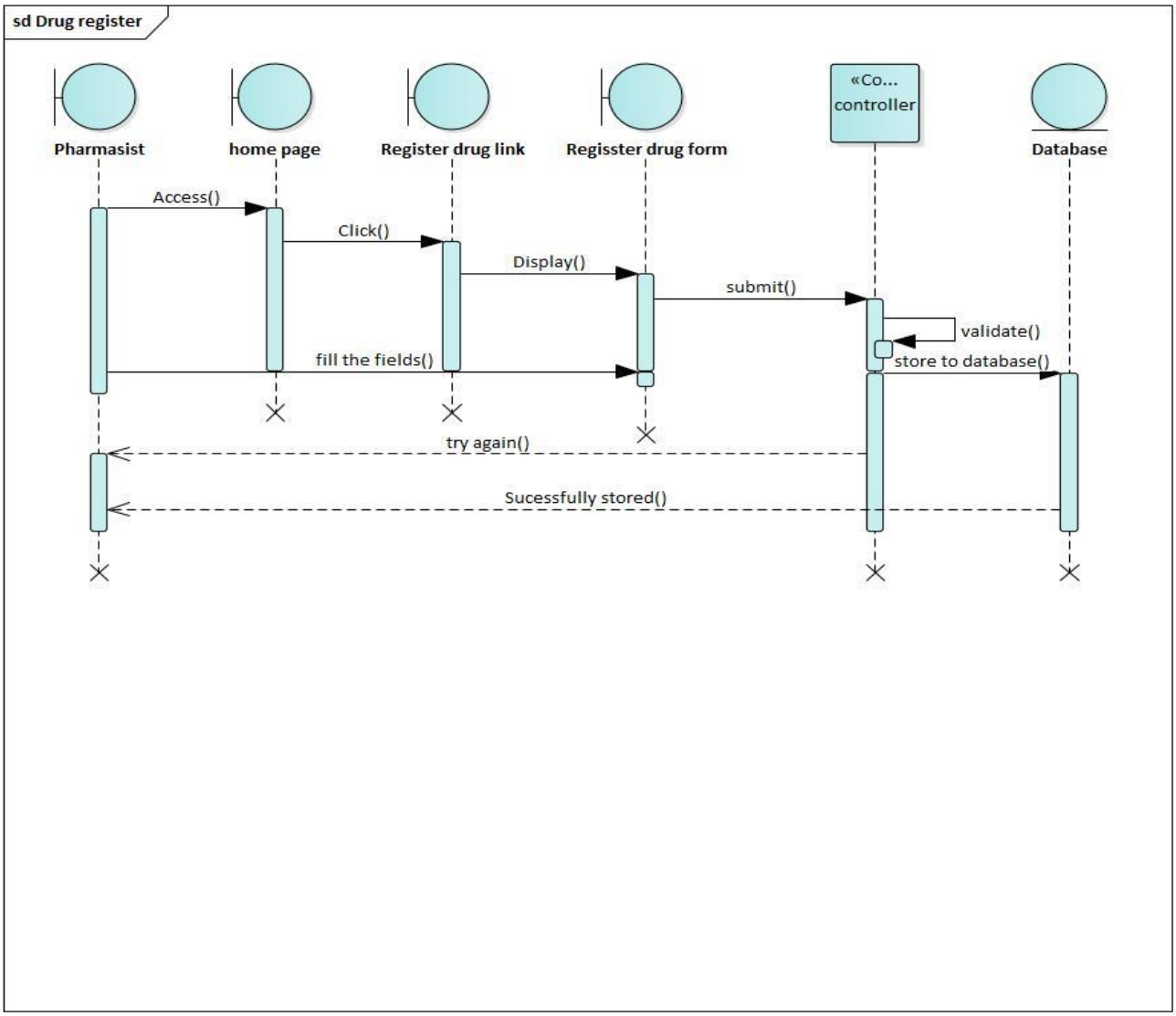



Figure 4. 10 Sequence Diagram For Drug Register

4.3.2. Activity Diagrams

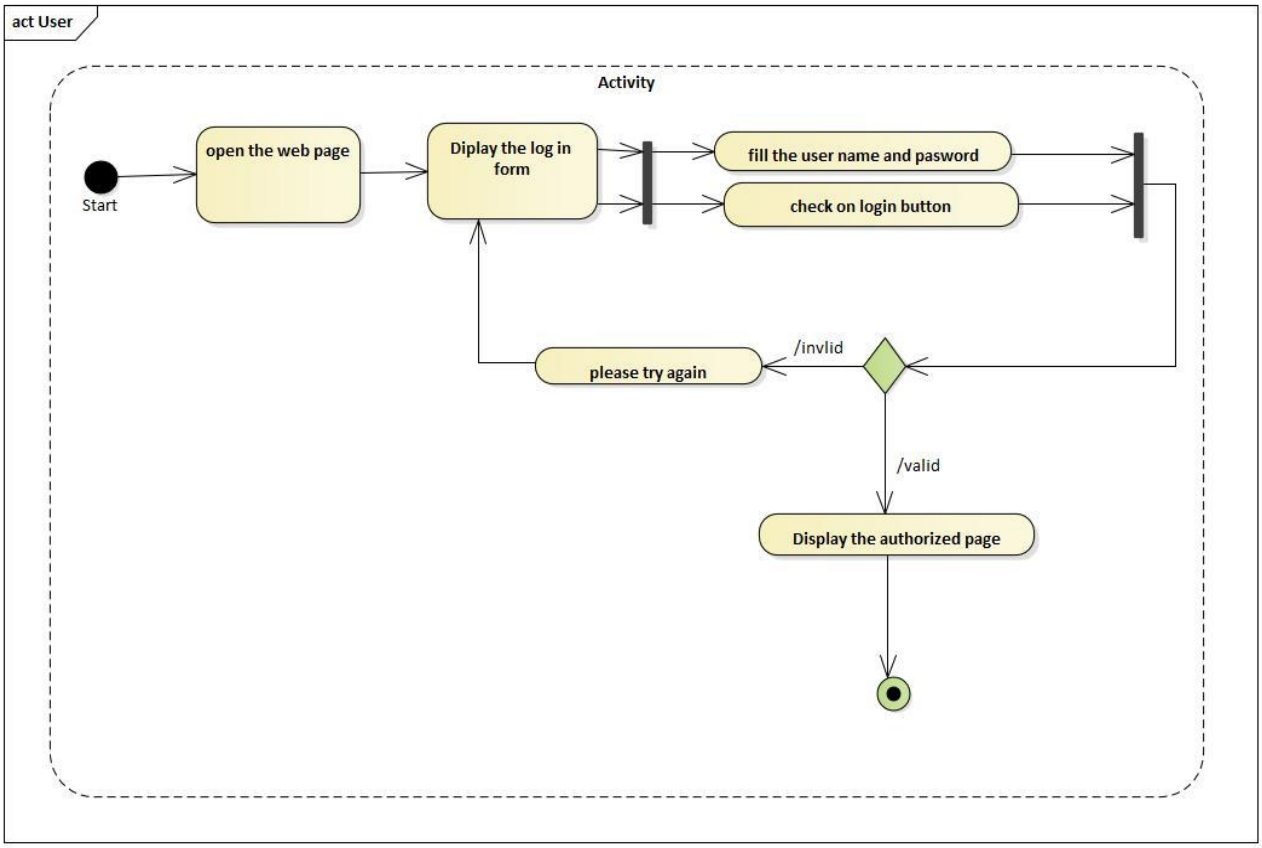



Figure 4. 11 Activity diagram for login

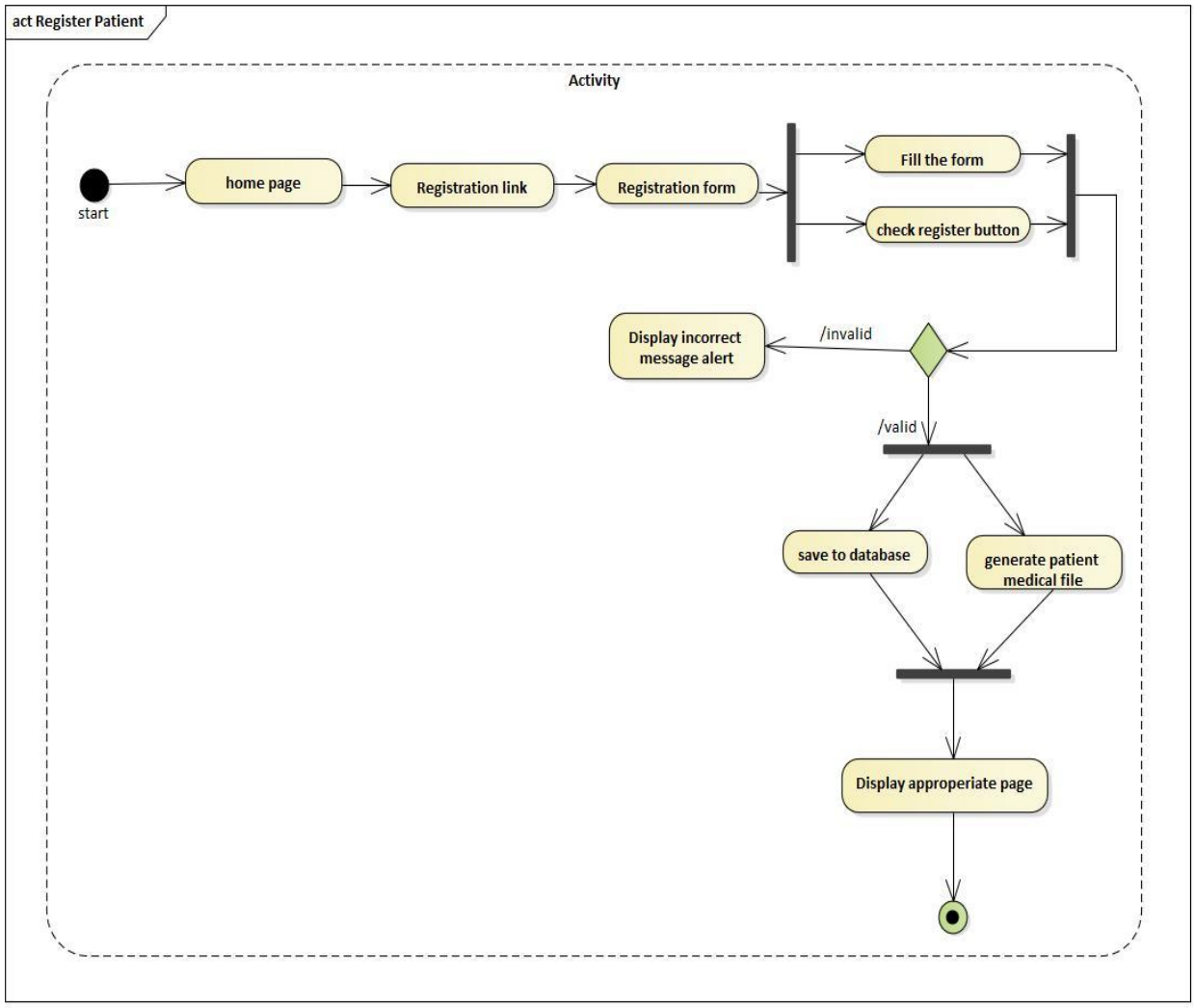



Figure 4. 12 Activity Diagram For Register Patient

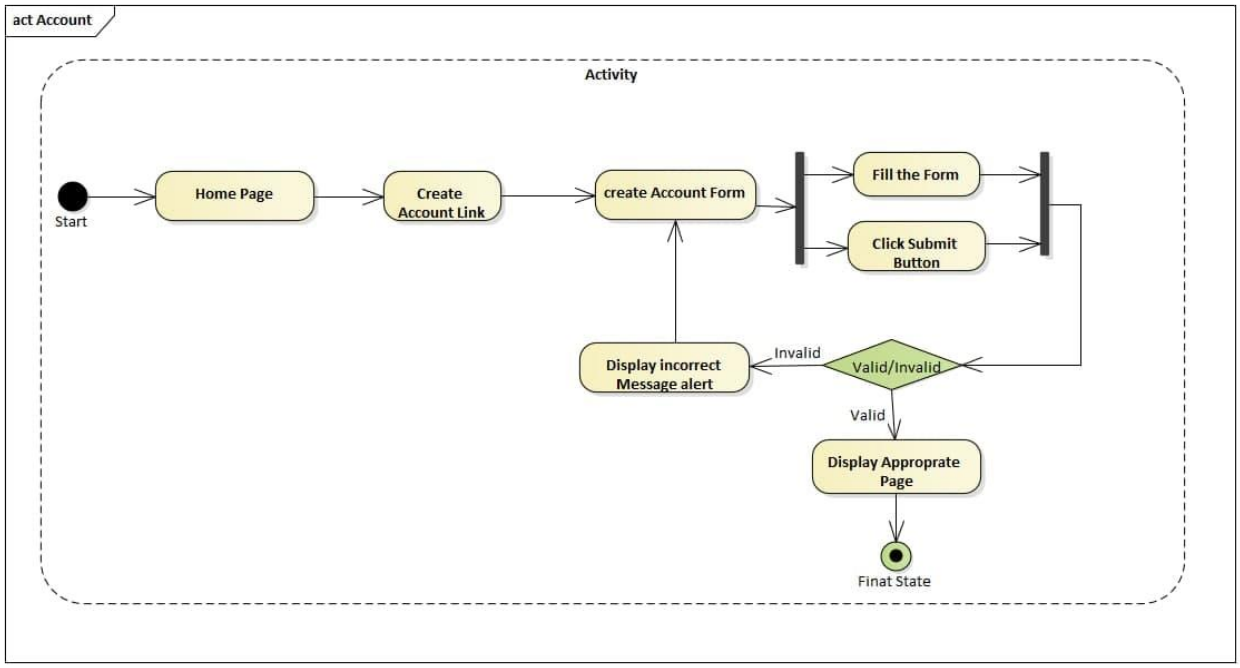



Figure 4. 13 Activity Diagram For Create Account

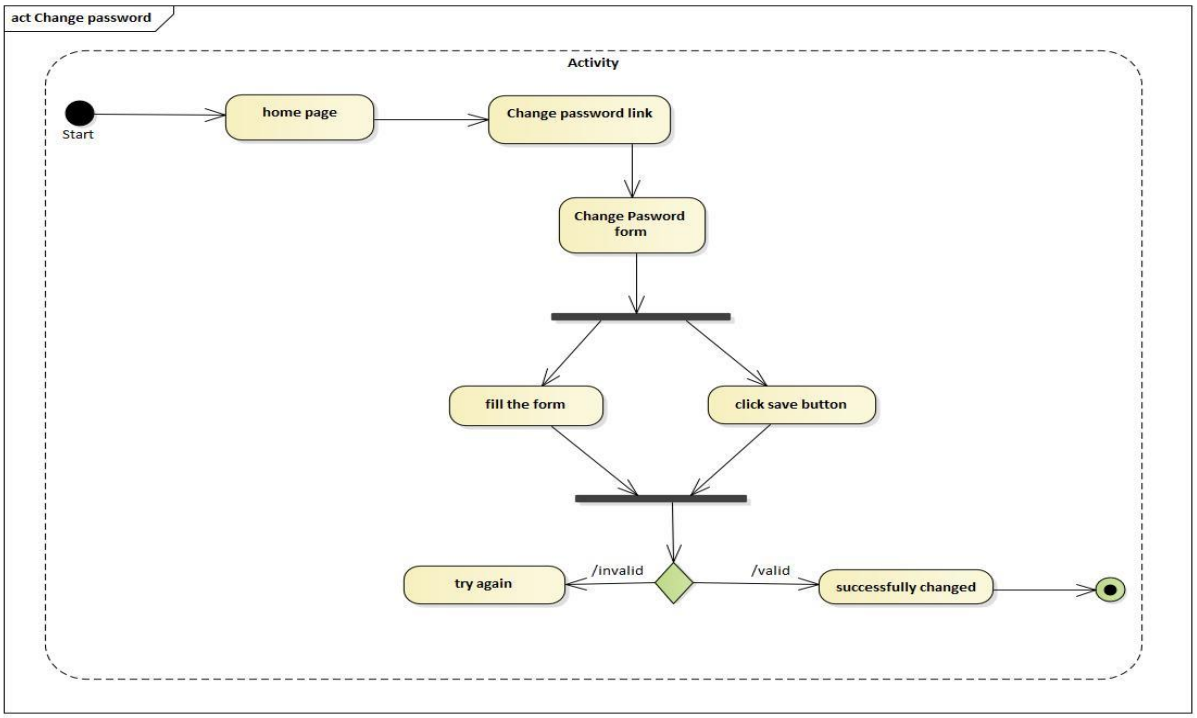



*Figure 4. 14 Activity Diagram For Change Password*

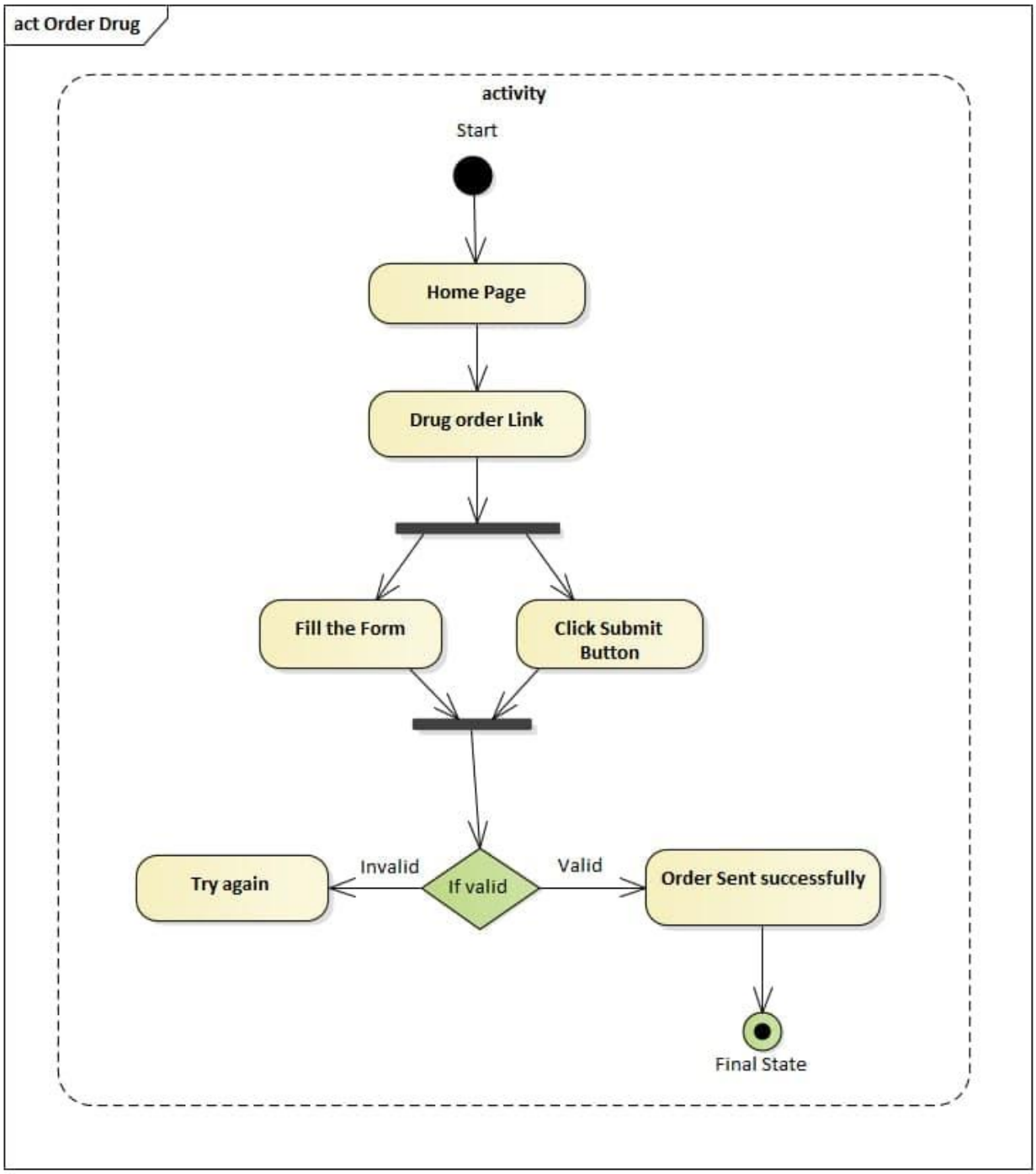



Figure 4. 15 Activity  Diagram For Drug Order

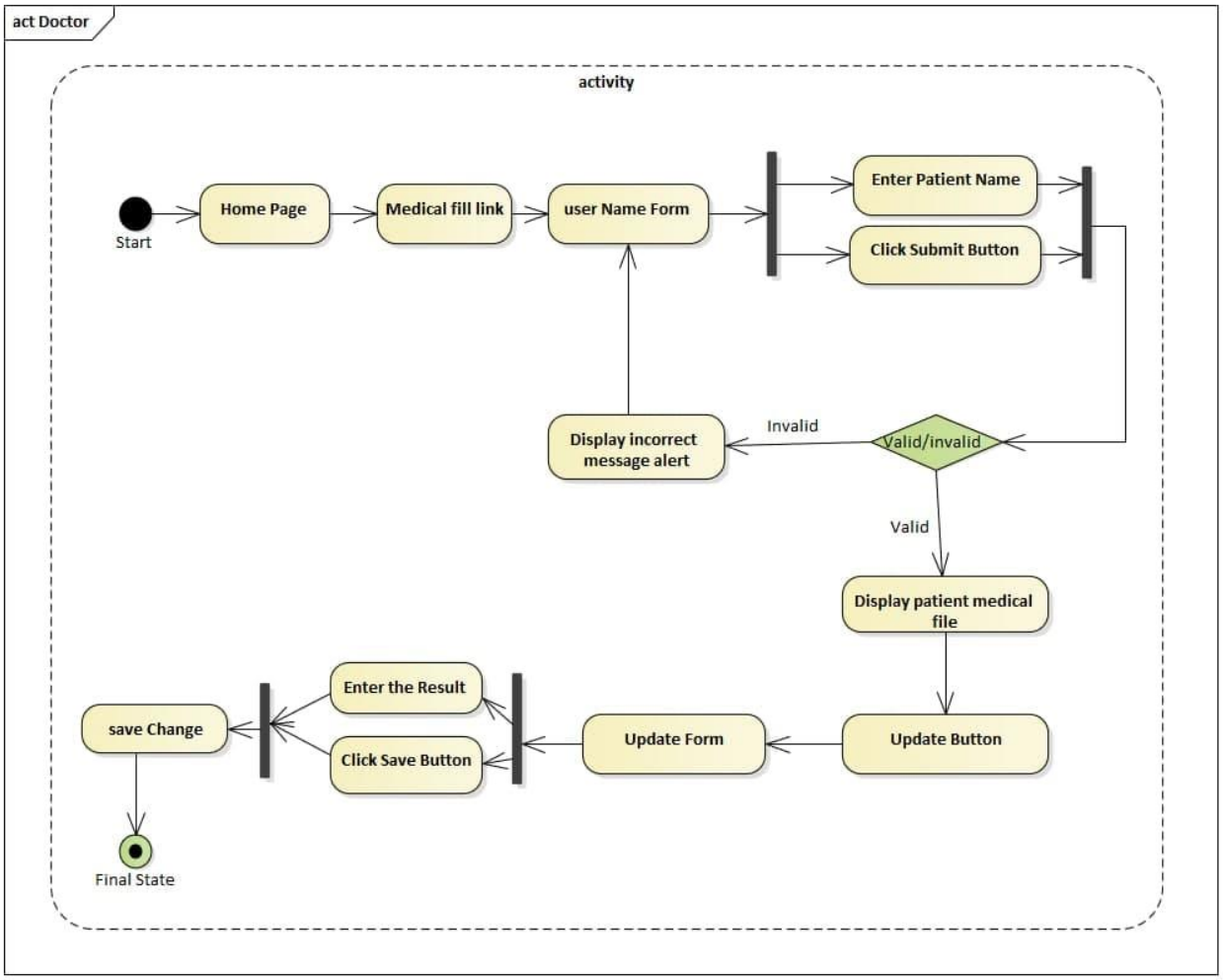



Figure 4. 16 Activity Diagram For Manage Patient History

### 4.3.3. State Chart diagram

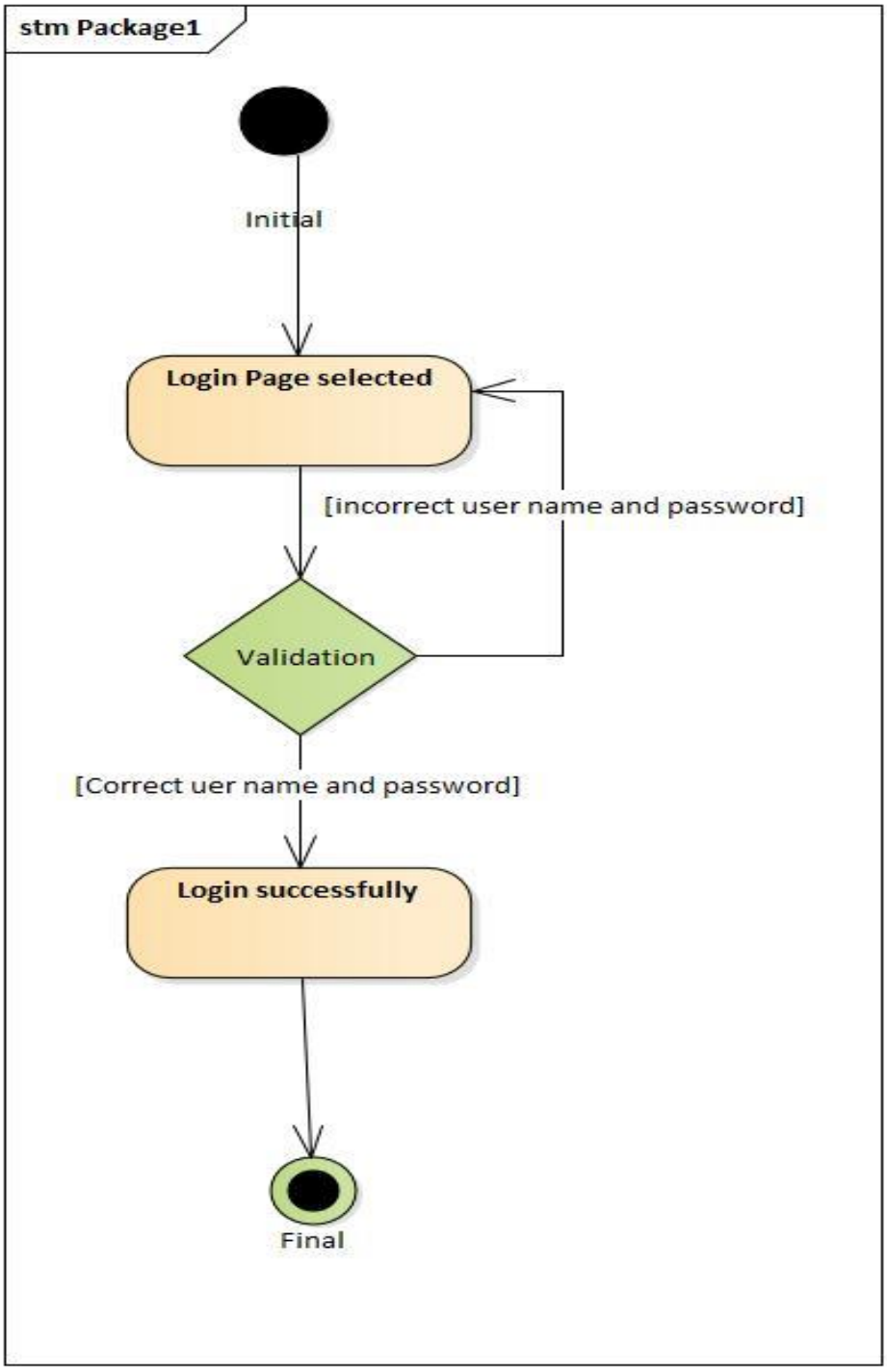



Figure 4. 17 State Chart Diagram For Login

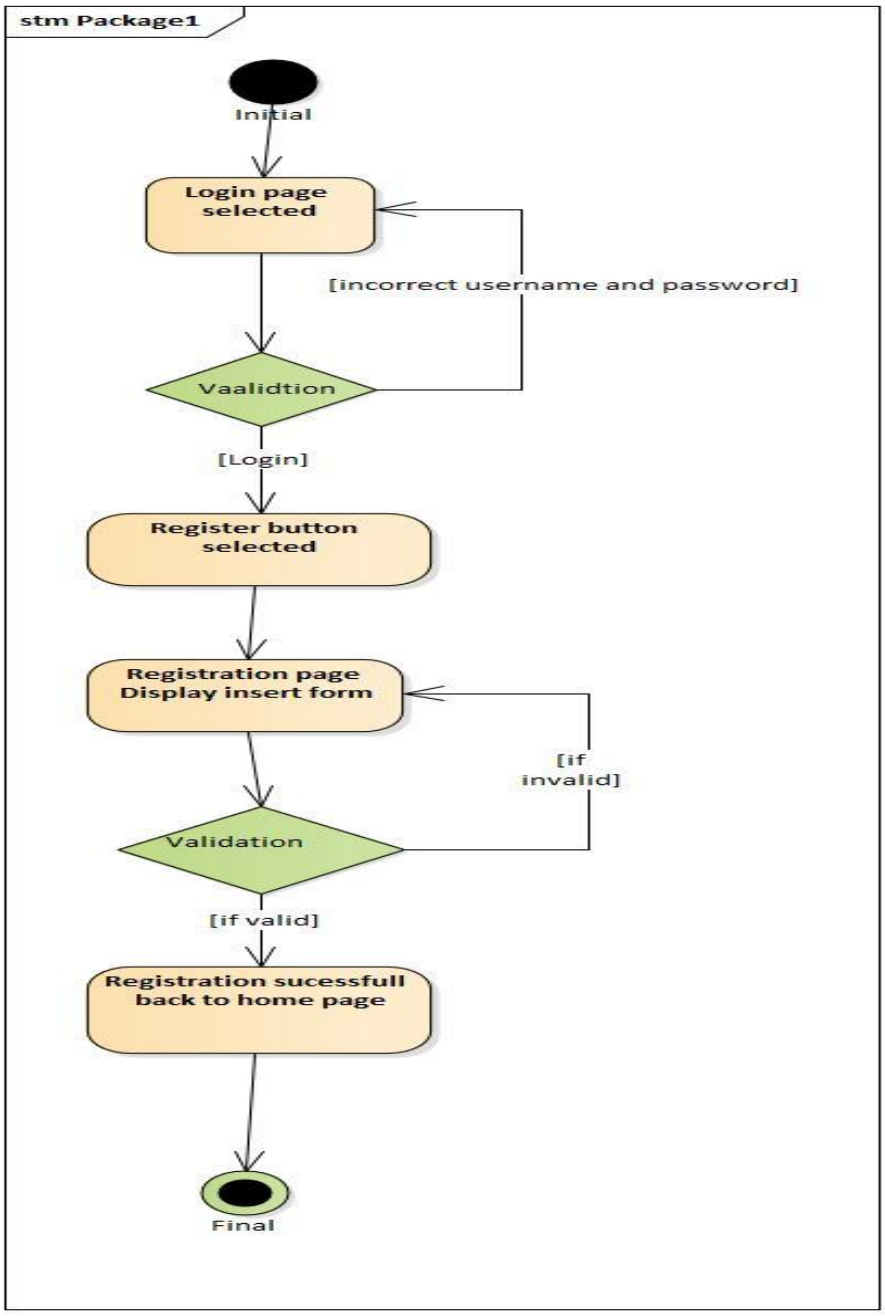



Figure 4. 18 State Chart Diagram For register

# CHAPTER FIVE

# SYSTEM DESIGN

## 5.1 Introduction

The system design activity starts after the system requirements analysis has been completed. The main goal of system design is to allocate the requirements of large system to hardware and software components. This chapter focus on transforming the analysis model into design model.it is the first part to get into the solution domain in software development. the purpose of this designing is to show the direction of how the system is built.it is based on an understanding of the model that the software built on. the objectives of design are to model the system with high quality. implementing a high-quality system depends on the nature of the design designed by the designer. If the system is designed effectively, it will be easy to make changes to it. The system has different elements like architecture, modules, components, interfaces and data.

Purposes of the system are: -

- To specify how the system, do tasks for the user
- To ensure security in the system by using different security mechanisms
- To increase the flexibility of the proposed system
- To provide sufficient detailed data and information about the system elements
- To enable the implementation consistent with architectural entities as defined in models and views of the system architecture.

## 5.2 Design Goals and Objectives

Design objectives are functional and non-functional qualities of the design. These are often stated as goals for what a design is meant to achieve. they serve to guide the design process and measure your results.

Design goals are statements a team makes about quality of experience they would like a product to attain. they are targets for design work. These are typically agreed upon by stakeholders as criteria for comparing design alternatives and evaluating design outcomes.

- Reliability: overall consistency of a measure in the system
- Security: the system is secured, unauthorized user cannot access the data
- Fault tolerance: the system continues operating properly in the event of failure of some of its components
- Performance: the system should respond fast with high throughput
- End-user criteria: the system should give reliable responses for each user request at least before the session expires. all the interfaces, forms and buttons are written or designed in a simple language or common language so that the user can access it without any difficulty.

## 5.3 System Architecture

This system uses three-tier architecture. The user interface is implemented on desktop pc and use the standard graphical user interface with different modules running on the application of server. The middle tiers are usually multitier.

Advantages of three-tier: -

- The client is not direct access to database, this improved the security logic
- Each tier runs on its own infrastructure, can be developed by separate development team
- It can be updated or scaled as needed without impacting the other tiers
- It provides to increase performance, flexibility, maintainability of the system while hiding the complexity of distributed processing from the user.

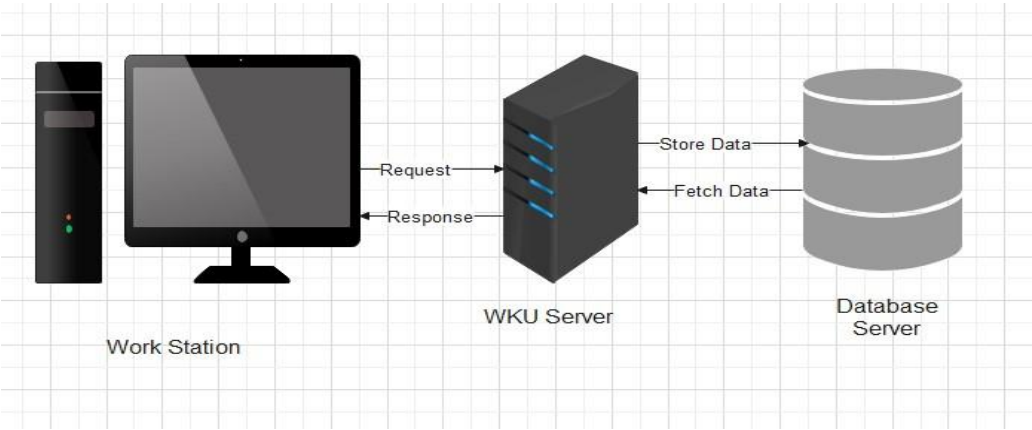



Figure 5. 1 System Architecture

### 5.3.1 Subsystem Description and Decomposition

Decomposition is a process by which complex system is broken into parts that are easier to understand, maintain and program.

To reduce the complexity of the solution domain, we decompose a system into simpler parts called subsystems, which are made of several solution domain classes.

Patient management subsystem

- This subsystem manages different patient registration and assignment.it provides methods for creating login accounts for patients, removing login accounts of the patient, gives patient treatment card id, patient appointment and ordering, assign patient, assign bed.
  - Staff management subsystem:
  - In this subsystem, the system should store the employee's information and manage accounts to use the system that means all the content of account settings like login and log out information settled. this subsystem will provide the following operations:
  - Create an account
  - Delete an account
  - Update an account
  - Manage employees
  - View reports
  - Change password

Give treatment subsystem

- In this subsystem, the system manages every treatment given to the patient like: give treatment, prescribe medicine. This subsystem will provide the following operations:
- Manage patient medical file
- Monitor emergency
- Counseling
- Order lab
- View lab result
- Order drug
- Generate medical certificate

- Generate refer

Pharmacy service subsystem

- In this subsystem, the system monitors every medicine stored in the pharmacy. This subsystem will provide the following operations
- Register drugs
- Check expiry date
- Delete drugs
- View drug order
- Approve drug order

Laboratory service subsystem

- Send laboratory result
- View lab order

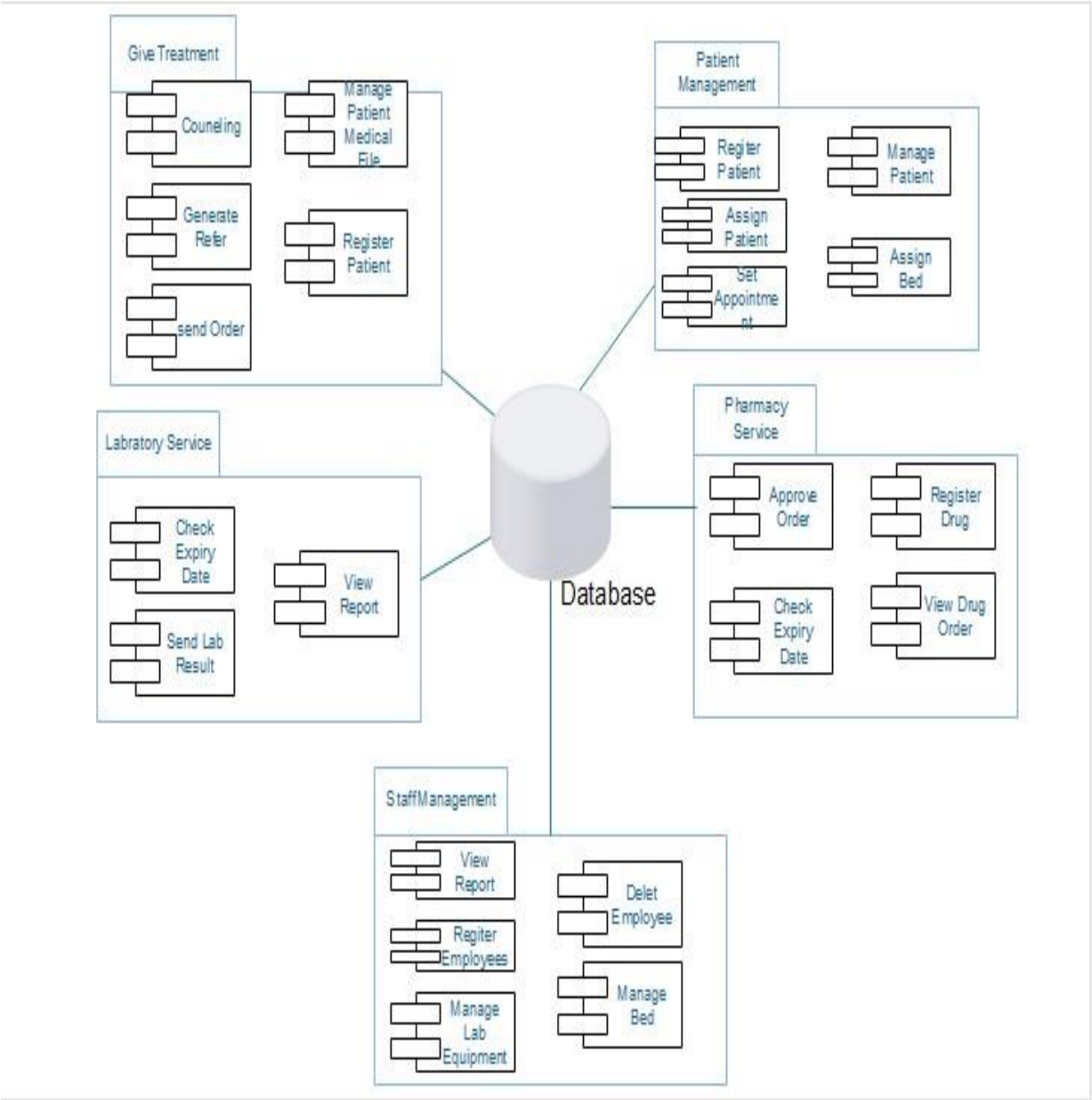



Figure 5. 2 System Decomposition Diagram

### 5.3.2. hardware/software mapping

Deployment modeling is used to show the hardware of the system, the software that is installed in the hardware and also the middleware that is used to connect the disparate machines to one and another. It also shows how the software and hardware components work together.

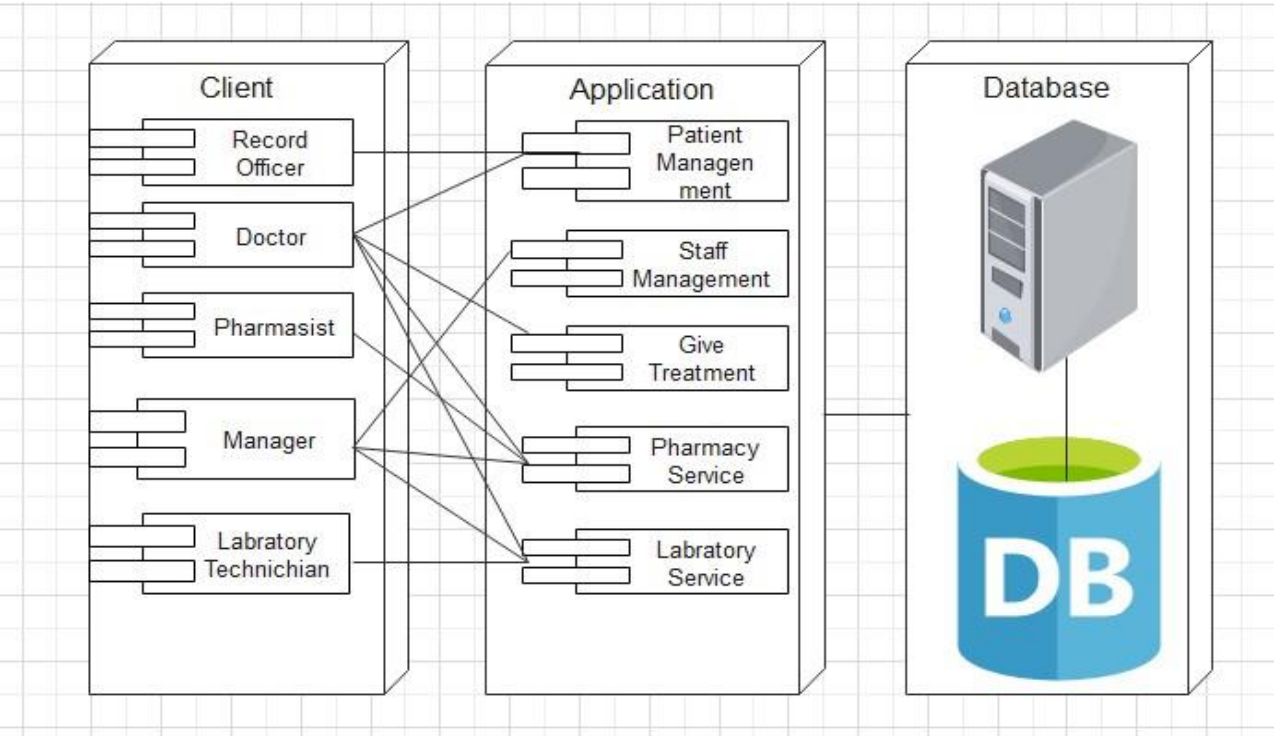



Figure 5. 3 Hardware/Software Mapping Diagram

### 5.3.3. Detailed class Diagram

The class diagram is the main building block of object-oriented modeling, it is used for general conceptual modeling of the structure of the application, and detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in the class diagram represent both the main elements, interactions in the application, and the classes to be programmed.

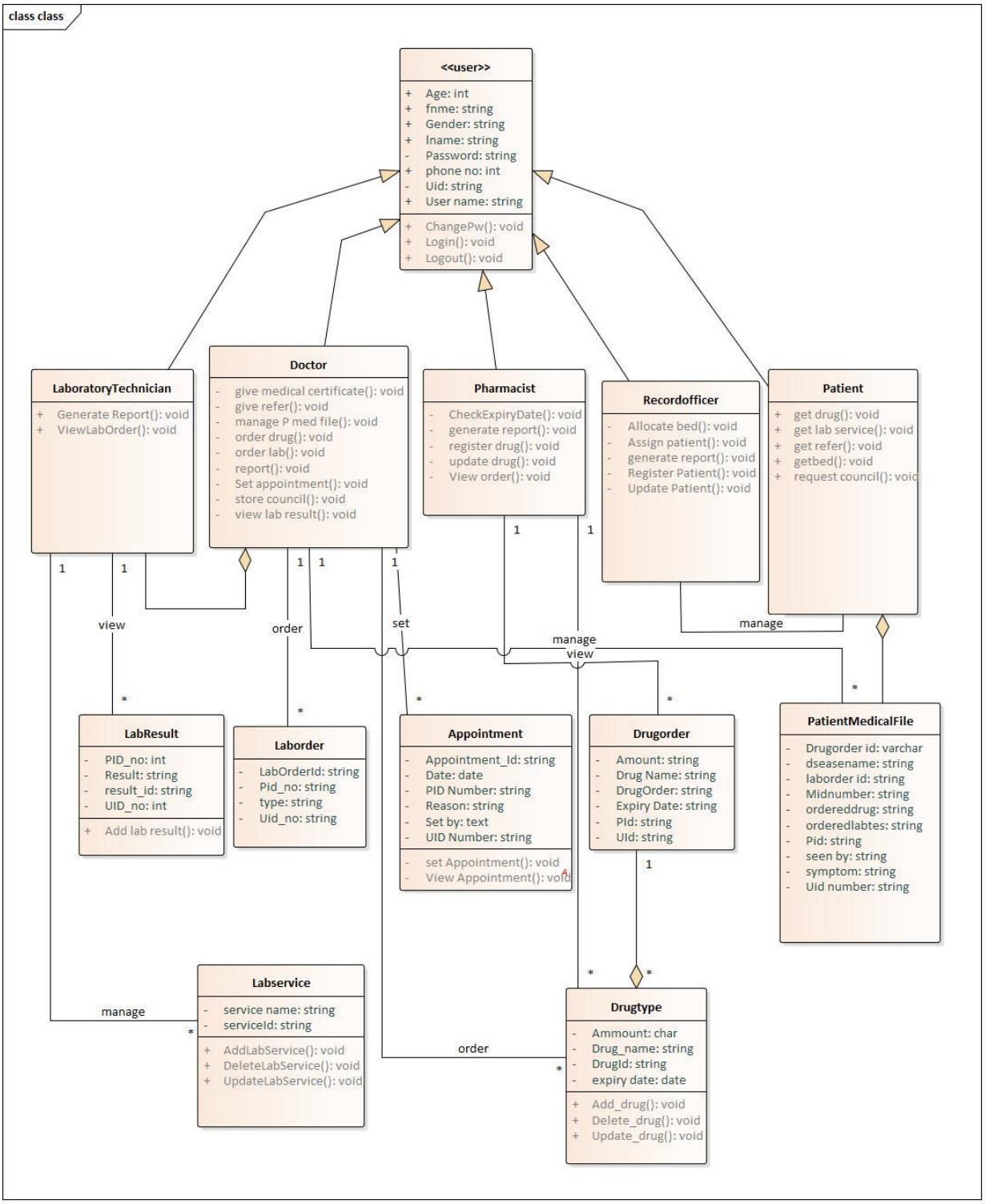



Figure 5. 4 Detailed Class Diagram

### 5.3.4. Persistent Data Management

A data model will help us uncover and describe the entities that are important to our system. These entities will become the tables in our database. The things we need to remember about the entities or the attributes of our entities will become the columns in our table. Persistent data management describes the persistent data stored by the system and the data management infrastructure required for it.

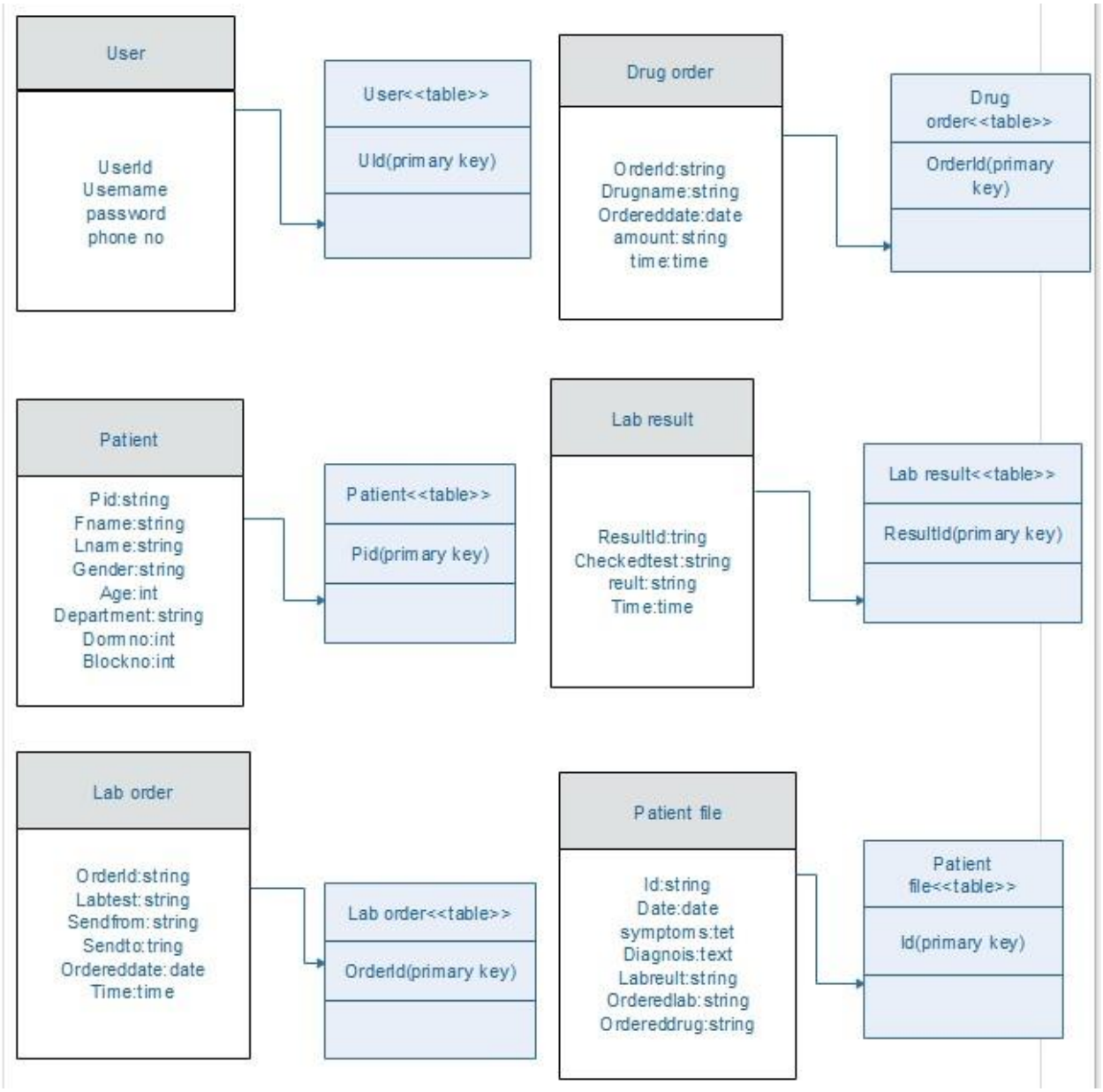



Figure 5. 5 Persistent Data Management

## 5.4. packages

The package diagram describes the decomposition of subsystem into packages and the file organization of the code. This include an overview of each package, its dependencies with other packages, and its expected usage. In the previous section, we were trying to define the subsystem of our system, in this part we are going to describe the dependency of each subsystem to another subsystem which is found in the same package.

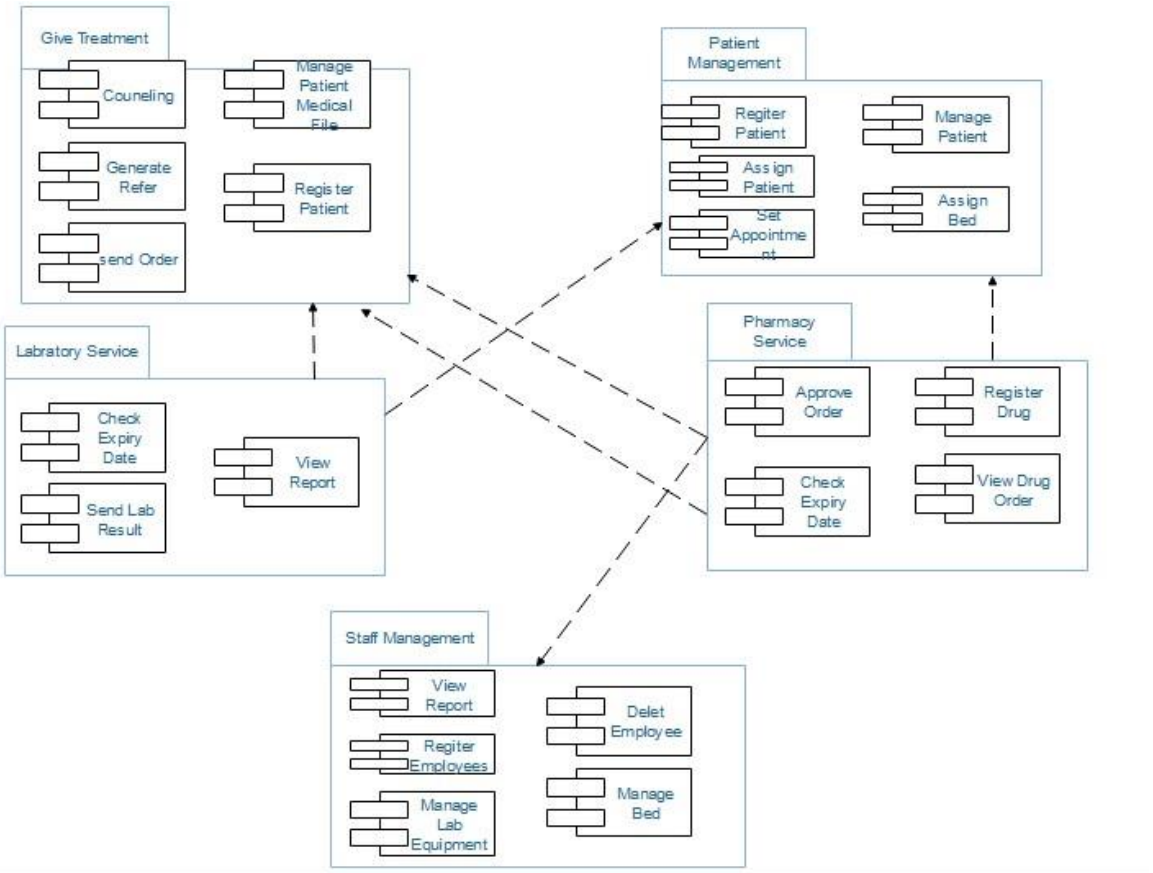



Figure 5. 6 Packages

## 5.5. Algorithm Design

**1. Login**

Input: Username and Password

Data Base output: login in status

Description: Enable the user login into the system

{

Begin

Connect to the user

Begin if {

If the user and password are, match the database

Login in to the system

Return true

} end if

Begin else

{

Display Error message

}

End

## 2. Register Patient ()

Input: Write Patient Information

Data Base output: none

Description: Enable patient register in to the system

{

Begin

Connect to the user

Begin if {

If the data filled not duplicated save the patient into the database

Return true

} end if

Begin else

{

If the primary is not duplicated, please try again

}

End

## 3. View Report

Input: Id number

Data Base output: View Report status

Description: Enable view report information the system

{

Begin

Connect to the user

Begin if {

If the Id number is correctly, match to then display report

Return true

} end if

Begin else

{

If the Id number is nor correctly, match to then display please enter the information correctly

}

End




Figure 5. 7 User Interface Design For Login

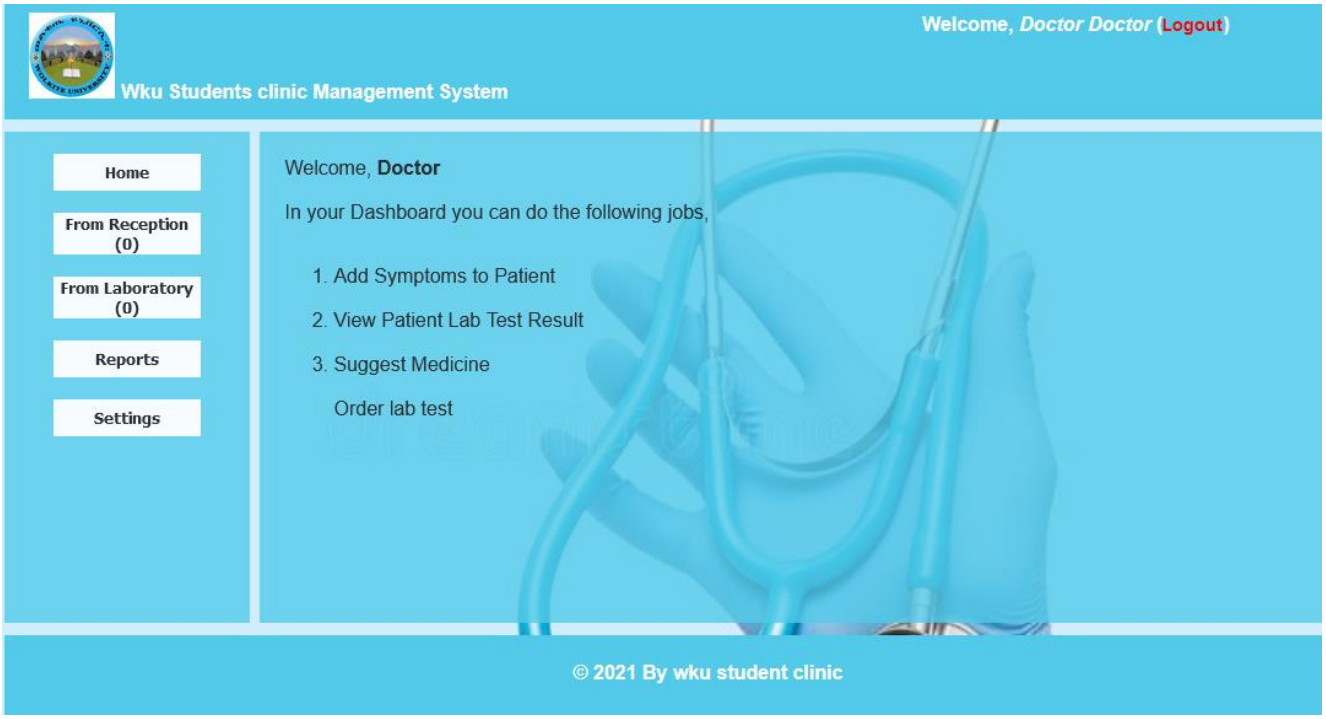



Figure 5. 8 User Interface For Doctor Page

# CHAPTER SIX

# IMPLEMENTATION

## 6.1. Introduction

The Implementation phase in the software life-cycle is where the actual software is implemented. The result of this phase consists of source code, together with documentation to make the code more readable. This is what we call software implementation. The purpose of these activities is to convert the final physical system specification into working model with reliable software and hardware, document the work that has been done, and provide help for current and future users and take care of the system.

## 6.2. Implementation of Databases

Since PHP can't store data by its own thereby a reliable database for storing information securely and being able to easily retrieve it whenever needed is required. We use MySQL because it can be deployed and run on any operating system. MySQL is easy, fast and can be used for any type of database whether it is relational or simple, large or small.

## 6.3. Implementation of class Diagram

- Implementation of class Manager

```php
<?php

class manager  {

    public function __construct(){}

    public function register_user(){ }

    public function create_account() {  }

    public function edit_account(){ }

     ?>
```

*Figure 6. 1 Implementation of class Manager*

```php
<?php
class doctor{
    public function __construct(){}
    public function send_drug_order(){ }
    public function send_lab_order(){ }
    public function view_lab_result(){ }
    public function set_appointment(){ }
    } ?>
```

*Figure 6. 2 Implementation of class Manage*

## 6.4. Configurations of Application Server

For our project we use XAMP application server. It is used for web development and internal testing.it allows us to test all WordPress features without any consequences.it speeds up the work process for both developers and team designers, so we download this application and install on our computer then configured it.

Before it is started, the server is on the state ready as shown in the picture.




*Figure 6. 3 Configuration of server*

When we need to start ‘Apache’ and ‘MySQL’ to access server services as shown in the picture below.

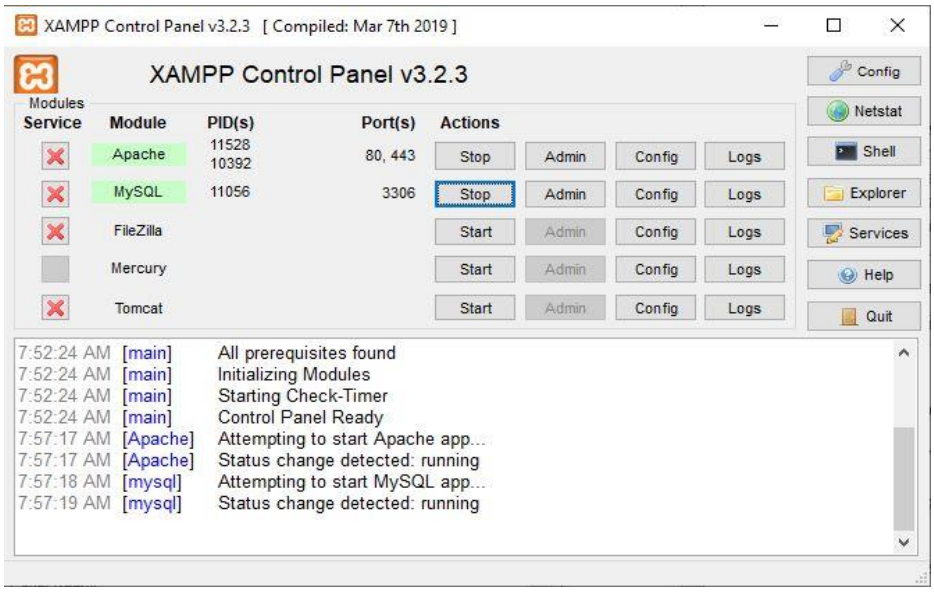



*Figure 6. 4 Configuration of server*

After complete operation of the server services, we need to shut down those running servers correctly as shown in the figure below.

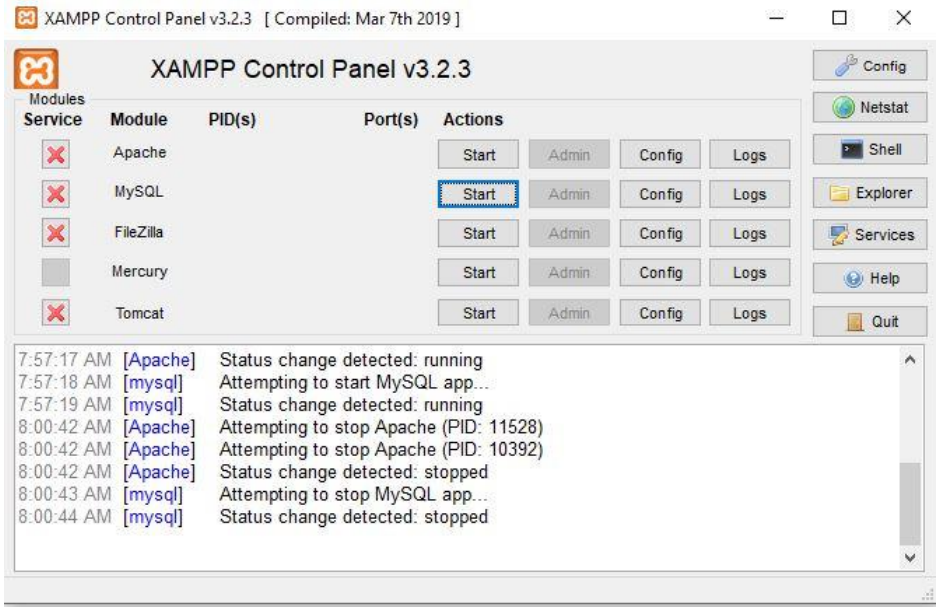



*Figure 6. 5 Configuration of server*

Then we configure it with our code-igniter PHP framework in order to use it as base URL of the system which is **'http://localhost/'.**

## 6.5. Configurations of application Security

- Form validation that are used in the system in order to prevent from storing the user wrong values.

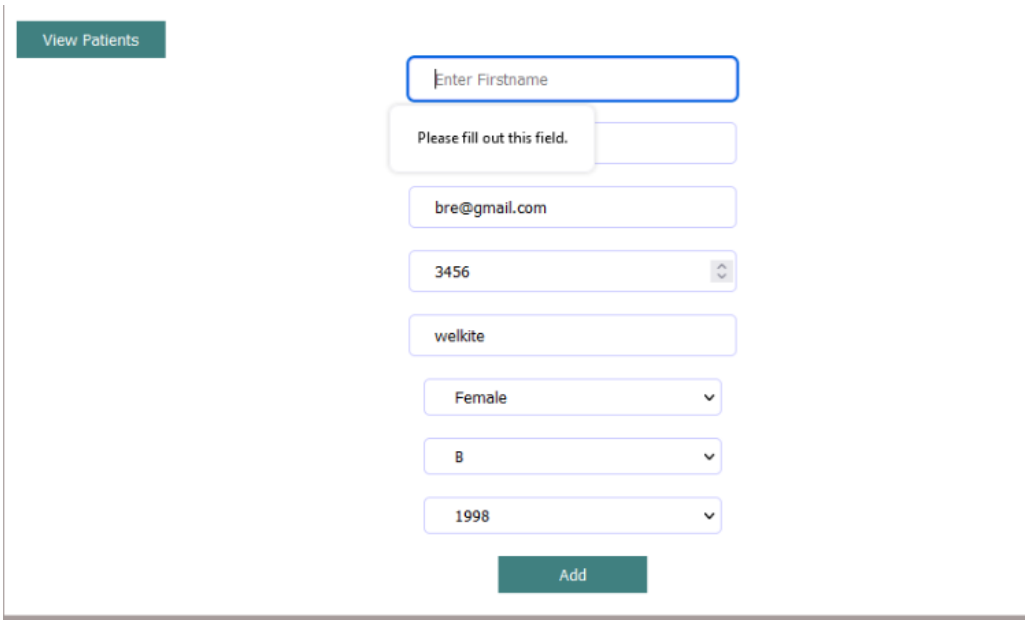



*Figure 6. 6 Form Validation*

- Implemented Encryption/decryption

  The other thing is we implement an MD5 password encryption to save the user password in unreadable format in the database. MD5 is a one-way encryption algorism which is hash function family and it is widely used in web application to save passwords in cypher text way to the database.

| username | password | fname |
|---|---|---|
| Admin | 011c945f30ce2cbafc452f39840f025693339c42 | Admin |
| Doctor | ab874467a7d1ff5fc71a4ade87dc0e098b458aae | Doctor |
| Lab Technician | 92f2fd99879b0c2466ab8648afb63c49032379c1 | Lab Technician |
| Pharmacist | f56d6351aa71cff0debea014d13525e42036187a | Pharmacist |
| Reception | fea7f657f56a2a448da7d4b535ee5e279caf3d9a | Reception |

*Figure 6. 7 Password encryption/decryption*

- Roles in the system

  In our system we support five different types of roles. And each roles have their own privileged pages and the access is determined by their roles.

  User can login to the system as:-

  1. Manager
  2. Doctor
  3. Lab technician
  4. Record officer
  5. Pharmacist

```
<select name="type" class="form" required="required">
    <option value="">Choose Type</option>
    <option>Admin</option>
    <option>NormalDoctor</option>
    <option>WomenDoctor</option>
    <option>Reception</option>
    <option>Pharmacy</option>
    <option>Laboratory</option>
</select><br><br>
```

*Figure 6. 8 Roles in the system*

## 6.5. Implementation of User Interface

We implement the system we develop has good and friendly user interface and it does not contain any complexity. The user interface is that portion of an interactive computer system that communicates with the user. Design of the user interface includes any aspect of the system that is visible to the user.

- Login page




*Figure 6. 9 Login page*

- Doctors home page

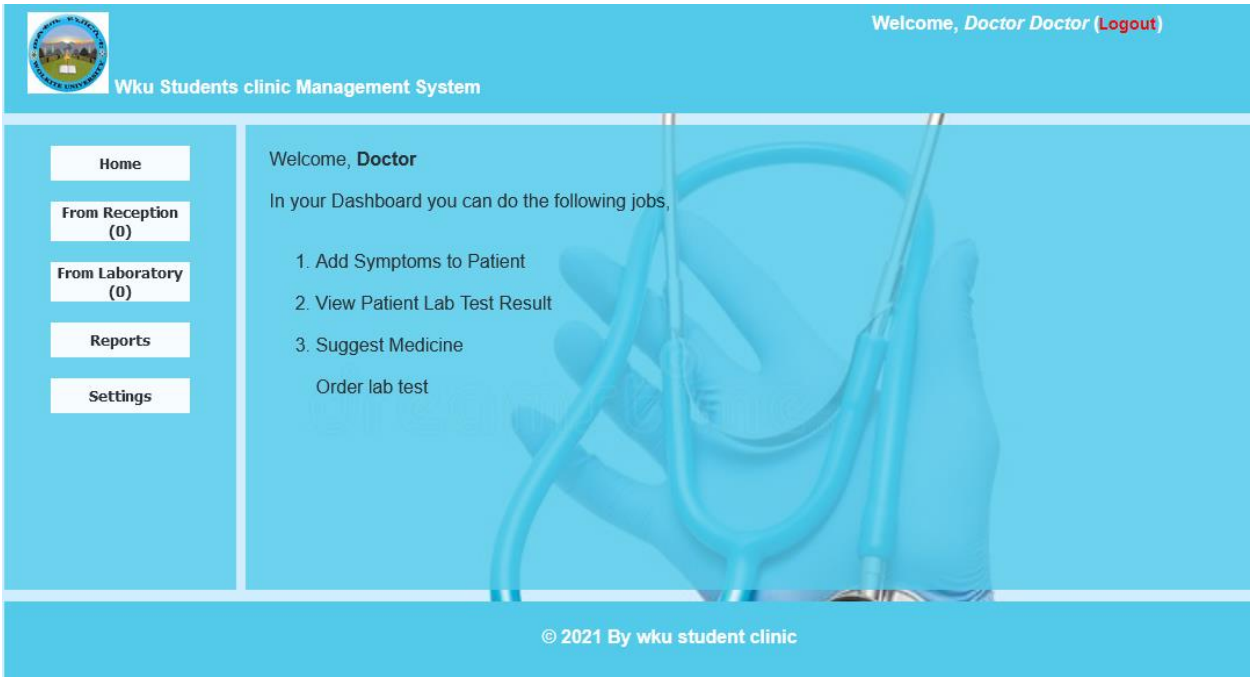



*Figure 6. 10 Doctor's home page*

- Pharmacy

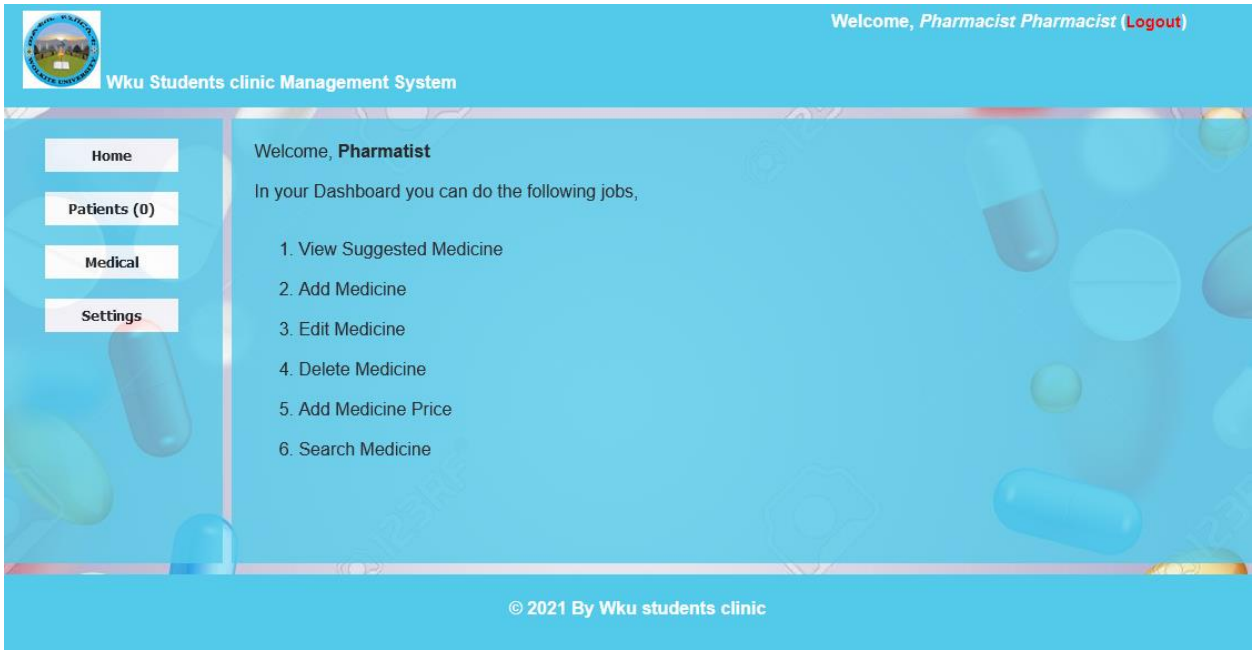



*Figure 6. 11 home page*

## 6.6. Testing

Developing software is a complex process. No matter how hard we try to eliminate all faults simply by going through the phases of requirements, analysis, design, specification, and implementation, however through good practice we can make sure that the most series fault does not occur in the first place. In addition, we need a separate testing phase, with the goal of elimination all remaining faults before testing process up into the distinct levels. These types testing are unit testing and system testing.

### 6.7.1. Unit Testing

In this type of testing, individual units of components have been tested during the development of the system. By doing this, we were able to fix any kind of errors and validate that each unit of the software code performs as expected.

We performed unit testing for the following reasons.

- Unit tests help to fix bugs early in the development cycle and save costs.
- It helps us to understand the testing code base and enables them to make changes quickly
- Good unit tests serve as project documentation

- Unit tests help with code re-use. Migrate both our code and our tests to our new project.

### 6.7.2. System Testing

We have made system testing to:

- Verify thorough testing of every input in the application to check for desired outputs.
- Test the user's experience with the system.

Nowadays, there are more than 100 types of system testing and we have tried to make very little of them due to the shortest time we have got and most of them are not fatal that much.

#### 6.7.2.1. Usability testing

For this purpose of testing, we have chosen some students randomly then let them try whether they can understand the system easily or not and they respond that it is easier even in their first sight. We also let those student union numbers for its usability and user friendliness and their response was beyond our expectation.

### 6.7.2.2. Functional testing

It took place to test for the completeness of system whether

| Test_1: authentication of log in attempt | | |
|---|---|---|
| Assumption: redirects to home.php | | |
| Test data<br><br>✓ User name (valid user name, invalid user name, empty)<br>✓ Password (invalid password, valid password, empty) | | |
| Steps to be executed | data | result |
| Empty User name and Password filled and Click login button | Empty data | Doesn't login |
| Enter invalid username and password | Username or password that doesn't exist in users table | Wrong username/password combination |
| Trying to access home page by directly writing the path | http://localhost/index.php | Doesn't login |
| Enter valid username and password and click log in button | Email and password that matches | Redirects to index.php |

*Table 6. 1 Functional testing*

| Test_2: validation of user input | | |
|---|---|---|
| Assumption: register members and return success message | | |
| Test data<br><br>✓ First name (valid, invalid)<br>✓ Last name (valid, invalid)<br>✓ Chose type ()<br>✓ Username (valid, invalid)<br>✓ Password (valid, invalid) | | |
| Steps to be executed | data | result |
| All empty fields and click register button | empty | Please fill out the fields |
| Enter one of the field with empty field and click register button | One of the fields empty | Please fill out this field |

*Table 6. 2 functional testing*

# CHAPTER 7

# CONCLUSION AND RECOMMENDATION

## 7.1. Conclusion

It is known that developing a system for an organization is not easy. But the team have tried its best and developed interesting web based clinic management system for Wolkite University. This system is a web based application to serve the whole students who wants to get treatments from the university's clinic and also the employees that are working in the clinic.

The system is flexible, accurate and attractive with easy GUI approach and the team confidently can say that the system accomplish its objective and completed successfully. Generally, passing through the development of this system gives us a lot of knowledge in software developing life cycle not only theoretically but also practically it show us the challenge in the real world to develop software and benefits from it. It also shows us the need for the software in the society to over control of data management.

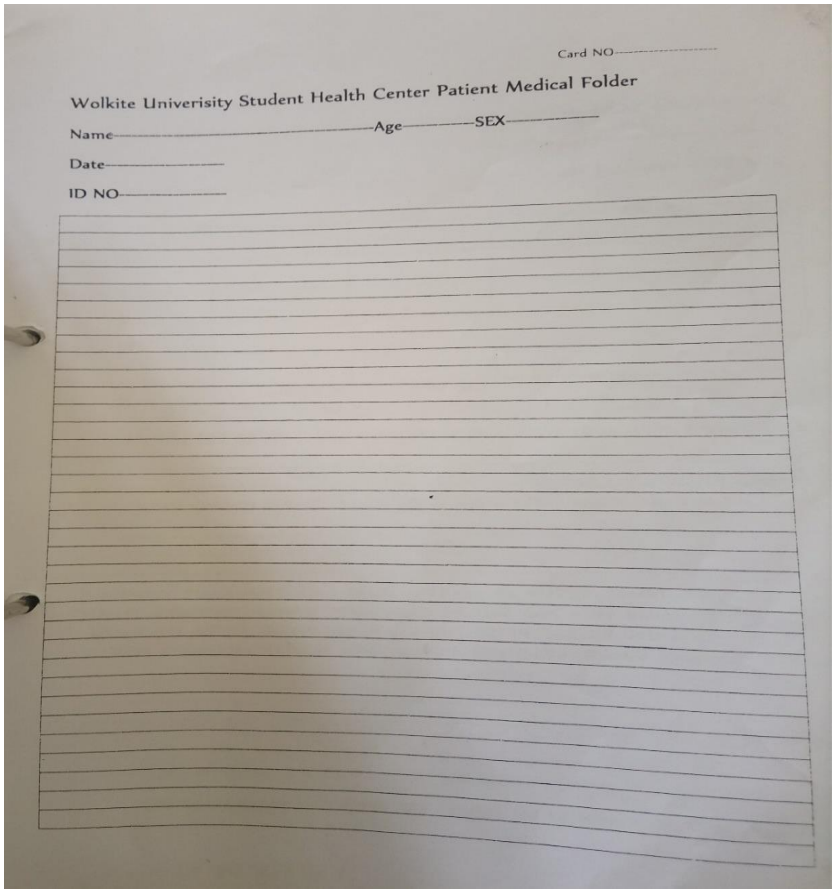
Finally the team expects the system will change the general information management of the clinic and makes it more reliable and effective than the previous manual system.

## 7.2. Recommendation

As you know in this year there is time complexity because of the corona virus pandemic. So we try to do our best battling with time and other factors. And also our university finish and opens a referral hospital which is called Wolkite University referral and teaching Hospital. And in our assumption this project can't handle the work load if it installed for the Hospital. So as a recommendation the system needs a great enhancement to fit the Hospital needs. So the upcoming students can enhance the system by adding functionality's like manage room service and by installing the system in the campus and in the hospital can have communication like send referral information, managing employee's information and so on.

So if a person who strongly motivated to make an enhancement on the system should try to implement with other programing language like python and java, this type of programming languages will make the system so powerful and can provide an easy way to add additional functionality.

# 9. Appendix


Card NO

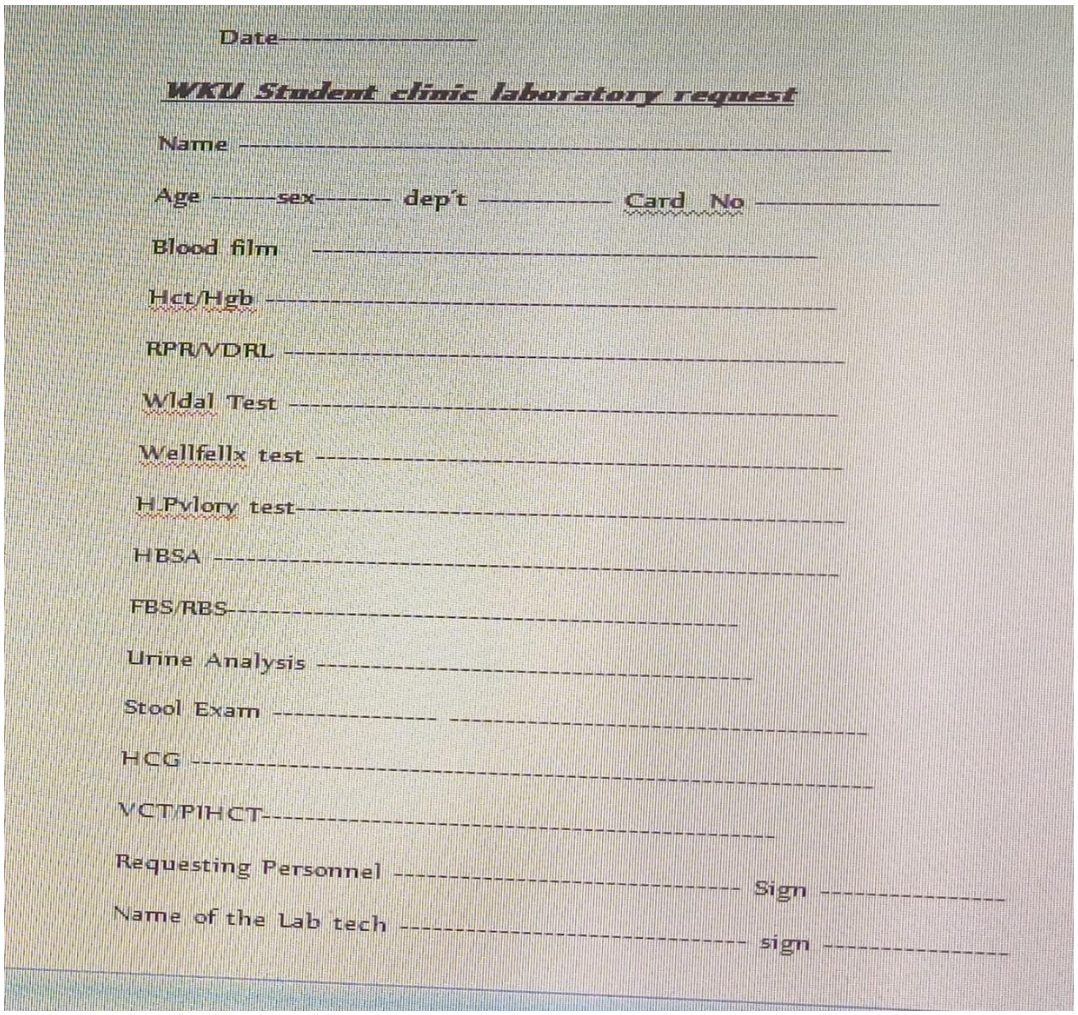
Wolkite Univerisity Student Health Center Patient Medical Folder

Name Age SEX

Date

ID NO

*Figure 6. 12* patients medical folder



Date_____

**WKU Student clinic laboratory request**

Name _____

Age _____sex_____ dep't _____ Card No _____

Blood film _____

Hct/Hgb _____

RPR/VDRL _____

Widal Test _____

Wellfellx test _____

H.Pylory test_____

HBSA _____

FBS/RBS_____

Urine Analysis _____

Stool Exam _____ _____

HCG _____

VCT/PIHCT_____

Requesting Personnel _____ Sign _____

Name of the Lab tech _____ sign _____

*Figure 6. 13 laboratory form paper*

# Reference

Ferdinand, B. (2020, 12 2). *Acadamia.com*. Retrieved march thuesday, 2021, from http://www.acadamia.edu

Mohamad, M. (2021, march Friday). How the existing system works. (G. Members, Interviewer)