

# THE UNIVERSITY OF ZAMBIA

SCHOOL OF NATURAL SCIENCES

DEPARTMENT OF COMPUTER STUDIES

UNIVERSITY OF ZAMBIA CLINIC ELECTRONIC MEDICAL RECORDS MAN-  
AGEMENT SYSTEM.

BY

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THE AWARD OF A BACHELOR'S DEGREE OF COMPUTER SCIENCE

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## **Dedication**

This project is a dedication to Mr. Mayumbo Nyirenda who introduced me to the world of programming and networking.

### **Declaration**

I, the undersigned hereby declare that the University of Zambia Clinic Electronic Medical Records Management System is my own work, that it has not been submitted for any degree or examination in any other university to my knowledge, and that all sources I have used or quoted have been indicated and acknowledged by complete references.

**Name: Reuben Chimbembe Chisebu**

  
**Signature.....**

**Date : September 20<sup>th</sup>, 2013**

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## **Acknowledgements**

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Lastly I would like to thank the Zambian Government through the Bursaries Committee for awarding me a loan to enable me pursue these studies at the University of Zambia.

## **Abstract**

The University of Zambia clinic in an effort to ensure that quality health care is provided to the University of Zambia Community the clinic keeps a number of records about the demography, medical history, diagnosis and treatment of this community. All these records are kept in a manual system, this involves storing all this information on hand written paper.

This manual system poses a number of challenges to the institution's performance as it is time consuming and has a high error rate. To mitigate these challenges an electronic medical record management system has been implemented which shall ensure that most records are electronically stored and accessible in real time. The system shall improve the performance and reduce errors that are caused by the manual system.

In this project a pharmacy/medicine storage and dispensary module has been designed and implemented on group project. This module will help to provide information about the drugs that are in stock and those that need to be ordered.

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## **1. CHAPTER 1: INTRODUCTION TO THE RESEARCH**

### **1.1. Introduction**

The University of Zambia Clinic is an institutional clinic that covers the radius of the University of Zambia. It is a non – profit making Health institution set up to offer medical care primarily to students and members of staff and their families. It is a small clinic that offers general medicine, laboratory services and anti-retroviral services. Complicated medical cases are usually transferred to the University Teaching Hospital or Levy Mwanawasa Hospital.

Like any other Health institution the University of Zambia Clinic keeps a number of records about their patients. The University of Zambia has in the recent past increased the number of students, this in turn has increased the number of patients the clinic has to attend to do. The increase in number of patients also increases the number of records that the clinic must keep

This exponential growth in the information supposed to be kept by the institution has brought a number of challenges to this small clinic. Increased storage space of the records is one of the challenges that has come up due to this increase of the population. Since medical records contain confidential information about the health of the clients they must be kept in a safe environment only accessible to relevant members of staff of the institution. Ensuring this confidentiality is really a challenge as the records are spiraling out of control [1].

Medical history is important to every visit of a patient to the clinic and it must be readily available to the clinician in real time for him/her to offer the right kind of treatment to the patient. It is quite a challenge to ensure that medical history is available as needed as some records get destroyed or spoiled with time or some get lost during the processing of movement [2].

These are some of the challenges that the clinic is facing due to the manual system. An electronic record medical managements system will provide a solution to most of these challenges posed by the manual system as it is going to centralize the records.



## **1.2. Motivation and significance of the research**

The manual records system being used currently at the University Clinic is something that would make the heart of any computer scientist bleed, because it is so tedious and time consuming to work with. With all the necessary skills required to implement an Electronic Medical Record system I was hurt to see our University Clinic still using a manual records system this motivated me to develop an Electronic Medical Records System for the clinic that will help to solve some of the challenges that are posed by the manual records system.

Upon deployment the University of Zambia Clinic Electronic Medical Records System will provide the following benefits:

1. The paper work used when issuing prescriptions and requisitions will be reduced drastically as well as the records used to keep stock of the drugs.
2. The system will help the pharmacy department to produce reports with easy as most of the calculations will be done by the system.

## **1.3. Scope**

This is a group project and has been implemented in two modules the registry and pharmacy module respectively. This research specifically focused on the pharmacy department, how to digitize their operations and develop a digital storage systems as well as a tracking system for the pharmacy department of the clinic. This includes the following functionality.

- i. Issuing and submitting electronic requisitions.
- ii. Issuing of electronic prescriptions and processing them.
- iii. Generation of reports.
- iv. Searching the stock to find the amount that is in stock.

## **1.4. Problem statement**

The University of Zambia Clinic uses a manual system of record management this project worked at providing an electronic medical record management system.

Against this background, this project answered the following questions:

- 1.) Is it possible to computerize the medicine dispensary system of the University of Zambia Clinic?
- 2.) Is it possible to develop a storage and tracking system of all the medicine purchased by the University of Zambia Clinic?

## **1.5. Aims and Objectives**

### **1.5.1. General Objectives**

To develop an Electronic Medical Record Management System that will ensure efficient and effective management of patient records at the clinic.

### **1.5.2. Specific Objectives**

- Study the existing manual system and look for challenges it poses to the clinic and how these can be reduced by the electronic record management system.
- Study the issues involved with patient records and their relevance to medical care.
- Develop a computerized medical record managements system for the pharmacy department.
- Gain hands own experience with software engineering

## **1.6. Research Contributions**

Currently University of Zambia Clinic uses a manual records system so this project in its entirety is a new contribution to the operations of the clinic. This has been achieved by providing the clinic with a running and working Electronic Medical Records System which will allow them to get rid of the paper work and introduce a new era of using digital information at the clinic.

## **1.7. Organization of the thesis**

The first chapter is the introduction which gives the overview of the project, its scope, the motivation for the research and the aims of this research as well. The second chapter is the literature review which looks and examines similar existing systems and researches that have been carried out worldwide on Electronic Medical Record systems. The second chapter also

gives the trends that EMRs are taking in effort to improve the efficient management of patient records. The third chapter looks at methods that were used in implementing the project and the fourth chapters presents the results of the project as well as the methods that were used during the testing process. The fifth chapter gives a discussion of the research and the challenges encountered during the research and concludes the thesis. The second last section is the appendix which contains excerpts of the code that is key to this project and the final section contains the references.

## **1.8. Summary**

This research focused on digitizing the operations and management of records at the pharmacy department of the University of Zambia Clinic. This research has provided the Clinic with a running and working Electronic Medical Records System which will help the institution to digitalize their records. This Electronic Medical Records System allows the pharmacy department to generate reports from the information that is kept in the database. Ultimately, this research has helped the clinic to have centralized information which can easily be manipulated.

## **2. CHAPTER 2: LITERATURE REVIEW AND RELATED WORKS**

### **2.1. Introduction**

Medical records, whether electronic or not, are a collection of information about a patient's healthcare that are essential for his or her present and future care [3]. As such, the medical record must contain sufficient information to identify the patient to whom it relates, as well as information relevant to the patient's treatment during current and future episodes of care, for example:

- the patient's medical history.
- the orders and results of any physical examination or tests.
- information relating to allergies.
- other factors that may need special consideration.

### **2.2. Definition of an Electronic Medical Record**

An Electronic Medical Record (EMR) replaces paper-based medical records by electronically documenting the information relevant to a patient's healthcare [3].

The term Electronic Medical Record, has been used to describe automated systems based on document imaging or systems which have been developed within a medical practice or community health centre. These have been used extensively by general practitioners in many developed countries and include patient identification details, medications and prescription generation, laboratory results and in some cases all healthcare information recorded by the doctor during each visit by the patient [4].

An Electronic Medical Record system comprises the clinical information and capabilities needed to deliver healthcare. An Electronic Medical Record system is used by healthcare providers for documentation, monitoring and management. At a minimum, the Electronic Medical Record system must conform to the legislative requirements for medical records. A well-designed and implemented Electronic Medical Record system will enable timely access to patient information and the clinical evidence base to deliver benefits, such as:

- providing access to high quality information that is critical for clinical results

- improving the ability to develop and embed best-practice clinical guidelines and clinical pathways to optimize operations
- healthcare delivery processes that -:
  - reduce risks
  - support a reduction in medical errors
  - support better clinical decision making
  - improve patient health outcomes
- enabling administrative and cost efficiencies to improve the capacity to manage demand
- sharing information across health services and primary care to support consumer-centred coordinated care [3].

### 2.3. Related Works

Though much research has been done about Electronic Medical Record Systems quite a number of health institutions have been reluctant in adopting them. Here are examples of institutions that have adopted them:

The Inkosi Albert Luthuli Central Hospital in Cato Manor in Durban, KwaZulu-Natal, is a state of the art paper-less hospital that has been developed as a private public partnership. While initially intended to be paperless, it is paper-less (less paper, not no paper) [5]. The Western Cape has developed an in-house primary health care application. The first module of this was implemented for HIV/AIDS patient and treatment management [6].

The Right to Care group of South Africa has implemented Therapy Edge, a desktop application with advanced clinical decision support features and the South African Medical Research Council(SA-MRC) has configured and implemented an integrated TB and HIV application using an open source EMR, OpenMRS (Open Medical Record System) [6].

Indian University School of Medicine and Moi University School of Medicine in Kenya worked to for number of years. And in 2001, this collaboration led to the Mosoriot Medical Record System (MMRS) [7]. The MMRS was installed in a primary care health care centre

in rural Kenya. In November 2001, the MMRS software was adapted to support the AMPATH (Academic Model for the Prevention and Treatment of HIV/ AIDS) project and renamed to AMRS [7].

The Ministry of Health (MOH) Zambia, in collaboration with the U.S Centers for Disease Control and Prevention (CDC) have initiated a SmartCare Electronic Health Records Project which is now being used as national wide standard for all Anti – Retroviral Treatment services offered by clinics with electricity [8]. SmartCare Electronic Health Record uses a smart card which carries an encrypted copy of the patient’s health history. At every visit to the clinic the patient’s health history is saved in the database of the clinic. This data is later de-identified, and pooled at the district, provincial and national levels for monitoring and evaluation. This system provides confidentiality and reduced use of paper [9].

## **2.4. Summary**

It can be seen that many hospitals, governments, and health institutions are adopting the use of Electronic Medical Records to improve their delivery of health care to their patients. Electronic Medical Records improve the efficiency of health institutions in that they reduce the paper work that comes with running a manual system. Electronic Medical Records also centralize the data collected and stored about the patients, hence curbing the duplication of records that is caused by manual systems as many institutions using these keep different redundant information about the patients. Electronic Medical Records also improve the storage and access of the these records as medical practitioners just need to use any gadget with a browser and can participate on a network without having to go to or contact the registry of the institutions as is the case when using manual systems.

### **3. CHAPTER 3: METHODOLOGY**

#### **3.1. Introduction**

This chapter of the thesis looks at the techniques and methods that have been used to design and implement the project. It is organized in five sections the first being this introduction and the second one outlines the system requirements or what the project is expected to do. The third section discusses the design of the system. And the fourth discusses how the system has been implemented. And the last section gives a synopsis of this whole chapter.

The research included studying the existing manual record management system at the University of Zambia Clinic. Exposing its weak points and also its strengths. Researching on how electronic medical record managements systems can be used to mitigate the weakness of the manual system. And incorporate the strengths of the existing manual system into the electronic system to ensure that it helps to overcome some of the challenges of the manual system. Much emphasis during this research was given to security of the system due to the confidential nature of the patient records and because the system will be a web based application which is susceptible to attack by crackers.

#### **3.2. Extreme Programming Development Model**

Extreme Programming (XP) is a lightweight software development methodology. The fundamental concept of XP is to start simply, divide a project into a series of iterations each ending with a rigorously tested release that works in the limited way, and then fit it into a specific structure designed to simplify and expedite the process of software development rather than an exhaustive based on the thorough and time consuming analysis.

Extreme Programming is actually a deliberate and disciplined approach created in response to software development in the environment of rapidly changing requirements. High-risk projects and those with vague or dynamical requirements are perfect for Extreme Programming and they will experience greater success and developer productivity in comparison with other software development methodologies.

Extreme Programming emphasizes team work and implements a simple, yet effective way to enable groupware style development. The Extreme Programming team includes not only developers – managers and customers are all part of the Extreme Programming team working

together closely and dedicated to delivering quality software. Extreme Programming teams use a simple form of planning and tracking to decide what should be done next and predict when the project will be completed. Focused on business value, the team produces the software in a series of small fully – integrated releases that pass all the pre – defined tests. With this foundation, Extreme Programming team is empowered to confidently respond to changing requirements and technology, even late in the life cycle. These advantages make Extreme programming a good software development model for our project.

### **3.3. System Requirements**

#### **3.3.1. Functional Requirements**

##### **Create User**

The System allows the creation of a user account that will be used for authentication purposes and also logging and verification of the data. This will be done by the administrator of the system.

##### **Login**

After an account has been created for a user, login credentials will be given to each user with these credentials the user must be able to login into the system and perform any operations that are within the bounds of his privileges.

##### **Logout**

When the user is done with the activities he will be able to logout of the system so that he can free the system resources.

##### **Issue Prescription**

When the clinician has logged into the system, he should be able to issue a prescription after he has diagnosed a patient and entered the diagnosis information which will be sent to the pharmacy technician working in the dispensary.



### **Check Pending Prescription**

The pharmacy technician in the dispensary must be able to see the pending prescriptions, that is those prescriptions that have not been handled and then process it. While doing this the system must decrement the drugs given to each patient from the dispensary stock.

### **Issue Requisition**

Nurses and pharmacy technicians will be able to issue requisitions for items that they have run short of in their respective departments.

### **Enter New Stock**

The system must allow the pharmacist to enter new stock into the inventory. This will be done via a web interface.

### **Generate Stock Report**

The system must allow pharmacy technicians and pharmacists to generate stock reports to keep track of which and how much drugs and other surgical materials that they have in stock.

### **Search for Stock**

The system will allow users search for stock in the system and see how much is available and also track how stock has been moving from the pharmacy to other departments.

## **3.3.2. Non – Functional Requirements**

### **Scalability/Modifiability**

This system will be scalable in that it will allow addition of new scripts or new functionality owing to the scalability of MySQL database. New tables can be added to the database and new functions can be added to the system.

## **Efficiency**

The system presents the user with an efficient access to data i.e is a quick access to the data at any time of the day. The interfaces will be made in as friendly as possible to make it easier for users to access the system.

## **Reliability**

The system will be reliable and available at all times. In one computer fails that will not affect the system in that all that is needed is to use another computer or any gadget which has browser. There will be redundant servers as well in case one fails the other backup server can be used.

## **Security**

The major sources of data threats are fire, wear and tear, natural calamities, accidental deletes etc. to ensure security against such, a regular backup process will be instituted and this backup will be stored far from where the original data is stored.

## **Usability**

The system will be very easy to use. The user just needs to have internet surfing skills to use this system.

### 3.4. System Design

#### 3.4.1. Database

Database ERD generated in MySQL Workbench

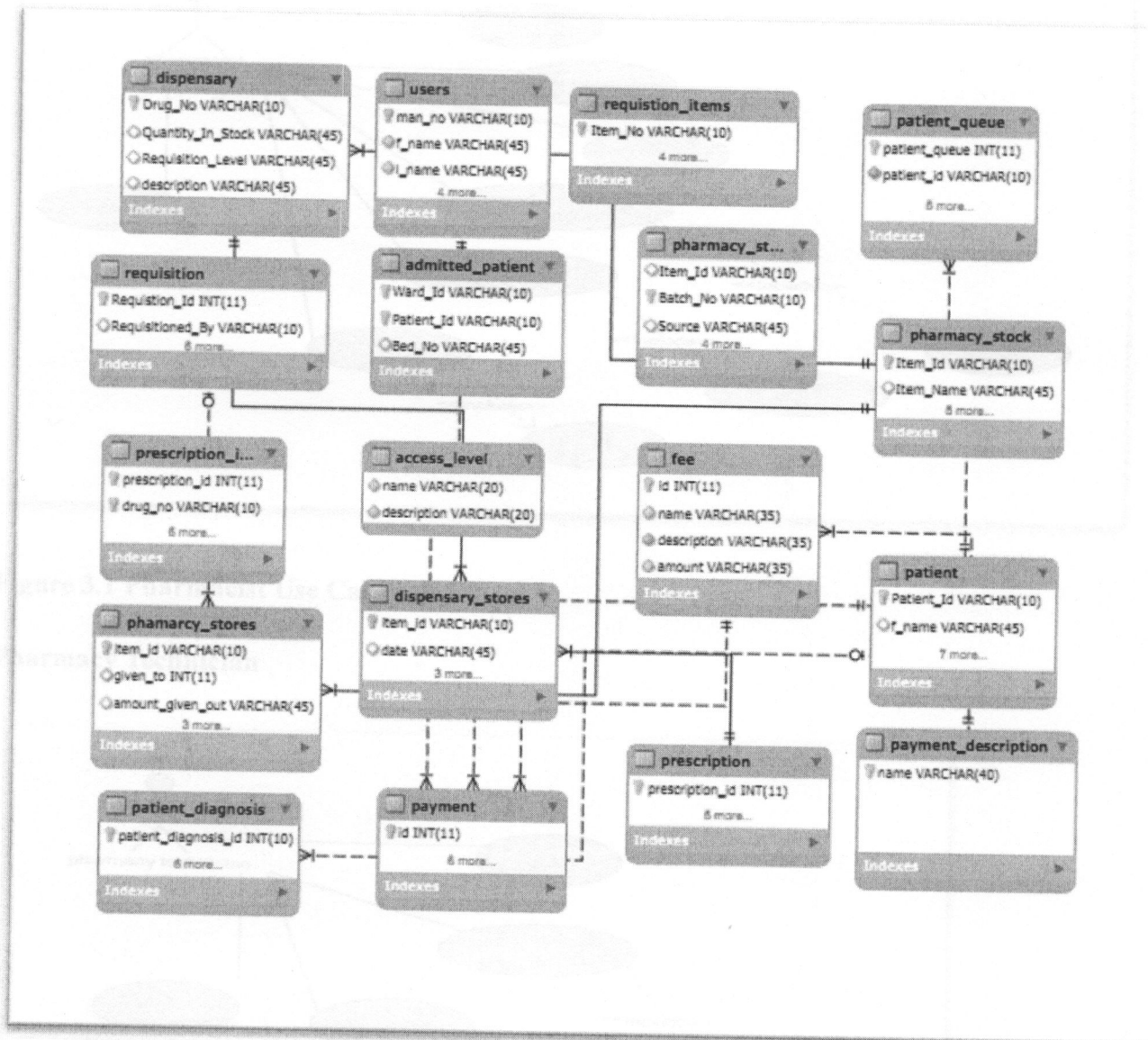


Figure 3.0 : ERD diagram for database

3.4.2. Use cases

Pharmacist

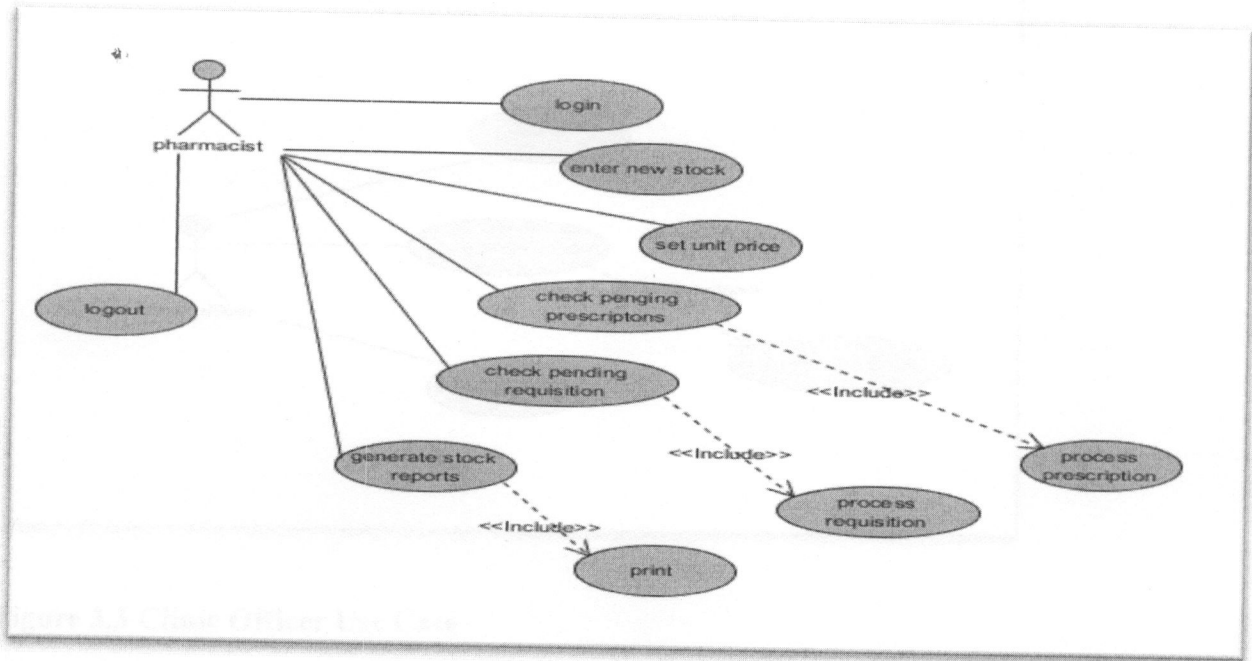


Figure 3.1 Pharmacist Use Case

Pharmacy Technician

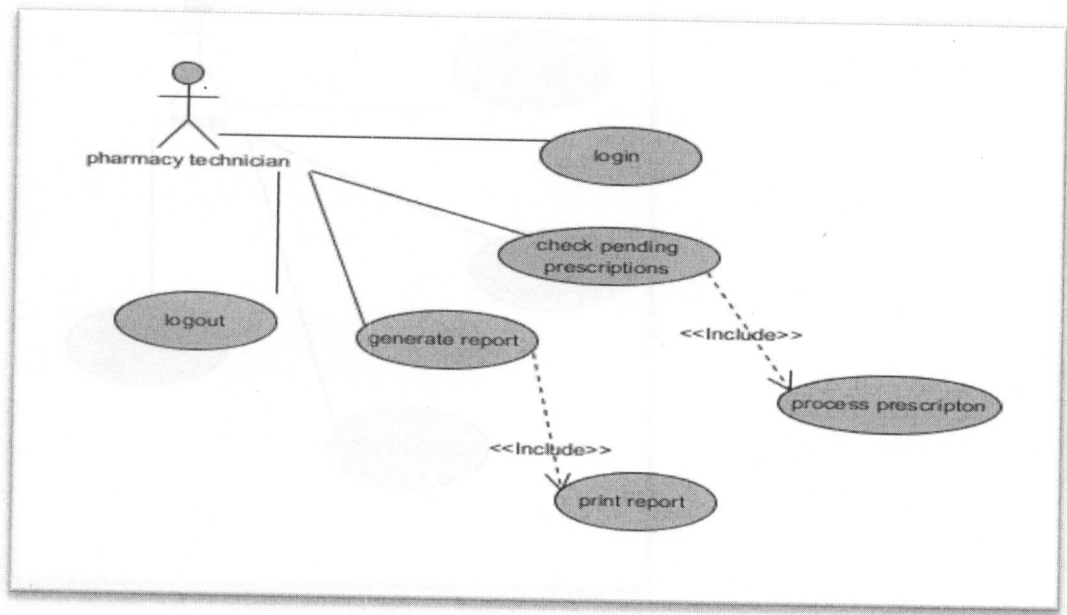


Figure 3.2 Pharmacy Technician Use Case

Clinic Officer

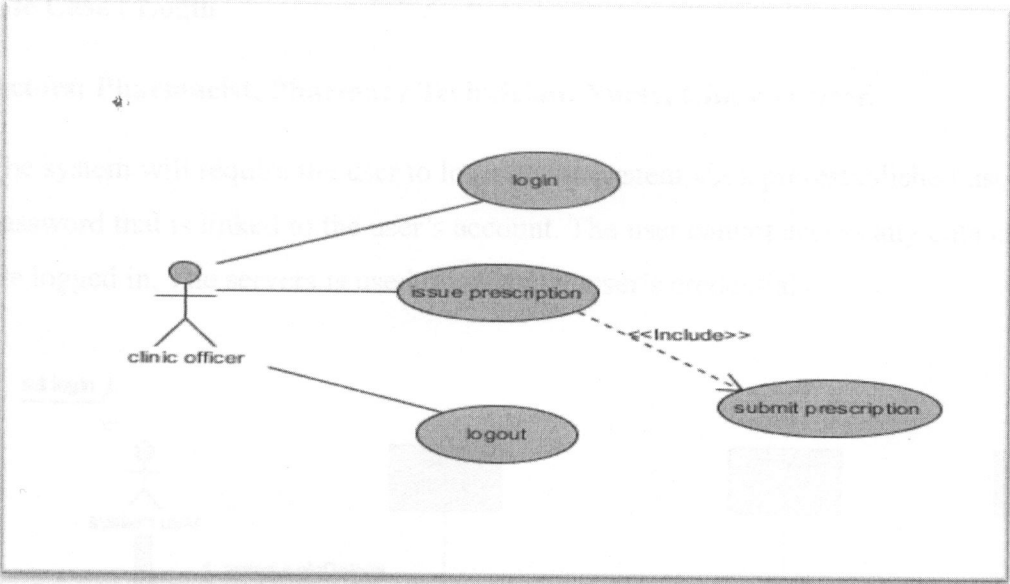


Figure 3.3 Clinic Officer Use Case

Nurse

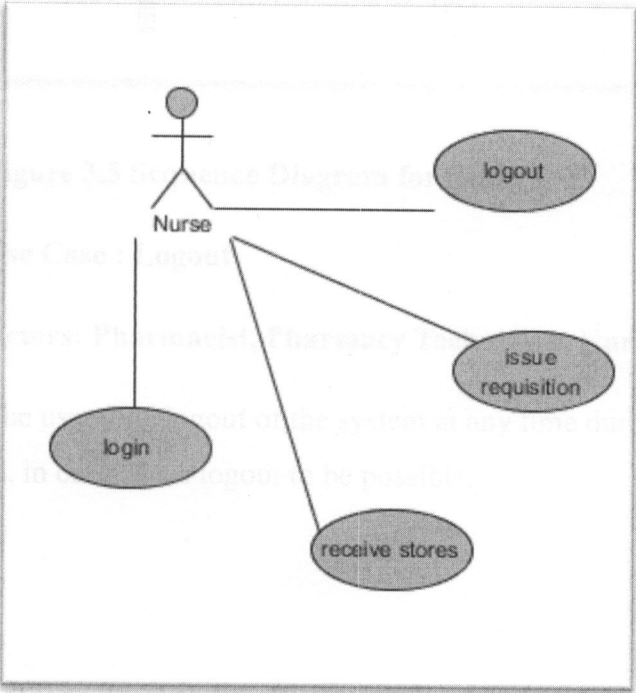
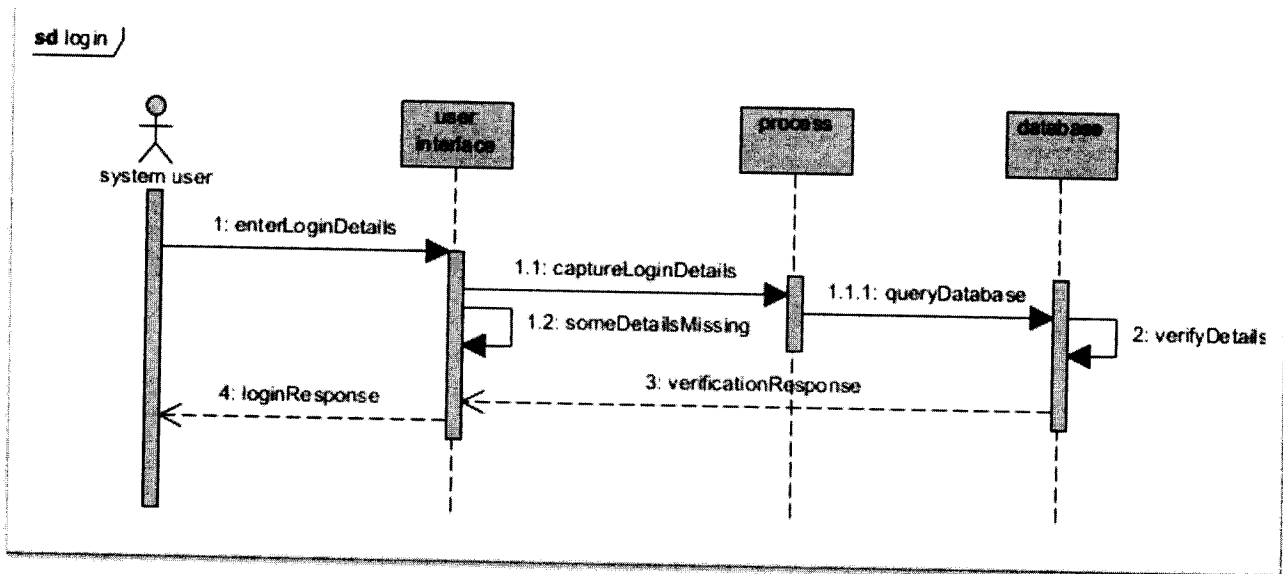


Figure 3.4 Nurse Use Case

**Use Case : Login**

**Actors:** Pharmacist, Pharmacy Technician, Nurse, Clinic Officer.

The system will require the user to login to the system via a pre-established username and password that is linked to the user’s account. The user cannot access any data unless they are logged in. The servers is used to verify the user’s credentials.

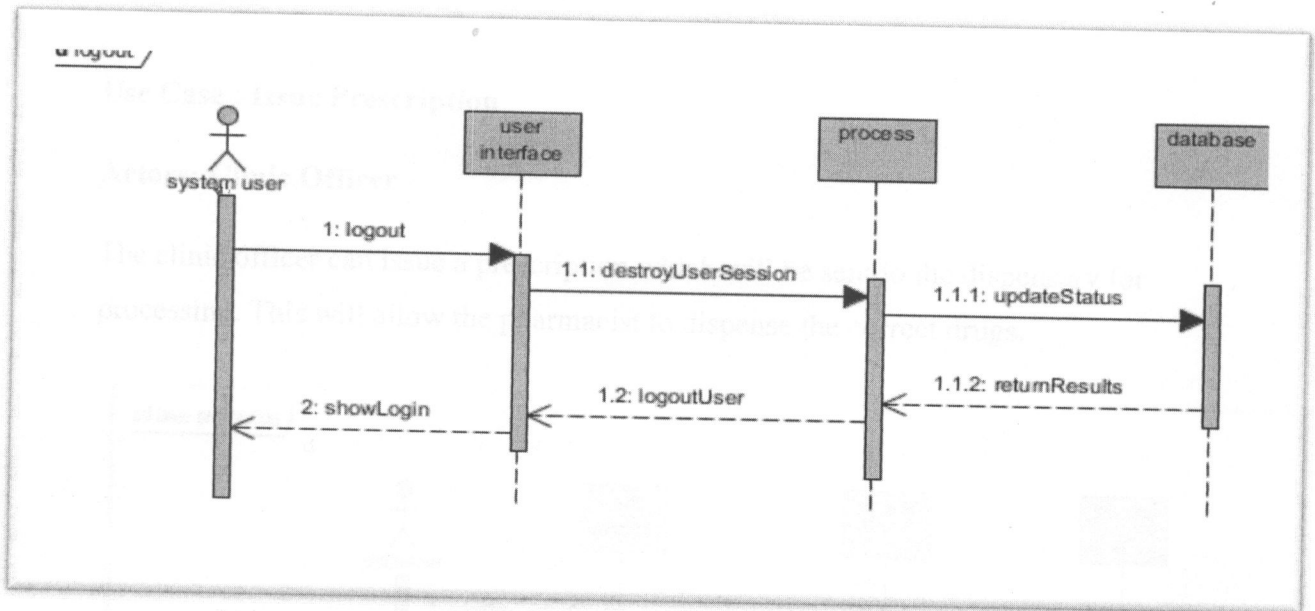


**Figure 3.5 Sequence Diagram for login.**

**Use Case : Logout**

**Actors:** Pharmacist, Pharmacy Technician, Nurse, Clinic Officer.

The user may logout of the system at any time during operations. A user must be logged in, in order for a logout to be possible.

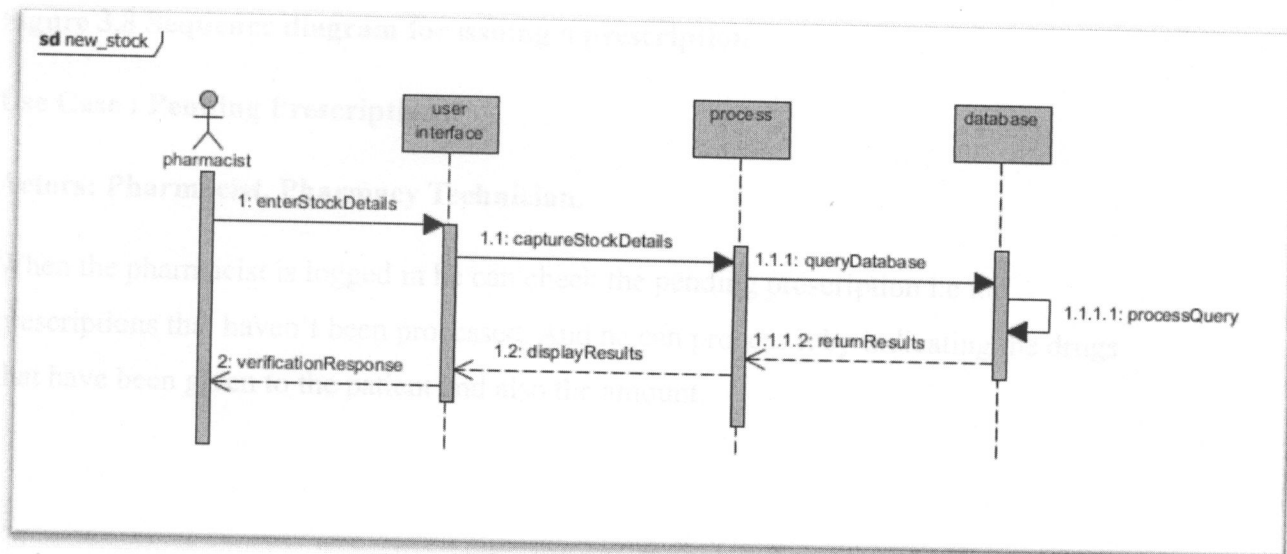


**Figure 3.6 : Logout Sequence Diagram**

**Use Case : Enter New Stock**

**Actors: Pharmacist.**

When the pharmacist is logged into the system, he can enter the new stock into the inventory which will be used by the system to keep track of the stores.



**Figure 3.7 : Sequence diagram for Entering New Stock**

### Use Case : Issue Prescription

Actors: Clinic Officer

The clinic officer can issue a prescription which will be sent to the dispensary for processing. This will allow the pharmacist to dispense the correct drugs.

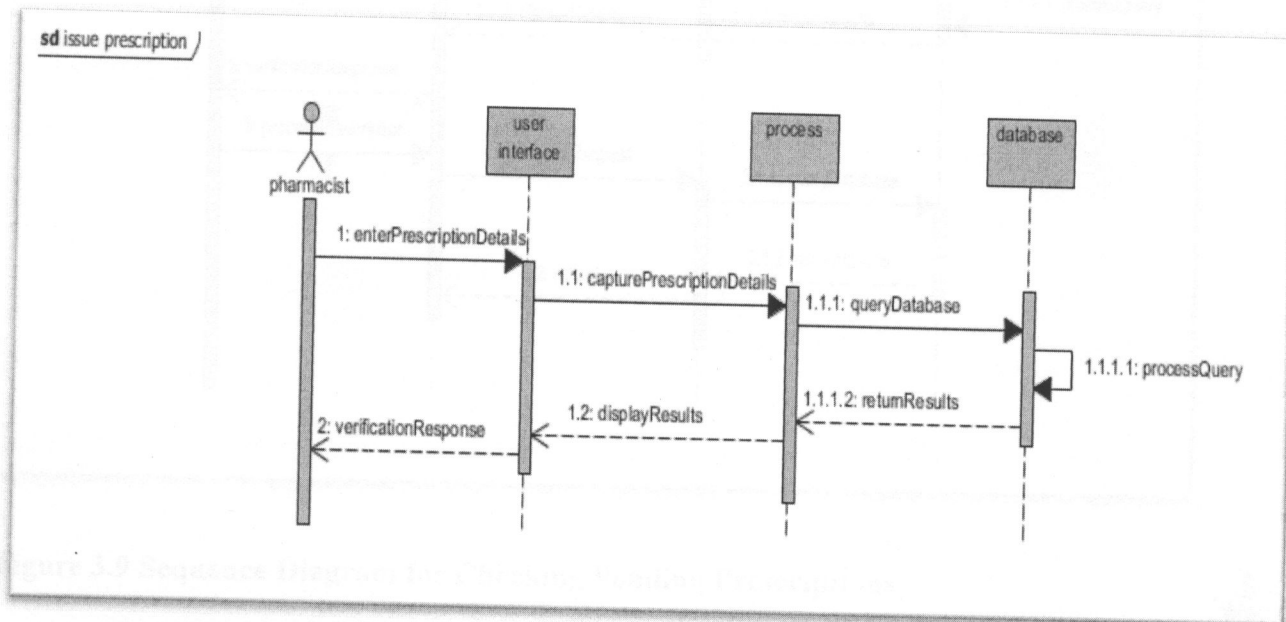


Figure 3.8 Sequence diagram for issuing a prescription

### Use Case : Pending Prescriptions

Actors: Pharmacist, Pharmacy Technician.

When the pharmacist is logged in he can check the pending prescription i.e the prescriptions that haven't been processed. And he can process it by indicating the drugs that have been given to the patient and also the amount.



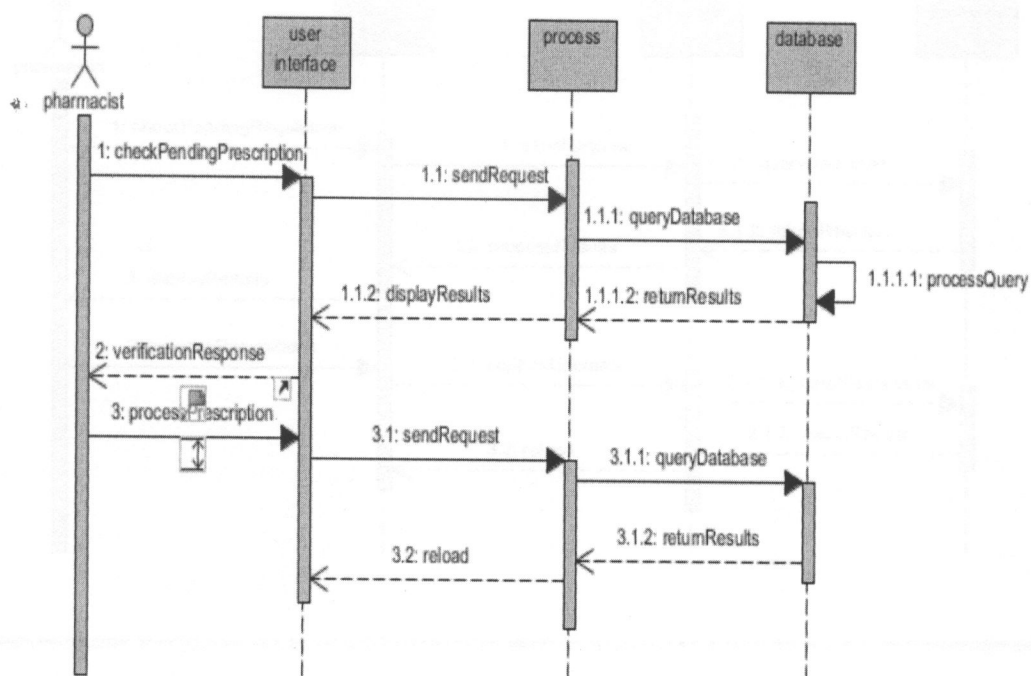


Figure 3.9 Sequence Diagram for Checking Pending Prescriptions

Use Case : Generate Reports

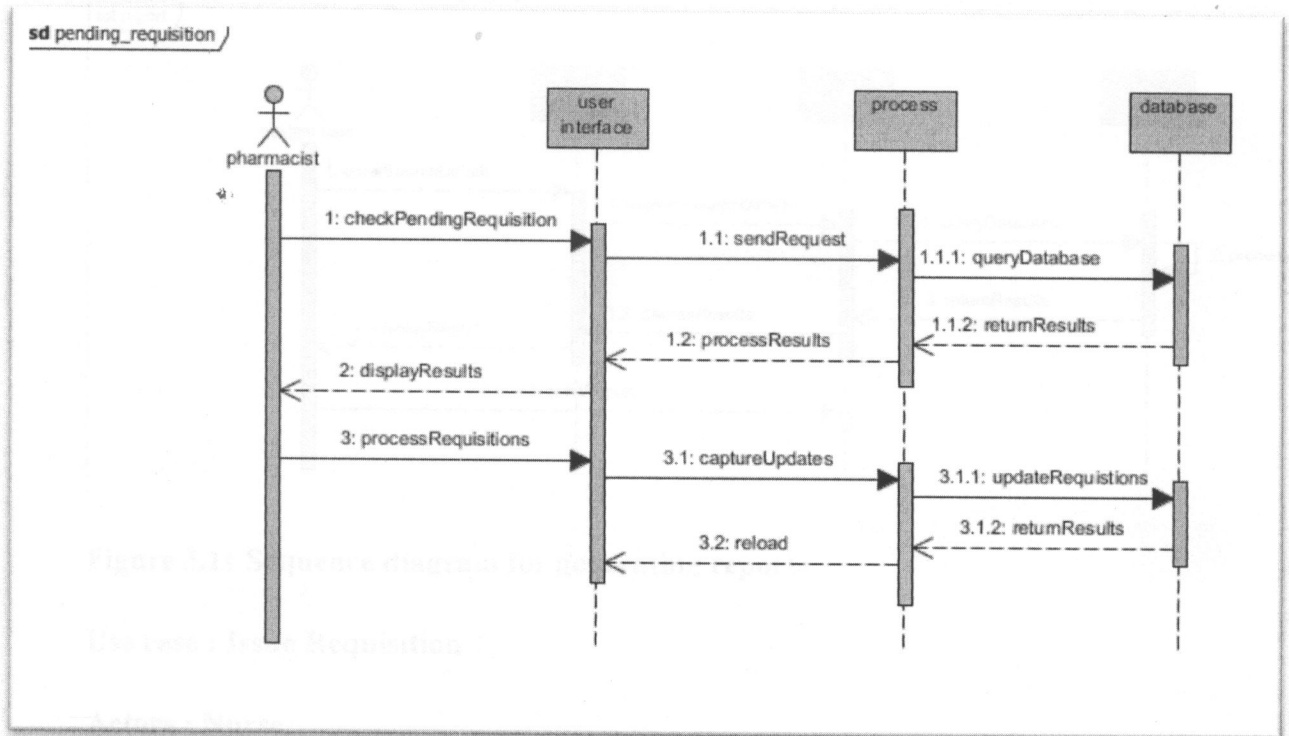
Use Case : Pending requisitions

Actor: Pharmacist, Pharmacy Technician

Actors : Pharmacist

The pharmacist and pharmacy technician can check the status of the requisitions that have been issued.

When the pharmacist is logged in he can check the requisitions that have been issued. Then he can search for drugs to confirm if they are in stock and then process the requisition by issuing the stores and indicating the amounts that have been issued.

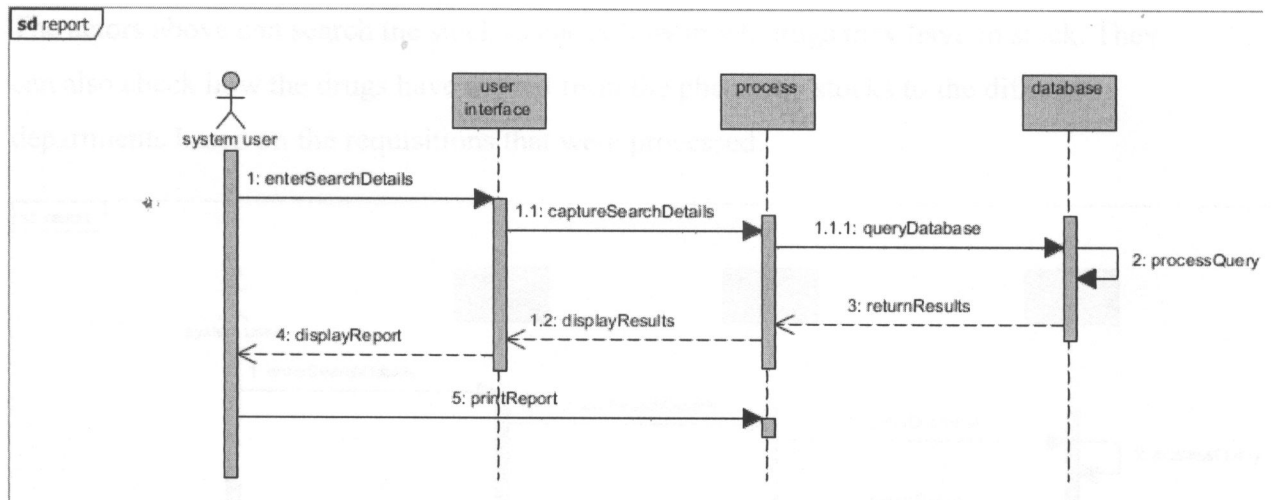


**Figure 3.10 Sequence Diagram for checking pending requisitions**

### Use Case : Generate Reports

**Actors: Pharmacist, Pharmacy Technician.**

The pharmacist and pharmacy technician can generate reports that indicate the quantity of the stores that they have in their respective departments. These reports can be sent to a printer for printing.

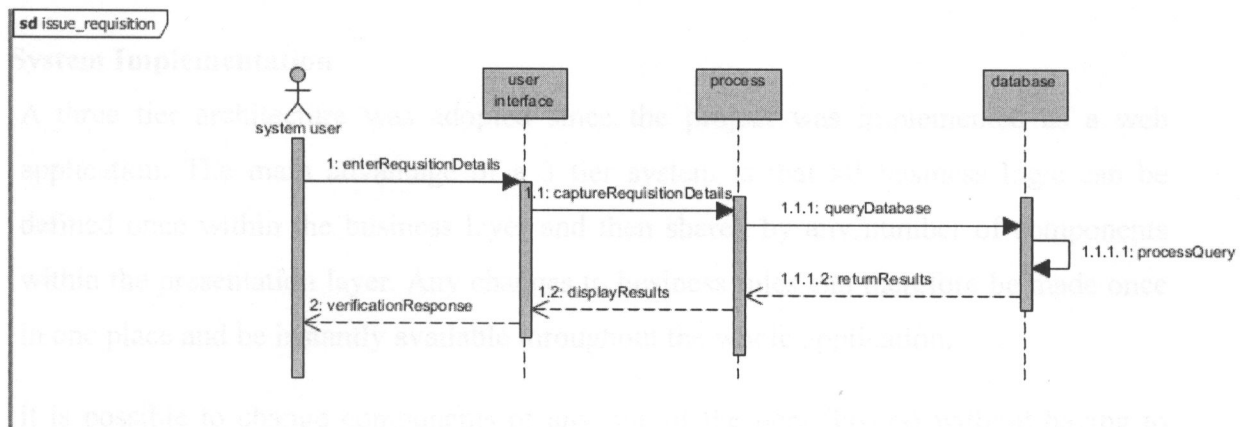


**Figure 3.11 Sequence diagram for generating reports**

**Use case : Issue Requisition**

**Actors : Nurse**

The nurse can issue a stores requisition for any department that he belongs to.



**Figure 3.12 Sequence diagram for issuing a requisition.**

**Use case : Search Stock**

**Actors : Pharmacist/Pharmacy Technician**

The actors above can search the stock to check how much drugs they have in stock. They can also check how the drugs have moved from the pharmacy stocks to the different departments based on the requisitions that were processed.

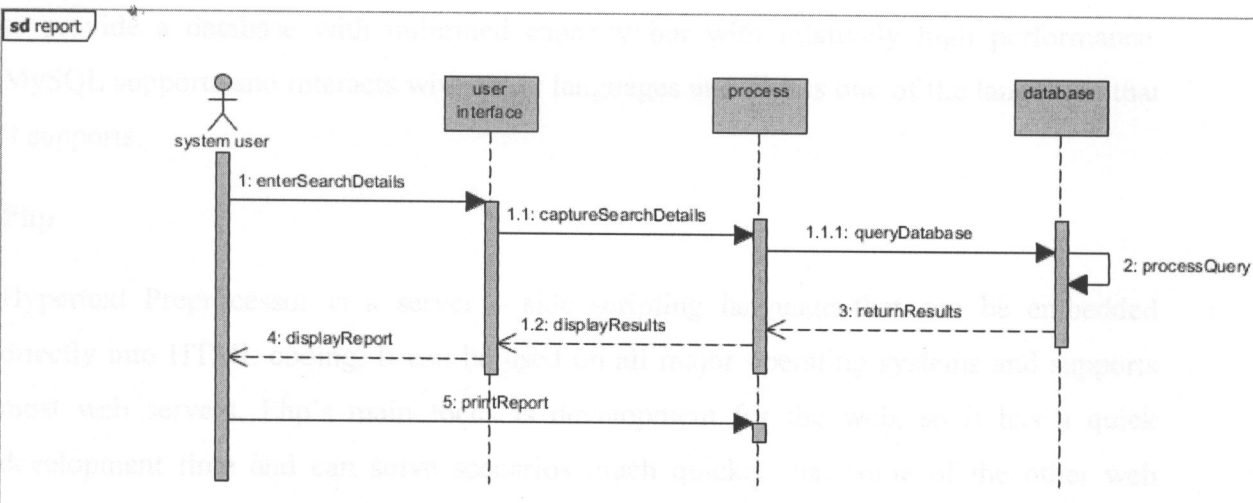


Figure 3.13 Sequence Diagram for Searching Stock

3.5. System Implementation

A three tier architecture was adopted since the project was implemented as a web application. The main advantage of a 3 tier system is that all business logic can be defined once within the business layer and then shared by any number of components within the presentation layer. Any changes to business rules can therefore be made once in one place and be instantly available throughout the whole application.

It is possible to change components of any one of the tiers (layers) without having to make corresponding changes in any of the others. Three tier architecture enables parallel development of the different tiers of the application. Complex application rules are easy to implement in the application server.

### **3.6. Research Tools Used**

#### **MySQL**

The database to be used for the project is MySQL. This is open source project that aims to provide a database with unlimited capacity but with relatively high performance. MySQL supports and interacts with many languages and Php is one of the languages that it supports.

#### **Php**

Hypertext Preprocessor is a server – side scripting language that can be embedded directly into HTML coding. It can be used on all major operating systems and supports most web servers. Php's main focus is development for the web, so it has a quick development time and can solve scenarios much quicker than some of the other web design languages. Php has good support for database interaction with the MySQL database which makes it a very good technology for this project.

#### **Wamp Server**

Wamp server is an acronym for Windows, Apache, MySQL and Php. It is a form of mini – server that can run on almost any windows operating system. It installs automatically Apache 1.3.32, Php5, MySQL database, Phpmyadmin and SQLitemanager on the computer. Wamp server as seen above is a one way install for all the major tools needed in the implementation of the project.

#### **JavaScript**

JavaScript is a scripting language designed primarily for adding interactivity to web pages and creating web applications. The language was first implemented by Netscape Communications Corp. in Netscape Navigator 2 beta (1995). Client – side JavaScript programs, or scripts, can be embedded directly in HTML source of Web pages. Depending on the Web Developer's intent, script code may run when the user opens the web page, clicks or drags some page element with the mouse, types something on the keyboard, submits a form, or leaves a page.

### **3.7. Summary**

This system has been implemented in an easy way to allow for future modifications and improvements. This was also a deliberate move to help those with no computer skills to easily learn how to use it.

## **4. CHAPTER 4: SYSTEM TESTING AND RESULTS**

### **4.1. Introduction**

This chapter demonstrates what the implementation and development of the project produced. It also discusses the methods that were used in testing the system. It only has three sections the first section looks at the system testing and the second contains the pictures of the implemented application. And the last section is a summary of this chapter.

### **4.2. System Testing**

#### **Test Scope**

The scope of the system testing includes the entire scope of the functional requirements outlined above.

#### **Test Cases**

A number of test cases were developed during the testing phase of the system development. A number of fictitious users of the system with different roles were created and allowed to perform the operations according to their respective roles.

#### **Unit Testing**

This was not much of a problem as it was done during the development of the individual pieces of the scripts themselves. After, being developed, the scripts were run and tested as small units.

#### **Integration Testing**

The final phase of testing was the integration testing. This involved testing the entire system as a whole. When all the scripts were integrated then the whole system was tested according to the requirements and its performance was compared with the performance of individual scripts or units.

4.3. Results

Login Page

This is the page that every user who types the address of the system will see and they must login from here.

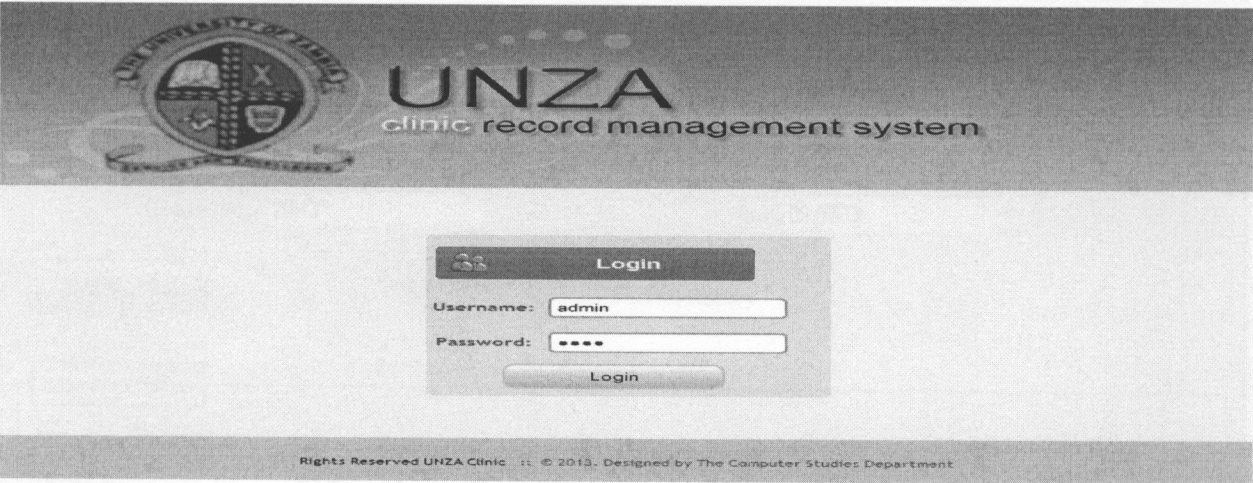


Figure 4.0 : Index Page

Home Page

This is the page that every user who successfully logs in will see.

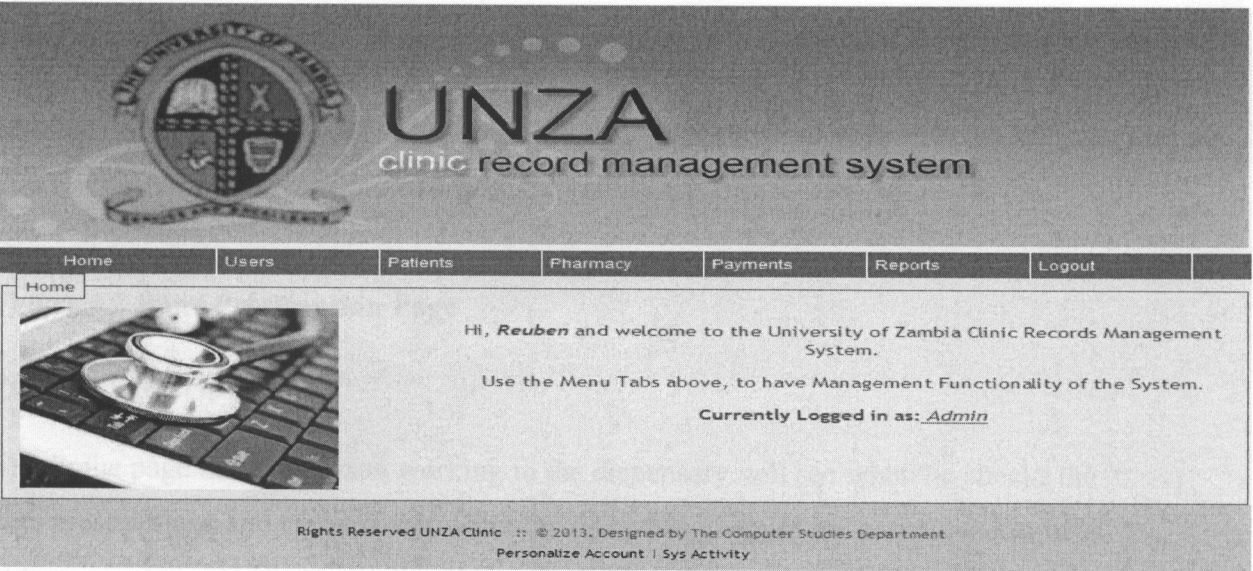


Figure 4.1:Home Page



### Issue Prescription Page

After entering the new medical record for a patient the clinician can issue a prescription using this form which is on the same page where he entered the new medical record.

Home

Users

Patients

Pharmacy

Payments

Reports

Logout

Pick Next Patient

Firstname

Isaac

Lastname

Nkumbukisha

Type

Student

Patient No.

123/08

Queued At:

20:43

On:

09-07-13

Call Next Patient

OR

☒ Medical History

Issue Prescription

No.	Formulation	Drug	Frequency	Dosage	Number of Days
1.	tab	Panadol	once	3	1
2.	cap	Septin	twice	3	2
3.	lotion	benzoate	once	2	3
4.	syrup	cough syrup	three times	5	5
5.		Select			

Submit Prescription

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Personalize Account | Sys Activity

Figure 4.2 Issue Prescription Page

### Pending Prescription

This is the page that the person working in the dispensary will see when he checks the pending prescriptions and can indicate which drugs he has given to the patient and in what quantities

Figure 4.3 Search Stock

HomeUsersPatientsPharmacyPaymentsReportsLogout

Pending Prescription

Please click on the name to see the prescription.

1:Isaac Nkumbukisha

Name : Isaac Nkumbukisha

Category : Student

Date : 2013-09-30

Prescription Id : 33

Formulation	Drug	Dosage	Frequency	Given	Quantity	No. of Days
tab	Panadol	3	once	Y <input checked="" type="radio"/> No <input type="radio"/>	15	1
cap	Septtrin	3	twice	Y <input type="radio"/> No <input type="radio"/>		2
lotion	benzoate	2	once	Y <input checked="" type="radio"/> No <input type="radio"/>	12	3
syrup	cough syrup	5	three times	Y <input checked="" type="radio"/> No <input type="radio"/>	23	5

Done

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Personalize Account | Sys Activity

Figure 4.4 Pending Prescription

## Search Stock

This is the page that is used to search for items in stock, items can be searched for using an interval or single day criteria.

HomeUsersPatientsPharmacyPaymentsReportsLogout

Search For Single Day Only

Item Name 

Select

Date(yyyy-mm-dd):

search

Search For Interval

Item Name 

Select

From (yyyy-mm-dd):

To(yyyy-mm-dd):

search

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Personalize Account | Sys Activity

Figure 4.5 Search Stock

Dispensary Stock Report

This report shows all the drugs in the dispensary.

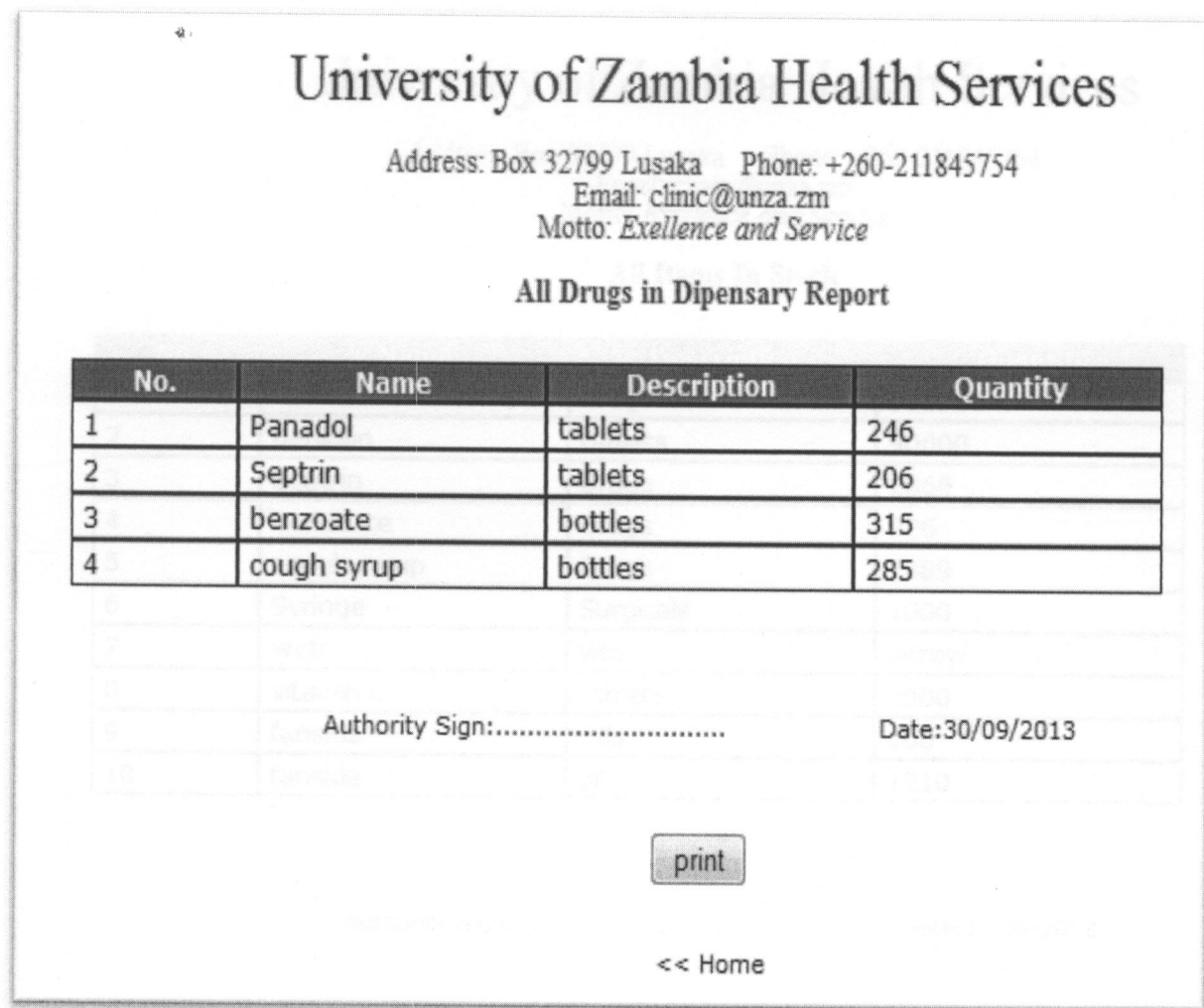


Figure 4.6 Dispensary Stock Report

Pharmacy stock report

This report shows all the items in the pharmacy stores.

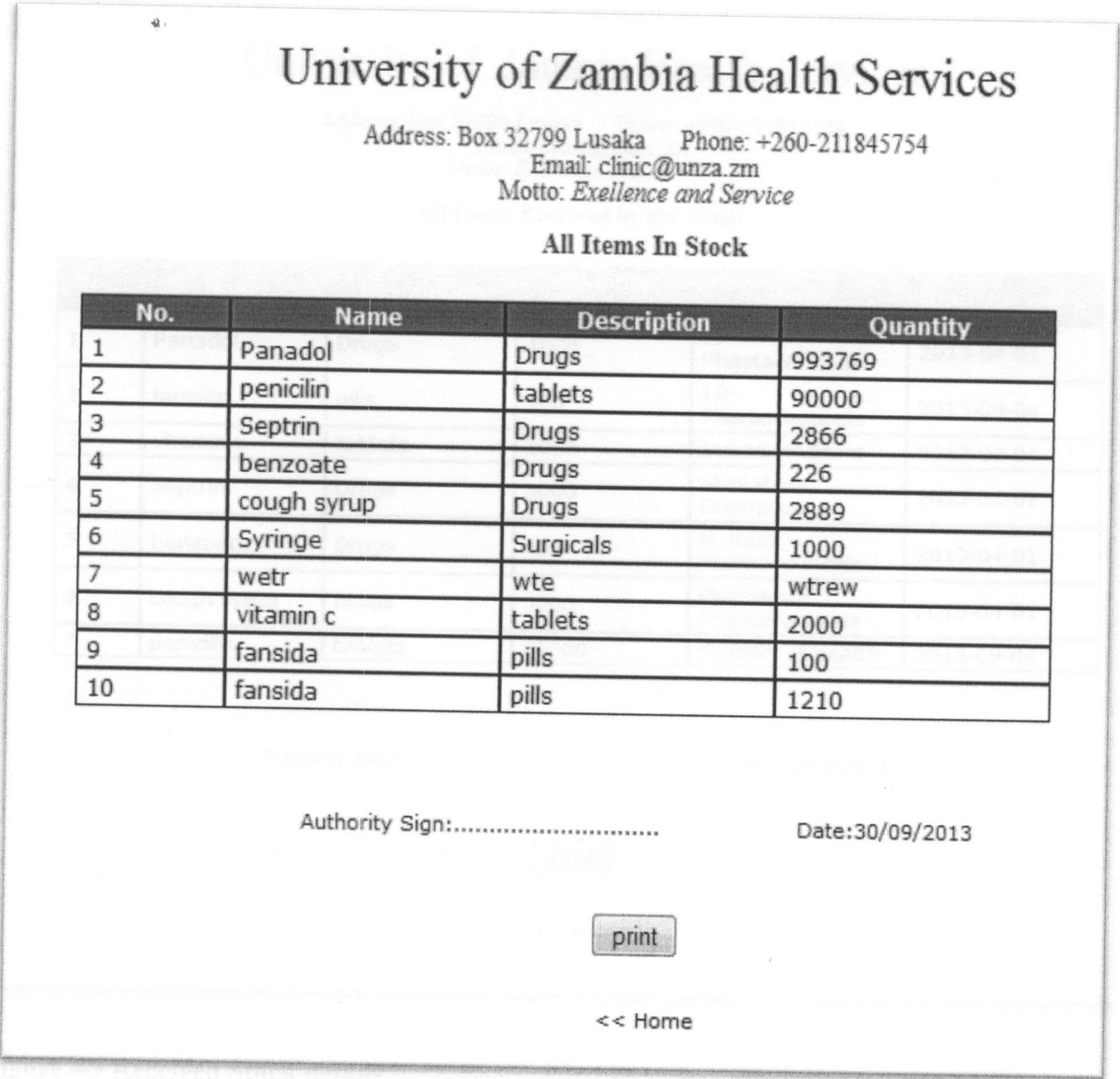


Figure 4.7 Pharmacy stock report

Received Stock details

This report shows all the items received by the pharmacy department.

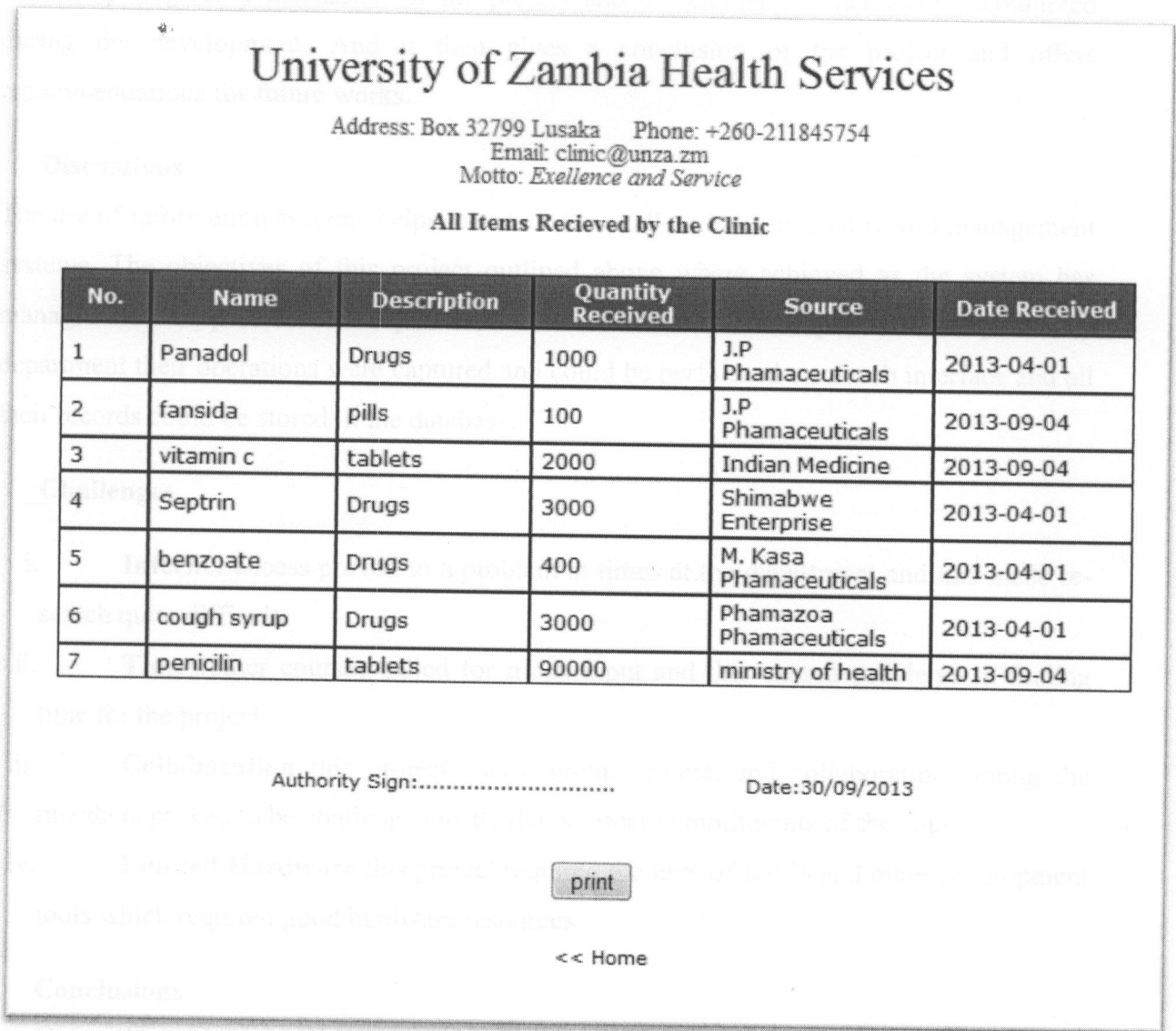


Figure 4.9 Received Stock details

4.4. Summary

The results achieved were as expected according to the requirements outlined above. This showed that the system is very useful and it was developed according to the requirements.



## 5. CHAPTER 5: DISCUSSIONS AND CONCLUSIONS

### 5.1. Introduction

This chapter gives a discussion of the project and the challenges that were encountered during the development. And it then gives a conclusion of the project and offers recommendations for future works.

### 5.2. Discussions

The use of information systems helps to reduce the challenges of manual record management systems. The objectives of this project outlined above were achieved as the system has managed to computerize the operations of the clinic. With respect to the pharmacy department their operations were captured and could be performed on a web interface and all their records could be stored in the database.

#### Challenges

- i. **Internet** access proved to be a problem at times at the department and this made research quite difficult.
- ii. **Time**: other courses called for much input and this caused problems in finding time for the project.
- iii. **Collaboration** this project was a group project, and collaboration among the members proved to be a challenge mostly due to other commitments of the courses.
- iv. **Limited Hardware** this project required the use of IDE's and other development tools which required good hardware resources.

### 5.3. Conclusions

University of Zambia Clinic Record Management System computerizes the operation of the University of Zambia Clinic. This helps the clinic to solve some of the problems posed by the manual record system that they are currently using such as the costs of the stationary and the file cabinets for storing the files and the hiring of clerks.

### 5.4. Future Works

This project just considered the registry and the pharmacy department. Other departments such as the wards, ART clinic, lab were left out since this is the first version. Some new

functionality can be added to this system. New reports depending on the client's requirements can also be issued.

When issuing prescriptions the drugs are preloaded from the database using Php this can be done using Ajax so that the selected drugs moves out to the list when issuing the second drug. The project hasn't captured the prescription of injections this can be added when capturing the treatment department of the clinic. The number of items that can be prescribed have been restricted to five, using JavaScript this can be made dynamic. When processing the prescription the system can also be improved so that it can calculate the cost of the drugs and add that automatically to the receipt of the patient. Currently when issuing the prescription when a medical officer selects the formulation even the drugs that don't exist in that formulation still appear on the drugs tab, this can be improved in way such that when the clinician selects the formulation only the drugs that exist in that formulation are displayed.

## **5.5. Summary**

This project was developed according to the outlined requirements. And the staff at the clinic expressed confidence and confirmed that it is going to help reduce the cost incurred by the purchase of stationary from the University of Zambia Press. And they are anxiously waiting to see its deployment.

## 6. APPENDIX

### 6.1. Login

```
if (!isset($_SESSION)) {  
  
    session_start();  
  
    }  
  
    //action for the particular form  
  
    $form_action = $_SERVER['PHP_SELF'];  
  
    //process login in first, check if use has clicked the submit button  
  
    if(isset($_POST['submit'])){  
  
        //declare redirect pages  
  
        $redirect_success = "landing.php";  
  
        $redirect_failed = "error.php";  
  
        //check the user against the database using thes queries  
  
        $login_query = "select * from users where  
username='".$_POST['username']."' and password=md5("'" .$_POST['password']."'");  
  
        $login_query_result = mysql_query($login_query) or die("tatatata  
".mysql_error());  
  
        $unique_user_exist = mysql_num_rows($login_query_result);  
  
        //check if there is a unique user with those credentials  
  
        if($unique_user_exist == 1){  
  
            //pull variables from resultset to create sessional varriables  
  
            $name = mysql_result($login_query_result, 0,'f_name');
```



```

$man_number = mysql_result($login_query_result, 0, 'man_no');

$_SESSION['username'] = mysql_result($login_query_result, 0, 'username');

$_SESSION['role'] = mysql_result($login_query_result, 0, 'role');

//declare session variables

$_SESSION['name'] = $name;

$_SESSION['man_number'] = $man_number;

$role = $_SESSION['role'];

//redirect user to the admin account upon verification

header("location:".$redirect_success);

//change login status of user

$login_status = "update users set status='1' where
username='".$$_POST['username']."' and password=md5('".$_POST['password']."'");

$login_statusResult = mysql_query($login_status);

}else{

//else redirect to the error page if not successive

header("location:".$redirect_failed);}}

?>

<br /><br /><br /> <form method="post" action="<?php echo $form_action; ?>"
name="form" onsubmit="return(validate());">

<div id="loginBox">

<p><h2>Login</h2></p>

<table>

```

```
<tr>
```

```
    <td><strong>Username:</strong></td>
```

```
        <td><input class="textbox" type="text" size="20"
name="username"></td>
```

```
</tr><tr><td></td></tr><tr>
```

```
    <td><strong>Password:</strong></td>
```

```
        <td><input class="textbox" type="password" size="20"
name="password"></td>
```

```
</tr>
```

```
<tr><td colspan="3"><input class="button" type="submit" value="Login"
name="submit"></td></tr>
```

```
</table>
```

```
    </div>
```

```
<br /><br /><br />
```

```
</form><script>  function validate(){
if(document.form.username.value == "" ){
alert("Username Cannot be empty!");
document.form.username.focus();
return false;    }
if(document.form.password.value == "" ){
alert("Password Cannot be empty!");
document.form.password.focus();
```

```
return false;    }    }</script>
```

## 6.2. Issuing prescription

```
<fieldset>
```

```
<legend>Issue Prescription</legend>
```

```
<form name="form" method="post">
```

```
<table>
```

```
<tr><td> No. </td><td>Formulation</td><td> Drug </td><td> Frequency  
</td><td>Dosage</td><td>Number of Days</td>
```

```
</tr><?php
```

```
for ($k=1; $k<=5; $k++){
```

```
    $formulation = "formulation".$k;
```

```
    $drg= "drug".$k;
```

```
echo "<tr><td>$k.</td><td><input type='text' name='\".$formulation\"'.  
id='\".$formulation.\"'></td><td><select id='\".$drg.\"' name='\".$drg\"'.><option  
value='\"default\"'> Select </option>";
```

```
$query = "SELECT item_id, item_name FROM pharmacy_stock where type = 'drugs'";
```

```
$result = queryMysql($query);
```

```
if($result){ $rows = mysql_num_rows($result);
```

```
for($j=0; $j<$rows; $j++) {$row = mysql_fetch_row($result);
```

```
echo "<option value = '\"$row[0]\"'> $row[1] </option>";    }
```

```
}
```

```

$dose = "dosage".$k; $freq = "frequency".$k;

$number_of_days = "num_days".$k;

echo

" <td><input type='text' name='$freq' id='.$freq.'" ></td><td><input type='text'
name='$dose' id='.$dose.'" ></td><td><input type='text' name='$number_of_days'
id='.$number_of_days.'" ></td></tr>";

} ?><tr>

<td colspan="5"><input type="submit" value="Submit Prescription"
class="submit_prescription"/>

<input type="hidden" value="<?php echo $pNumber ; ?>" id="patient_num" /><td>

<tr>

</table>

</form>

</fieldset>

```

### 6.3. Ajax code for submitting the data

```

</script>

<?php $_SESSION['count'] = 0; //added by Reuben to send prescription data ?>

<script type="text/javascript">

$(function(){

    $(".submit_prescription").click(function(){

```

```

var dose = "#dosage"+1;      var dosage = $(dose).val();

    varpNumber = $("#patient_num").val(); ;

    $.ajax({
type: "POST",

url: "prescription.php",

data: {pNumber:pNumber},

success: function(data,textStatus,xhr){

alert(data);

    },      error:function(xhr,textStatus,error){

alert(error);

    }
});

    for(i=1; i<=5; i++){

var form = "#formulation"+i;

vardrg = "#drug"+i;

varfreq = "#frequency"+i;

var dose = "#dosage"+i;

    varnum = "#num_days"+i;

if (($ (form).val()!="") && $(drg).val() !="" )&& $(freq).val() != "" )&&
($ (dose).val()!="")&&$(drg).val() !="default")&& $(num_days).val()!="")

```

```

        { var formulation = $(form).val();

var drug = $(drg).val();

var frequency = $(freq).val();

var dosage = $(dose).val();

        varnum_days = $(num).val();

        $.ajax({

type: "POST",

url: "new_prescription.php",

data:
{formulation:formulation,drug:drug,frequency:frequency,dosage:dosage,num_days:num_days},

success: function(data,textStatus,xhr){

        //alert(data);

        },

error:function(xhr,textStatus,error){

        // alert(error);

        }}});    }

        } //end for-loop

return false;

    });

```

```
});
```

```
</script>
```

#### 6.4. Php code querying the database

```
<?php
```

```
//first if stmt
```

```
if($_POST)
```

```
{
```

```
    $prescription_id = 0;
```

```
        $count = 1;
```

```
    foreach ($_POST as $item){
```

```
        $sql= "Select Prescription_Id from prescription order by Prescription_Iddesc";
```

```
    $presult = mysql_query($sql);
```

```
    $details = mysql_fetch_array($presult);
```

```
    $pNumber=$details['Prescription_Id'];
```

```
        $query = "INSERT INTO `prescription_items` (`Prescription_Id`, `Drug_No`,  
`Dosage`, `Frequency`, `formulation`) VALUES  
        ($pNumber, '".$_POST['drug']."', '".$_POST['dosage']."',  
        '".$_POST['frequency']."', '".$_POST['formulation']."'");
```

```
$result = queryMysql($query) ;
```

```
    *
```

```
$_SESSION['count']=2;
```

```
    } //end of for loop
```

```
echo "prescription successfully added";
```

```
    }//end of if
```

```
?>
```

## 6.5. Pending prescription

```
<fieldset>
```

```
<legend>Pending Prescription</legend>
```

```
<?php
```

```
echo "<br/>";
```



```
$queryName = "SELECT f_name, l_name, Type, pc.prescription_id, date,
(year(curdate())-year(dob)) as age , pc.patient_id FROM Patient p, prescription pc
WHERE pc.patient_id = p.patient_id and pc.handled = 0 ";
```

```
$result1 = queryMysql($queryName);
```

```
$resultName = mysql_num_rows($result1);
```

```
if($resultName==0){
```

```
echo<<<_END
```

```
<div id="head" >
```

```
<table border="0" class="gradienttable" width="760" align="center">
```

```
<tr>
```

```
<th width="90" height = "50">Currently there are no pending prescriptions!</th>
```

```
</tr>
```

```
</table>
```

```
</div>
```

```
_END;
```

```
}
```

```
else {
```

```
echo<<<_END
```

```
<div id="head" >
```

```
<table border="0" class="gradienttable" width="760" align="center">
```

```
<tr>
```

```
<th width="90" height = "50">Please click on the name to see the prescription.</th>
```

```
</tr>
```

```

</table>

</div>

_END;

//echo "<div>" . "<br/>". "</div>";

echo<<<_END

<form method = "post" action = "pending_prescription.php" >
_END;

        for($i=0; $i<$resultName; ++$i )
        {
            $num = $i+1;
            $row = mysql_fetch_row($result1);

echo<<<_END

                <input type="button" name="search" value="$num:$row[0] $row[1]"
class="button" onclick="toggle($row[3]);"/>
_END;

echo "<div id = \"\$row[3]\" style=\"display:none;\"> ";

echo<<<_TAB

        <table class="gradienttable" cellpadding="20px">

        <tr>

        <th width = "300" height = "30">Name : $row[0] $row[1] </th>
        <th width = "200">Category : $row[2]</th>
        <th width = "200">Date : $row[4]</th>

```

```

<th width = "200">Prescription Id : $row[3]</th>
</tr>

</table>

_TAB;

echo "<br/>";

echo<<<_TAB
    <table class="gradienttable" cellpadding="20px">

        <tr>
<th width = "100" height = "40">Formulation </th>
<th width = "150">Drug </th>
<th width = "100">Dosage </th>
<th width = "100">Frequence</th>
<th width = "100">Given </th>
                <th width = "100">Quantity </th>
        </tr>

_TAB;
$queryDetails = "SELECT DISTINCT dosage, frequency, formulation, item_name,
item_id FROM prescription_items pi, pharmacy_stockps, prescription pc WHERE
pi.prescription_id = '$row[3]' and ps.item_id = pi.drug_no ";

$result2 = queryMysql($queryDetails);

$resultDetails = mysql_num_rows($result2);

for($j=0; $j<$resultDetails; ++$j )

```

```

        {
$rowd = mysql_fetch_row($result2);
$drug_no[] = $rowd[4];
echo<<<_END

        <tr>

<td>$rowd[2] </td>
<td>$rowd[3] </td>
<td>$rowd[0] </td>
<td>$rowd[1] </td>
<td>Y <input type = "radio" name = "$j" value = "yes"/> No <input type = "radio" name
= "$j" value = "no"/></td>

                <td><input type="text" name = "quantity" size =
"2px"></td>
</tr>

_END;

        }

echo<<<_END
<tr><td colspan = "6"><input type= "submit" value = 'Done'><td></tr>
</table>
<div id = "button" style = " position:relative; left :50px;" >
<input type= "hidden" name = 'update' value = 'yes'>
<input type= "hidden" name = 'prescription_id' value = '$row[3]'>
<input type= "hidden" name = 'patient_id' value = '$row[6]'>
<input type= "hidden" name = 'total_drugs' value = '$resultDetails'>
</div>
</form>
_END;

```

```

        echo ""."</div>";
        echo "<div>" . "<br/>"."</div>";
    }
}

?>

```

```
<script type="text/javascript" language="javascript">
```

```

function toggle(id){
    var e = document.getElementById(id);
    if (e.style.display=="block"){
        e.style.display="none";
    }
    else {
        e.style.display="block";
    }
}

```

```
</script>
```

```
<?php
```

```

if(isset($_POST['update'])&&isset($_POST['prescription_id']))
{
    $id = get_post('prescription_id');
    $queryUpdate = "update prescription set handled = 1 where prescription_id = '$id'";
    if (queryMysql($queryUpdate))
    {
        echo "This prescription of $id has been done";
    }
}

```



```

        echo "update successful";
    }

    $resultTotal = get_post('total_drugs');//get the total number of drugs given
to a patient

for ($t =0; $t<$resultTotal; $t++){
    if (isset($_POST[$t])&&($_POST[$t]=="yes")){

        $quantity = get_post('quantity');//quantity given to patient
        $drgn = $drug_no[$t];
        $query_amount = "select charge_per_unit from pharmacy_stock
where item_id = $drgn";
        $result_amount = queryMysql($query_amount );
        $row_amount = mysql_fetch_row($result_amount);
        $amount = $row_amount[0];
        $cost = $amount * $quantity ;
        $pid = get_post('prescription_id');

        //item name to be entered on a payment ticket
        $item_name = get_post('drug');

        $updatePres = "update prescription_items set given = 'yes', cost =
'$cost', quantity = '$quantity' where prescription_id          = $pid and drug_no =
$drgn ";
        $result_update_pres= queryMysql($updatePres);
        $updateDisp = "update dispensary set quantity_in_stock = quanti-
ty_in_stock - $quantity wheredrug_no = $drgn ";
        $result_update_disp= queryMysql($updateDisp);

        if($result_update_disp&&$result_update_pres){

```

```

        echo "<div>Update Successful</div>";
    }
}

elseif(isset($_POST[$t])&&($_POST[$t]=="no"))
{
    $pid = get_post('prescription_id');
    $drgn = $drug_no[$t];
    $query_not_given = "update prescription_items set given
= 'no' where prescription_id = $pid and drug_no = $drgn ";
    queryMysql($query_not_given);
}
}
//reload the page
header('Location: pending_prescription.php');
}
?>

```

```

</fieldset>

```

## **6.6. Abbreviations**

Unza – University of Zambia

EMR – Electronic Medical Record



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