

# **'iMediCare' System for Doctor - Patient Interactions**

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**2021**



# **‘iMediCare’ System for Doctor- Patient Interactions**

**A dissertation submitted for the Degree of Master  
of Information Technology**

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**University of Colombo School of Computing**

**2021**



## DECLARATION

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of

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under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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## **ABSTRACT**

'MediCare' is a medical center in Kadawatha that has been in operation since 2015. It offers medical facilities to patients. The Medical Center is modest, with only about four examination rooms. They have a steady stream of patients and also offer laboratory services to them. Doctor channeling is currently done over the phone because they are operating manually. Because they don't have access to an online system, all of the employees are having a difficult time.

Considering the issues that arise in the traditional way of manual operations 'iMediCare' solution is proposed to facilitate better diagnosis by the doctor by providing patient medical history and analysis based on previous records. Also, the system is designed to carry out the basic operation within the channeling center to have smooth relationship between the patient and the medical center. The system will also provide visibility to the patient of their records, reports, and other details.

The hybrid approach was chosen as the software development life cycle model for the effective completion of system development. In addition, the system was designed using the Unified Modeling Language (UML), and the diagrams were drawn using various tools such as wire-frame, creately, and Star UML. The system implementation was done using MVC architecture and the fun framework was used for developing the system with HTML, CSS, and JS. For the creation of this web-based system, PHP was utilized as a server-side programming language, and the development environment was constructed using XAMPP with Apache and MySQL servers.

The project was successfully completed, allowing the client to continue operating efficiently and effectively. Furthermore, it was able to successfully eliminate existing issues in the manual system while maintaining an acceptable level of client satisfaction.

## **ACKNOWLEDGEMENT**

The success and final end of this project necessitated a great deal of direction and assistance from many people, and I consider myself quite fortunate to have received it during the duration of my project. All of what I've accomplished has been possible solely because of their guidance and aid, and I'd like to express my gratitude to them.

I respect and thank Mr. W.V Welgama giving me the opportunity to complete the project and for providing me with all of the necessary support and direction. I owe him a huge debt of gratitude for all of his help and advice.

I'd want to offer my heartfelt gratitude to my family and friends for their unwavering support and encouragement in helping me complete this system.

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## LIST OF ABBREVIATIONS

CMS	:	Content Management System
CSS	:	Cascading Style Sheets
HTML	:	Hypertext Markup Language
MVC	:	Model View Controller
PHP	:	Hypertext Preprocessor
RDBMS	:	Relational Data Base Management System
SDLC	:	Software Development Life Cycle
SMS	:	Short Message Services
UI	:	User Interface
XML	:	Extensible Markup Language

# **CHAPTER 1: INTRODUCTION**

## **1.1 Project Overview**

'MediCare' medical center is situated in Kadawatha and it continues its operations since 2015. It provides freestanding medical facility for outpatients. The Size of the Medical Center is small with around 4 examination rooms. They are having regular base of patients and provide Laboratory Services also for the patients.

Currently they are operating manually doctor channeling is done over the phone. All the staff members are facing many difficulties since they don't have an online system to operate. As a solution for that 'iMediCare 'System is proposed.

This project targets implementing a web-based system where the patient can have online appointments and have their medical records, all other details saved and viewed in one place. By this, time will be saved, and the medical errors can also be reduced, moreover, the doctor-patient relationship can be improved.

## **1.2 Motivation**

Going for a doctor checkup has become a day to day problem for people these days. Most people tend to prefer private hospitals and private channeling centers to government hospitals because it takes a lot of time in the government hospitals for a patient to consult a doctor. Due to this reason, private hospitals have become competitive and it is said that the private sector contribution to the provision of health care in Sri Lanka has been growing in the last two decades.

Even with the invention of technology, these days the people of this era do not have time to waste, they seem occupied the whole time of the whole day. So, they find the easy way to consult a doctor, and that is done in the private channeling centers. There are several e-channeling applications and hospitality management systems have developed to serve these problems in isolation.

As a solution for that, 'iMediCare' Application was developed to provide efficient and effective communication between doctors and patients with online doctor channeling facility. so that can be recognized as a major motivation to implement such a system for 'MediCare' medical center.

### **1.3 Objectives**

The main objective of this project is to develop a web-based system where the user can find out all the details of the channeling center in a centralized system. The proposed system is linked to doctor details, reception, and patient records so that the patient can get everything in one window.

The system will facilitate to make decisions by the doctor providing patient medical history and by analysis provided by previous records, and also carry out the basic operation within the channeling center.

The system will also provide visibility to the patient of their records, reports, and other details.

Followings are considered as objectives of the suggested system.

- ✓ To provide an automated solution to keep patient wise records, analysis. Currently 'MediCare' Medical Centre is operating manually and keeping patient wise records is a tedious operation.
- ✓ To provide an online channeling facility where a patient can easily book an appointment with the doctor without time waste and provide options to connect with doctors at times where physical interactions are not possible ( video channeling).
- ✓ To minimize the risk of misjudgments by the doctor based on analysis of past medical history.
- ✓ To provide an integrated system with patients and doctors where both users can easily access the information.
- ✓ With busy schedules, patients normally tend to forget their frequent check-ups. By sending reminders, the system will help to minimize that risk.
- ✓ Provide an easy option to share medical reports with clients securely and convenient way. Currently 'MediCare' Medical Centre uses various methods to share medical reports by introducing this system it is anticipated to provide a hazel free convenient option to patients share medical reports.

## 1.4 Scope

The main focus of this project is to provide an e-channeling facility with maintaining all patient details and provide a facility to view all these details by both doctor and the patient.

**The project scope is limited to the following.**

- ✓ Ability to register patients to the system by entering basic information and a separate account is created for the patient. The login details will be shared by text message or by email.
- ✓ Ability to channel doctors based on the availability once logged in to the system, and Ability to have audio or video channeling facility by connecting to a doctor.
- ✓ Once appointment is confirmed confirmation message will be generated as a text message to the patient with relevant information.
- ✓ The patient will be given a facility to view a separate dashboard with health analysis and health charts based on medical history.
- ✓ Ability to maintain digital noticeboard and send reminders to patients of their frequent checkups.
- ✓ The Administrator will have ability to perform all the admin tasks including doctor registration, maintaining doctor schedule and managing appointments.
- ✓ The doctor will have separate logins to the system using the username and the password given to him and check the records and the details of the patient appointments and prescribe medicines during consultation.
- ✓ The system will also facilitate sharing medical reports through the system.

## **1.5 Structure of the Thesis**

### **Chapter 1 – Introduction**

In the first chapter it includes a brief description about the client, project, objectives and the scope of the project and the structure of the dissertation.

### **Chapter 2: Background**

Requirement analysis will be done through this section. Under that existing system will be thoroughly analyzed. Also, this chapter will discuss similar existing systems that relate with the proposed system and how proposed system is differ from existing systems. further it will be discussed the available technologies for design the & implementation of ‘iMediCare’ Application with their pros and cons.

### **Chapter 3: System Design**

Software designing methodologies will be discussed in this chapter. Under that Design approaches, system designing diagrams, and user interfaces(UI) will be included.

### **Chapter 4: Implementation**

System implementation details including major pseudo code segments will be included. Further Software designing tools and techniques and concepts also will be contained.

### **Chapter 4: Testing & Evaluation**

Final Solution will be evaluated under this chapter. The evaluation will be done with respect to the project objectives. Also, problems encountered, testing results, user acceptances, and rejections also taken into consideration for the evaluation.

### **Chapter 5: Conclusion**

This Chapter will conclude the work carried out during the project and the result of the project. Further, it will include future enhancements of the project and lessons which are learned through the implementation of the project.

### **Chapter 5-References**

In the reference section all the references cited in the desertion is included as a list.

## **Chapter 6-Appendices**

Detailed information which are too detailed to include in the body of the dissertation are included in this section.

## CHAPTER 2: SYSTEM ANALYSIS

### 2.1 Introduction

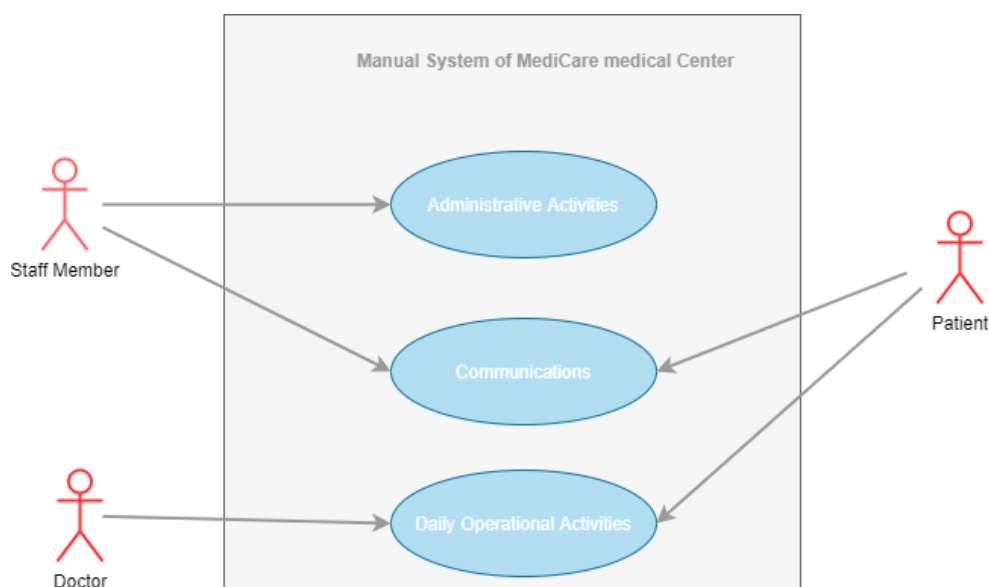
Requirement gathering and analyzing is essential for understanding and defining the project scope. To gather requirements of 'MediCare' medical Center followings fact finding techniques were used.

1. Studying existing manual system with documentation.
2. Observations from the working environment.
3. Interviewing users.

Studying existing manual system and observations were used as the primary fact-gathering techniques. Also reviewing the documentation of an existing processes was useful to the identification of process flow of the system. Interviewing the people who are engaging with the main processes in the medical Center was critical source to identify the exact expectations of the users.

#### 2.1.1 Existing Manual System

Currently, 'MediCare' medical center manages all transactions manually, with communication taking place either orally or over the phone. The current system can be divided into three sub-sections. Refer Figure 2.1 Existing Manual to see those sections.



**Figure 2.1 Existing Manual System**



Under the administrative functions, new patients are registered in their manual system using patient's name and keep their records in a MS Excel sheet. Also available doctors and their available times are recorded manually. Additionally, all the laboratory services related document and details are kept manually using MS Excel Sheets.

When it comes to the daily operations of the medical center, everything is done manually. As an example, when they collect blood and send those to the laboratories and when they receive reports they keep records manually and inform to the relevant patient over the phone. Also activities related to the daily channeling process also carried out manually. Currently there is no option to keep records of medical history of the patient.

### **2.1.2 Drawbacks of the existing system**

Drawbacks of the existing system in 'MediCare' medical center can be discussed from two perspectives. one is from the Staff members point of view including doctors and other one is drawbacks from the patient point of view.

#### **Drawbacks faced by staff members of the 'MediCare' medical center**

- Staff members are assigned huge paper works as daily duties.
- Facing many difficulties when it is needed to communicate with patient.
- It is very cumbersome to track the records of the patients.
- Some of the works are needed to be done repeatedly.
- It is not easy to access past medical history of the patient when required.

#### **Drawbacks faced by patient**

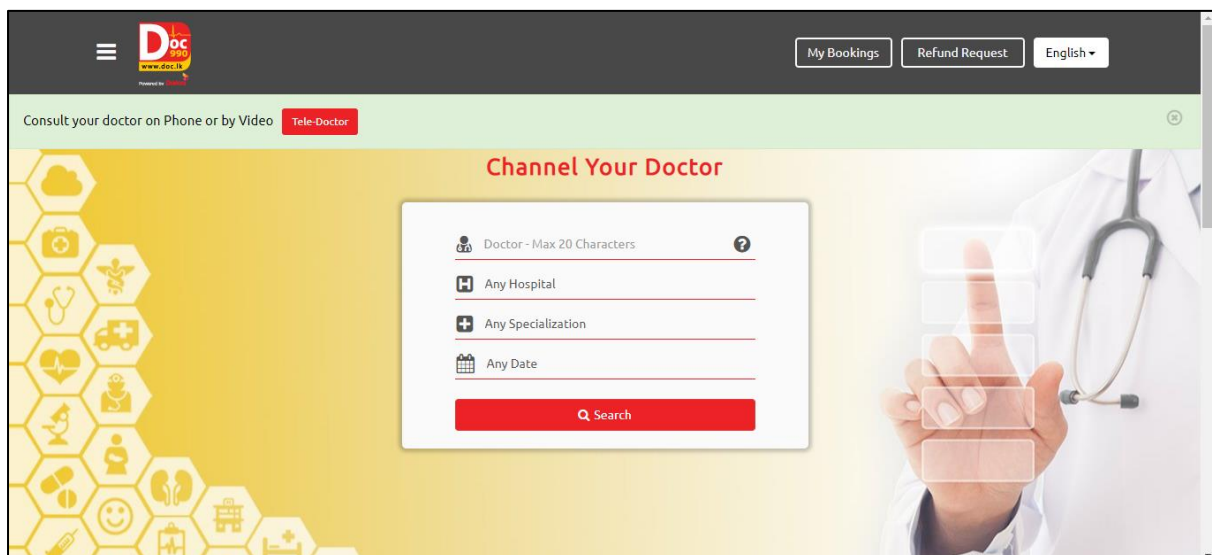
- Facing difficulties when placing appointments.
- If patients are missing some of the information it is not easy to track again.
- No place to keep details of their medical history without possibility of losing those.
- Patients are missing some of the notices that doctors informed them.

## 2.2 Review of Similar systems

In Sri Lanka, there are several applications developed for online channeling (Doc990, n.d.) (echannelling, 2021) purposes and many hospital management systems (ehealth4everyone, n.d.) (acsonne, n.d.). In the current context, there are very complex, and advanced hospital management systems that have been implemented with the following feature .

1. **Patient Management**-mostly focused on controlling patient flow and an online appointment facility.
2. **Facility Management**- focus on tracking and maintaining the room availability, the occupancy status as well as various kinds of administrative documentation.
3. **Inventory Management.**
4. **Staff Management.**
5. **Accounting.**
6. **Reporting.**

### Doc 990 Channeling Solution



**Figure 2.2 Doc 990 e-Channeling System**

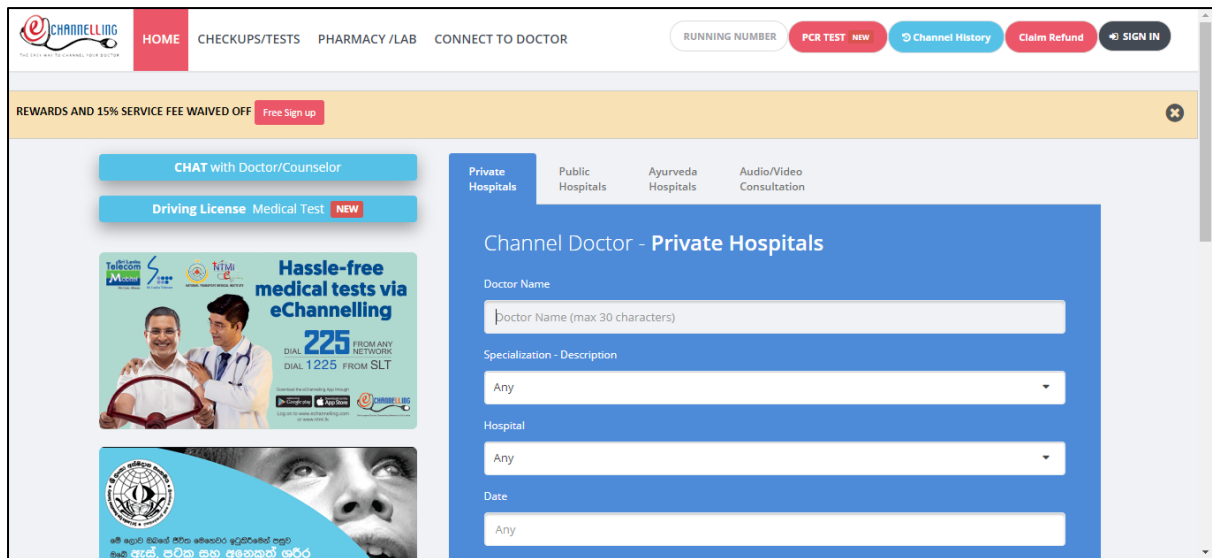
Doc990 (Doc990, n.d.) is a service that allows to make doctor appointments at Sri Lanka's leading hospitals. The primary function of this system is to, allows users to schedule appointments with doctors and health specialists based on their availability, and to make payments online.

Despite the fact that Doc990's initial value proposition was to provide patients and hospitals with a less expensive and higher-quality alternative to the existing doctor channeling service, it has now expanded its services to cover a number of more services. (Viljoen, December 2018)

The current suite of services offered by Doc990 includes:

1. Channel Your Doctor : Patients can use Doc990 to book and pay for in-person appointments with healthcare specialists via a digital platform.
2. Tele Doctor Service : This function allows for a phone consultation between a patient and a doctor.
3. Medicine to Your Doorstep : By uploading a copy of their prescription to the Doc990 app or web platform, users can order and pay for prescription medications.
4. Healthcare to Your Doorstep : Patients can use this option to request that health treatments be delivered to their house or a specific place. Patient transportation, home-based examinations, doctor consultations, and expert care or treatment are among the health services available (nursing, physiotherapy, etc.).
5. Lab Reports : Lab results are uploaded to Doc990 by staff at partner hospitals, and patients can access them easily and securely through Doc990.

## e-channeling Solution



**Figure 2.3 channeling Solution**

e-Channelling PLC (echannelling, 2021) is Sri Lanka's first software development and ICT service provider for the healthcare sector. Primary function of this solution is also to make it easier for the general public to schedule a meeting with a health Specialist or Consultant at a time and location that is convenient for them. (echannelling, n.d.)

In addition to it's primary function e-Channelling solution provides following value-added services to their clients.

- |               |   |
|---------------|---|
| For Hospitals | <ul style="list-style-type: none"> <li>: Notification to Doctors (SMS notification system, to inform patients about the updated doctor appointment status)</li> <li>Notification from the D-Doctor (SMS notification system to inform doctors about their appointment details )</li> </ul>              |
| For Patients  | <ul style="list-style-type: none"> <li>: Refunds for no-shows (enables a hassle-free reimbursement of all payments made for the patient's missed appointment.)</li> <li>offers a discount on the e-Channeling service fee, as well as merchandise from 800+ merchants all across the island.</li> </ul> |

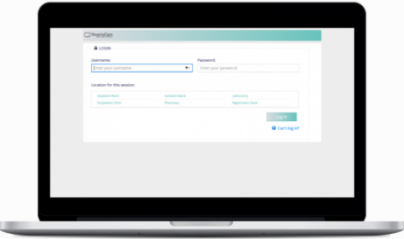
## Smartacare System

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### Smartacare

Smartacare is an electronic health record system that enables efficient healthcare delivery through digitization of healthcare processes.



#### Features

- Easy to Use**  
It requires no technical expertise to install and it is easy to learn. The interface of the software can easily be navigated ensuring patient encounters are effective and always positive.
- Secure, private and ensures confidentiality**  
Smartacare is developed with strong security features built-in to help protect patient privacy and prevent data breaches.
- Easy Patient Capture**  
Smartacare boasts of unique clinical tools that can help healthcare providers easily capture patient health information while staying engaged during the visit.
- Easy to customize**

Caritas NIGERIA

**Figure 2.4 Smartacare System**

## Accureare Solution

S Administrator Plus Demo

ACCURATE Watch later Share

Welcome To GALAXY LIFE CARE SERVICES P. LTD. (1850)

Please Login

manager1

Login

ACCURATE Designed & Developed By Accurate Info Soft Pvt. Ltd.  
Best view in Google Chrome With Minimum Screen Resolution 1280\*768

MORE VIDEOS

2:25 / 4:53

YouTube

**Figure 2.5 Accurate Solution**

The accurate solution (acsonne, n.d.) is an offshore hospital management software that is developed to have effective and dependable hospital administration software solutions that fulfill client requirements.

Following modules are provided by the Accurate solution.

1. Patient Management : Every patient treated in a hospital will be assigned a unique Patient ID, which may be used to track patient visits
2. OPD Management : Registration with the OPD When a patient arrives at the reception counter, he is automatically assigned a new registration number. His personal information, as well as the services he wants, are entered into the software.  
Handles payments for all services Provided with complete Patient Information.
3. Laboratory Management : As the test is booked at reception request is automatically send to laboratory. Lab can feed the result later and prints attractive reports.
4. Pharmacy Management : Complete pharmacy shop can be managed through this module. Additionally it can be linked to main billing. As patient collects medicines from pharmacy shop their charges will automatically transfer to patient billing.
5. Store Management : Maintain Purchase order with due dates of delivery Maintain MRN and Issue slips Maintaining Stock, Reorder levels and show appropriate warning. Bills can be adjusted against the payments made at another department.

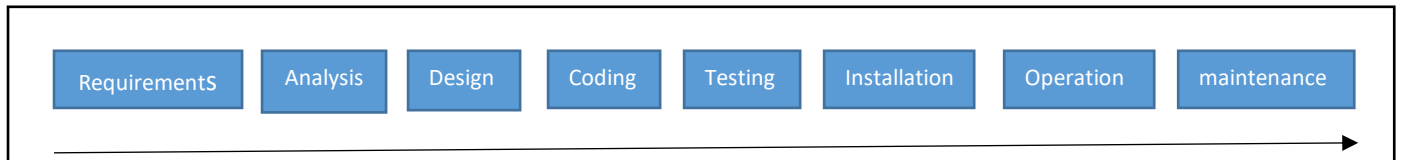
When analyzed features of these systems, mostly both online channeling systems and hospital management systems are developed in an isolation.

The main identified drawback is that, even though these most complex hospital management systems are keeping records and have several functionalities, those systems do not pay attention to the patients. Especially the records of the patients, those are not visible to the patients.

So there no such system which meets the exact requirement of the patient which sends reminders and keeps records of them with access to those records and analyzed details.

## 2.3 Software Process Model

Software developments and processes go through a development lifecycle which is called software development lifecycle (SDLC). Generally, SDLC is interrelated with traditional ‘waterfall’ methodology. In real scenario most of other models also outline the stages of SDLC. Typical software lifecycle includes following stages. Requirements, Analysis, Design, Implementation (coding), Testing, Installation, Operation, Maintenance.



**Figure 2.6 Software Development Life-cycle**

Software development methodology act as a framework for the development of the system through out of the SLDC. There are several development methodologies are available such as Waterfall, Prototype, Agile, Rapid development (Acodez, n.d.).

Selection of suitable development methodology depends on the implementation type and the type of the software (wikipedia.org, n.d.).

The implementation methodology following for this system is Hybrid Development Methodology. Hybrid Development Methodology is a combination of both formal and agile development methodologies. During the development, it was not targeted for frequent releases, as most of the requirements are capture initially. Formal development was focused while allowing agile features to be included during the development period as my proposed solutions have so many features that can be recognized separately and it is having complex modules.

## 2.4 Functional Requirements

### Admin Module Functionalities

- System shall be able to add, and edit Patient.
- System shall be able to add, and edit Doctors.
- System shall be able to maintain doctor’s availability.
- System shall be able to maintain individual patient’s lab reports.
- System shall be able to cancel appointments.

## **Patient Module Functionalities**

- System Shall be able to search a doctor using name.
- System Shall be able to search a doctor based on specialty.
- System shall be able to search doctor's availability base on date.
- System shall be able to show all available doctors for a particular date based on the specialty of the doctor.
- System shall be able to create a new onsite or video appointment.
- System shall be able to generate online video call to contact channeled patient.
- System shall be able to record next appointment date.
- System shall be able to generate reminders about appointment dates to the patient.
- System shall be able chat with selected professional expertise.
- System shall be able to provide separate dashboard to each patients and doctors.
- The Patients shall be able to view patients' Lab Reports.
- The Patients shall be able to view patients' Health analysis graphs, (body pressure, heart rate, body temperature, BMI etc.)

## **Doctor Module Functionalities**

- The Patients and Doctors shall be able to view patients' medical history Reports.
- The Doctors shall be able to view patients' Lab Reports.
- The Doctors shall be able to view patients' Health analysis graphs, (body pressure, heart rate, body temperature, BMI etc.)
- System shall be able to generate digital prescription and keep patient other records of current consultation. (calculate body pressure, heart rate, body temperature, BMI etc.)



## **2.5 Non-Functional Requirements**

- User Friendliness-facilitates user friendly interfaces so that new users understand the application easily
- Compatibility- When functioning the system all modules are interconnected together and all module compatible with other module.
- Reliability- Application must be reliable in order to provide a quality and trustworthy information.
- Time Saving- Using application users must be able to save time for doctor channeling
- Integrity- There are several modules in the system. Those modules should work together to fulfill the required need.

## CHAPTER 3: SYSTEM DESIGN

### 3.1 Introduction

Software design plays an important role in the software development life cycle. It usually involves problem solving and planning a software solution. This includes both low-level component and algorithm design and high-level, architecture design. Software design can be defined as follows.

“Software design is the process by which an agent creates a specification of a software artifact, intended to accomplish goals, using a set of primitive components and subject to constraints” (Anon., n.d.)

The requirements identified in the analysis phase are transformed into design models during the software design phase. A software design model can be known as the blueprint of the software which is to be implemented. Goal of the software design process is to produce a model which satisfies the requirements of the client without any bugs.

### 3.2 Related Design Strategies

There are so many design strategies available to select when developing a software. The different strategies may involve how the system being implemented (Way of development), the hardware environment and the software environment.

Selecting one of the best strategies is an important decision and should liaise with the requirement of the project and the cost concerns.

Considered development strategies for the project development are as follows

<b>Way of Development</b>	Develop Software from Scratch
	Use open-source component
<b>Hardware Environment</b>	Standalone personal Computer
	Client Server environment
<b>Software Environment</b>	Windows
	Linux
	MacOS
	Linux

**Figure 3.1 Development Strategies**

Now a days opensource components are readily available in the internet. Compared to the developing system from the scratch the effort that is takes is very less and can be customized according to the project requirement. The time takes to develop a system from the scratch is too long and the cost is also higher. Considering those factors, the system is developed using open-source components.

The developed 'iMedicare' System is a web-based system since that the selected hardware environment is client server environment. Additionally, Windows software environment is selected as that is currently available and matches with the project requirements.

### **3.3 System Design**

System design is the Process of designing system elements such as architecture, modules, and components. It is very much important to identify different interfaces of those components and the data goes through the system in the design stage.

The main purpose of the design process to identify detailed information about the system and elements of the system to enable the system implementation consistent with architectural entities and models and views of the system architecture.

As a methodical approach to arrive for the design, following steps were taken into consideration.

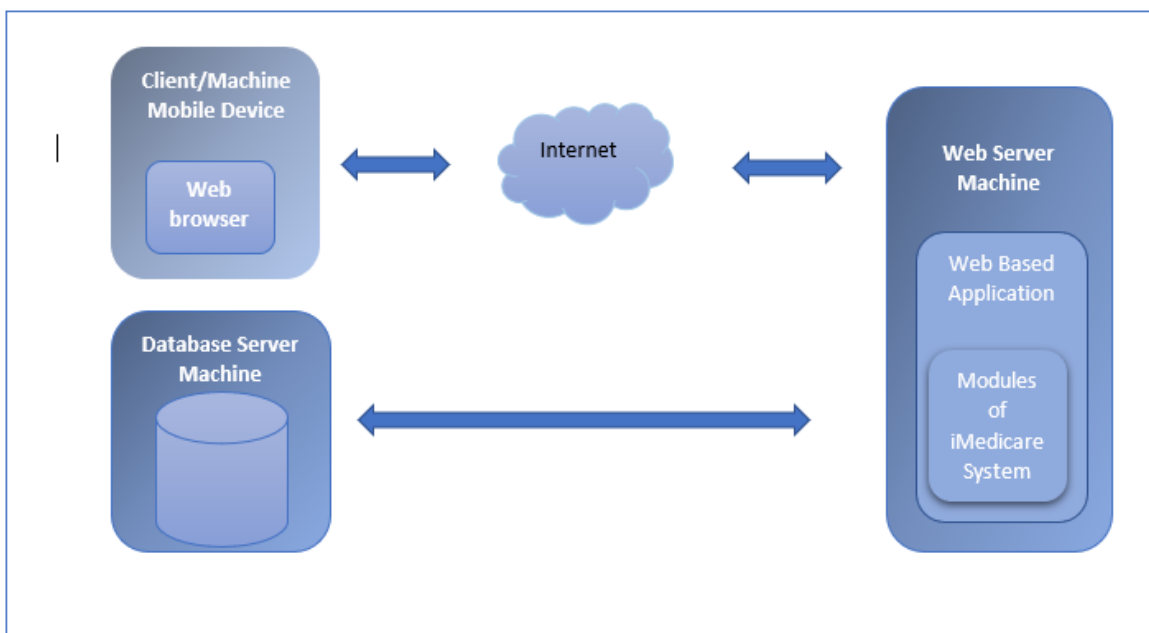
- System architecture was designed.
- Based on the analysis is done for the identified functional requirements, the use case diagram was designed to show how external entities are interacting with the system.
- Flow of events were identified using activity diagram.
- Designed sequence diagram to identify sequence of message interaction.
- Identified entities and relationships to come up with the relational database.
- UI design was done

### 3.3.1 Design Architecture

Design Architecture is a process of defining the sub-systems that involves in making up a system and the framework for communicating and controlling the defined sub-systems. Architectural design is done at the early stage of a system design process also it shows the connection between specification and design processes. (Sommerville, n.d.).

Description of software architecture is the output of architectural design.

Below diagram represents system architecture of ‘iMedicare’ Application. It demonstrates how the web application interacts with the server. In this architecture, a separate database server is kept running to handle complex operations. This three-tire architecture consists of a client tire (web browser), a middle tire (web server), and a third tire (database).



**Figure 3.2 System Architecture of ‘iMedicare’ Application**

### 3.3.2 Use Case Diagram

A use case diagram is a simplest representation of user interaction with the system. It depicts relationship between each user with different use cases in the system in each user's perspective.

Refer Below for the use case diagram of proposed system.



**Figure 3.3 Use Case Diagram of 'iMedicare' Application**

Three actors for the application were identified and the diagram depicts various interactions of the actors with the several identified use cases.

### Use Case Narratives

- **Use Case Description - Login**

Every actor must be able to log in to the system. *Table 3.1 Use Case Description* shows use case description for login.

<b>Use Case</b>	Login
<b>Actors</b>	Administrator, Doctor, Patient
<b>Description</b>	
All registered users can login to the system	
<b>Pre-Conditions</b>	
Have a authorized Username and Password combination	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Enter User Name (E-mail) and Pass word</li> <li>2. If the e-mail/username and password combination is valid then they can log in to their respective “dashboard” page.</li> <li>3. If the e-mail/username and password combination is invalid, a relevant error message is appeared.</li> </ol>	
<b>Post-Conditions</b>	
Only the authorized persons have the access to the system. others cannot log in to the system.	

**Table 3.1 Use Case Description – Login**

- **Use Case Description – Patient Registration**

Refer *Table 3.2 Use Case Description - Patient Registration* for patient registration.

<b>Use Case</b>	Patient Registration
<b>Actors</b>	Administrator, Patient
<b>Description</b>	
Administrator or Patient can be able to register a new patient in the system	
<b>Pre-Conditions</b>	
Logged in to the system as Administrator or view Landing page as a Patient	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate to the Registration Page.</li> <li>2. Enter all mandatory Information.</li> <li>3. Submit the information.</li> </ol>	
<b>Post-Conditions</b>	
If the patient registration is done successfully in the system, then patient will be notified by email regarding the registration.	

**Table 3.2 Use Case Description - Patient Registration**

- **Use Case Description – Create Doctor Specialty**

The system should maintain doctor specialty in order to assign doctors at doctor registration and search doctors when scheduling an appointment.

Below *Table 3.3 Use Case Description- Create Specialty* shows use case description of creating specialty.

<b>Use Case</b>	Create Specialty
<b>Actors</b>	Administrator
<b>Description</b>	
Administrator can be able to create new specialty in the system	
<b>Pre-Conditions</b>	
Logged in to the system as Administrator	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate to the Specialty Page.</li> <li>2. Enter Specialty Information.</li> <li>3. Submit the information.</li> </ol>	
<b>Post-Conditions</b>	
If the specialty created successfully in the system, then it should appear in both doctor creation and new appointment screens.	

**Table 3.3 Use Case Description- Create Specialty**

- **Use Case Description – Make an Appointment**

Below *Table 3.4 Use Case Description- Make an appointment* shows use case description of Make an appointment.

<b>Use Case</b>	Make an Appointment
<b>Actors</b>	Patient, Administrator
<b>Description</b>	
Patient or Administrator can be able to make a new appointment in the system	
<b>Pre-Conditions</b>	
Patient or Administrator should have logged in to the system.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate to make an appointment Page.</li> <li>2. Enter all required details. (Search doctor based on specialty, date or name )</li> <li>3. Submit the information</li> </ol>	
<b>Post-Conditions</b>	
If the appointment is successfully created in the system, then patient will be notified by email regarding the appointment.	

**Table 3.4 Use Case Description- Make an appointment**

- **Use Case Description -Consultation**

Below *Table 3.5 Use Case Description-Consultation* shows use case description of Consultation.

<b>Use Case</b>	Consultation
<b>Actors</b>	Doctor, Patient
<b>Description</b>	
The Doctor can be able to initiate the consultation	
<b>Pre-Conditions</b>	
Doctor should have accessed the system and landed on the Dashboard. Upcoming channels should be available on the dashboard.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate to the upcoming consultation.</li> <li>2. Click on Consultation Button.</li> <li>3. Prescribe medicine.</li> <li>4. Enter required reports.</li> <li>5. Submit the information.</li> </ol>	
<b>Post-Conditions</b>	
If consultation successfully saved it should view on the channel history of the patient.	

**Table 3.5 Use Case Description-Consultation**

- **Use Case Description -Upload Medical Reports**

<b>Use Case</b>	Upload Medical Reports
<b>Actors</b>	Administrator
<b>Description</b>	
The Administrator should be able to upload Medical Reports of patients to the system.	
<b>Pre-Conditions</b>	
Administrator should have accessed system and landed on Admin panel.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate to Medical Reports section.</li> <li>2. Select relevant patient.</li> <li>3. Enter Report type.</li> <li>4. Upload attachment</li> <li>5. Submit the information.</li> </ol>	
<b>Post-Conditions</b>	
If consultation successfully saved it should view on the lab report section on patient dashboard.	

**Table 3.6 Use Case Upload Medical Reports**

Refer to Appendix A- Use Case narratives for all use cases



### 3.3.3 Activity Diagram

Flow of activities are represented graphically using activity diagram. Activity diagram for the doctor channeling module is shown below.

#### Activity Diagram for Doctor Channeling

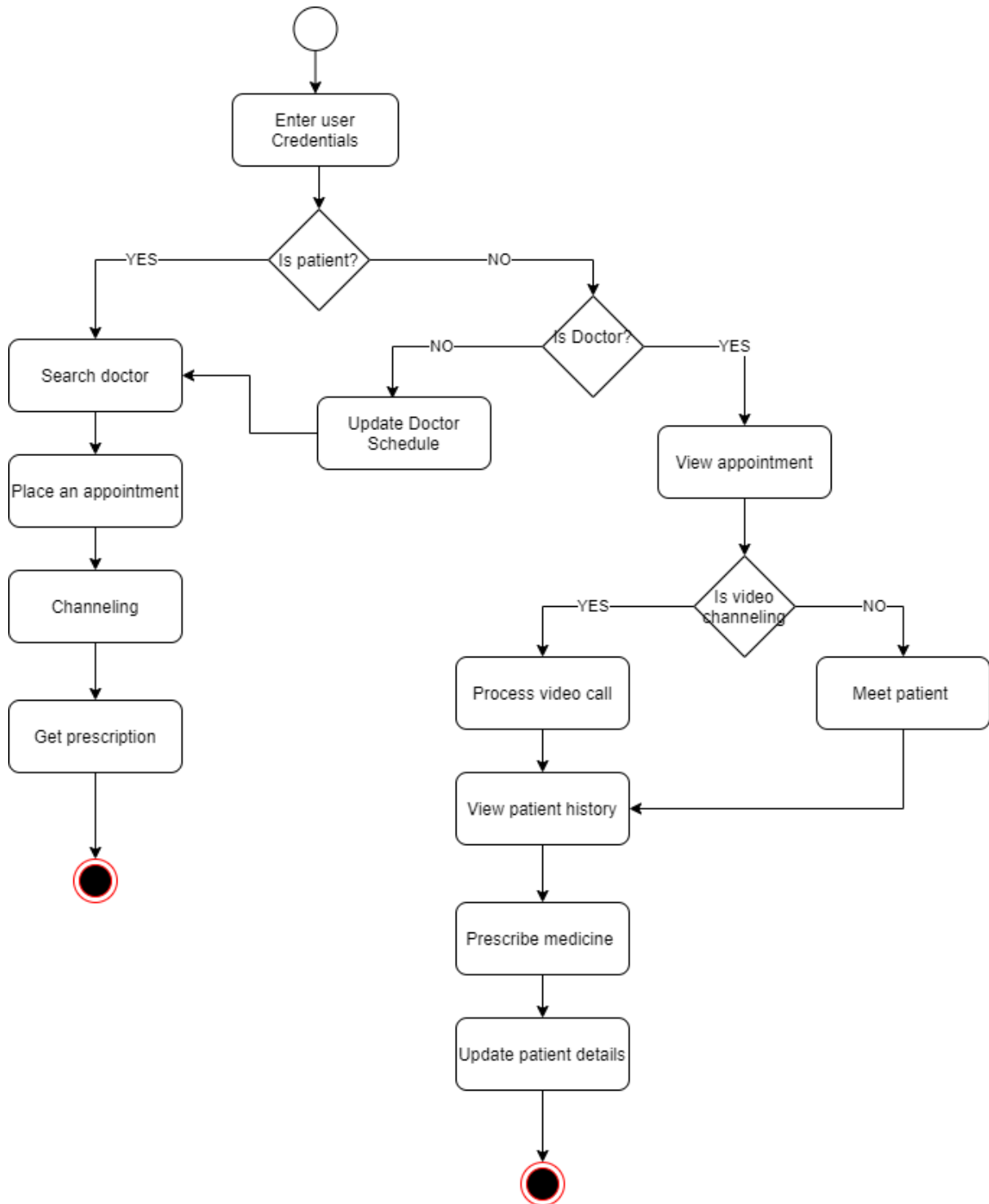


Figure 3.4 Activity Diagram - Doctor Channeling

### 3.3.4 Class Diagram

Objects and classes will be identified graphically as shown below.

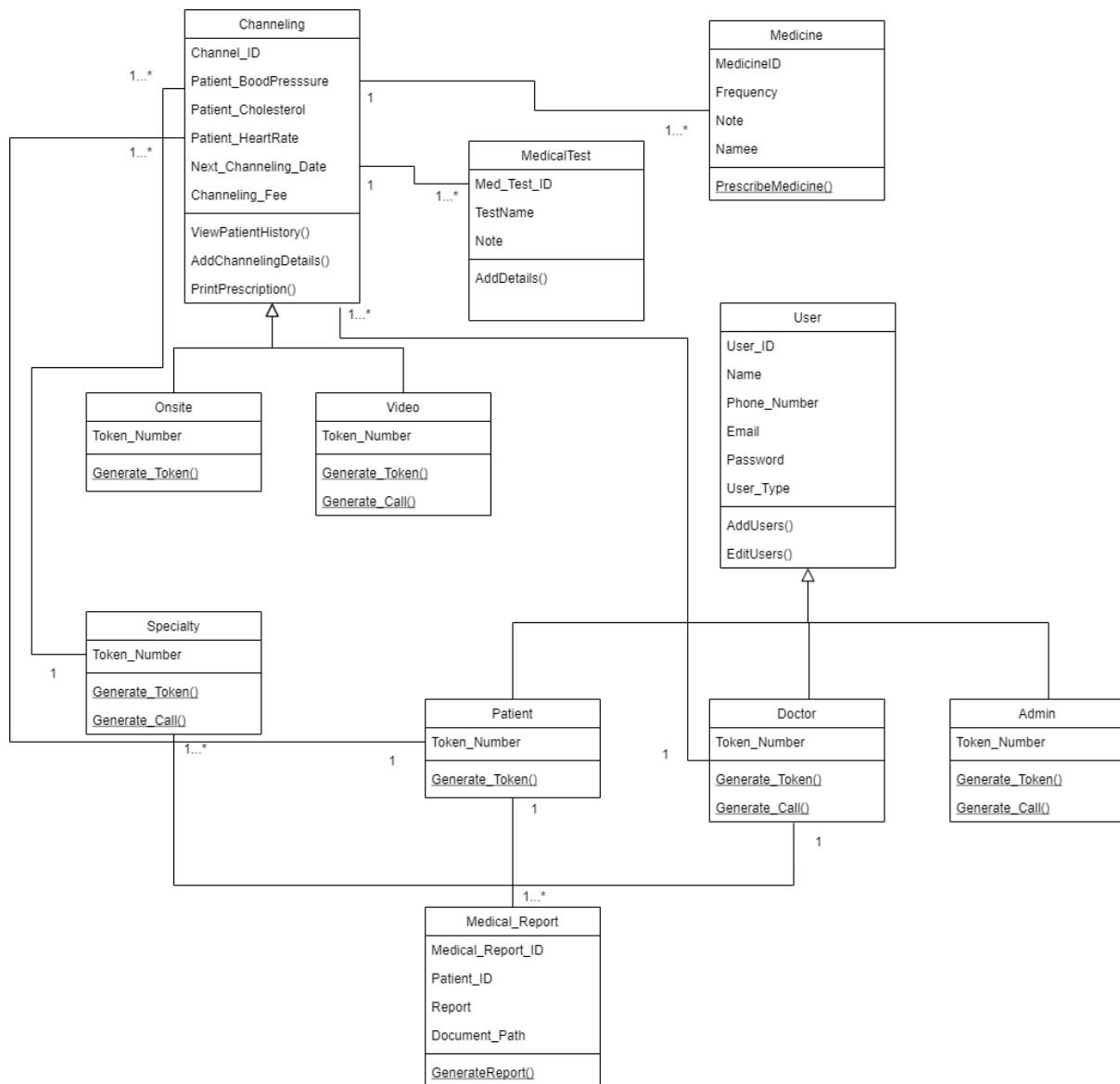


Figure 3.5 Class Diagram for the System

### 3.3.5 Sequence Diagram

Sequence diagrams are depicting how messages are passing between objects. Below sequence diagram is containing message interaction of doctor channeling process.

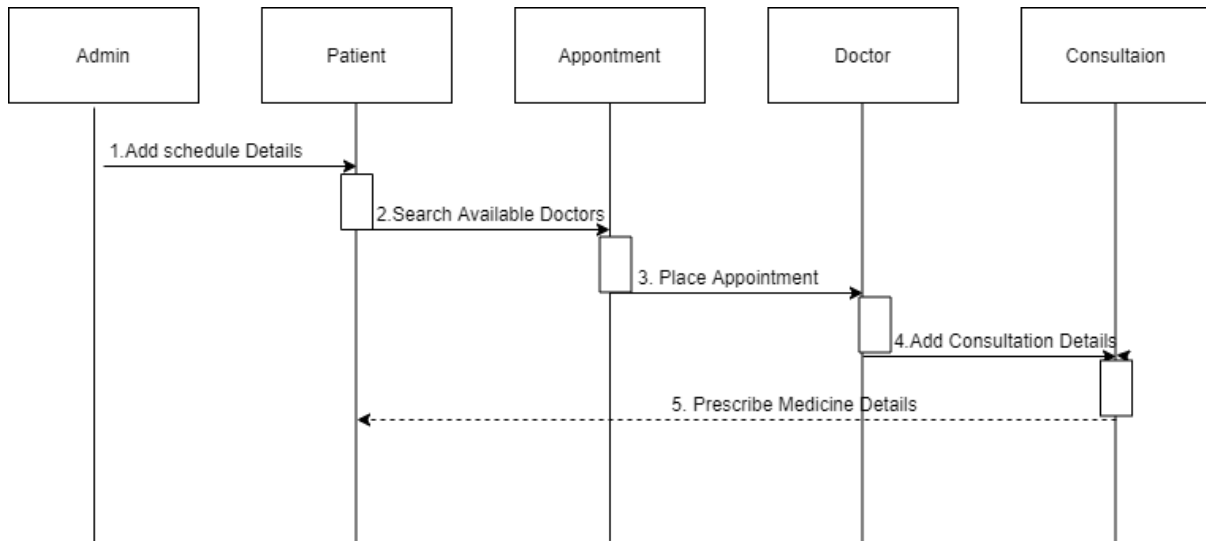


Figure 3.6 Sequence Diagram-Doctor channeling

### 3.4 User Interface Design

Usability of the system and User Friendliness of system are based on the interfaces that were designed during this phase. Samples of the user interfaces of this 'iMedicare' system are shown as follows.

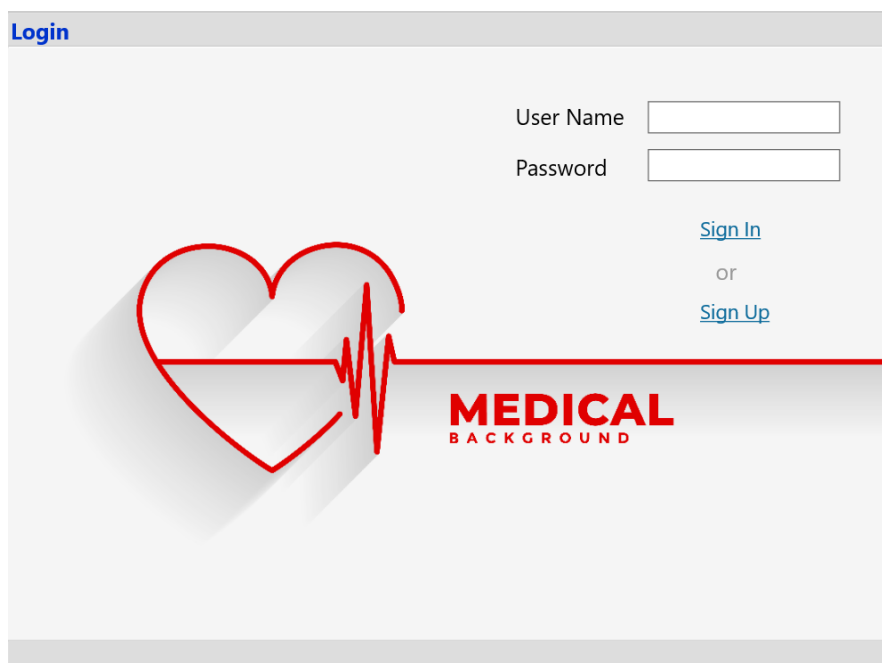


Figure 3.7 User Interface-System Login

**Doctor Registration** - □ ×

Title  ▼

Gender  Male  Female

Doctor Name

Specialty  ▼

NIC

Contact Number

E-mail Address

Persnal Address

Channelling Fee

Password

Re-enter Password

**MEDICAL**  
BACKGROUND

**Figure 3.8 User Interface-Doctor Registration**

**Appointment**

*Channel a doctor of your choice....*

Doctor

Specialty  ▼

Date

**Figure 3.9 User Interface-Appointment**

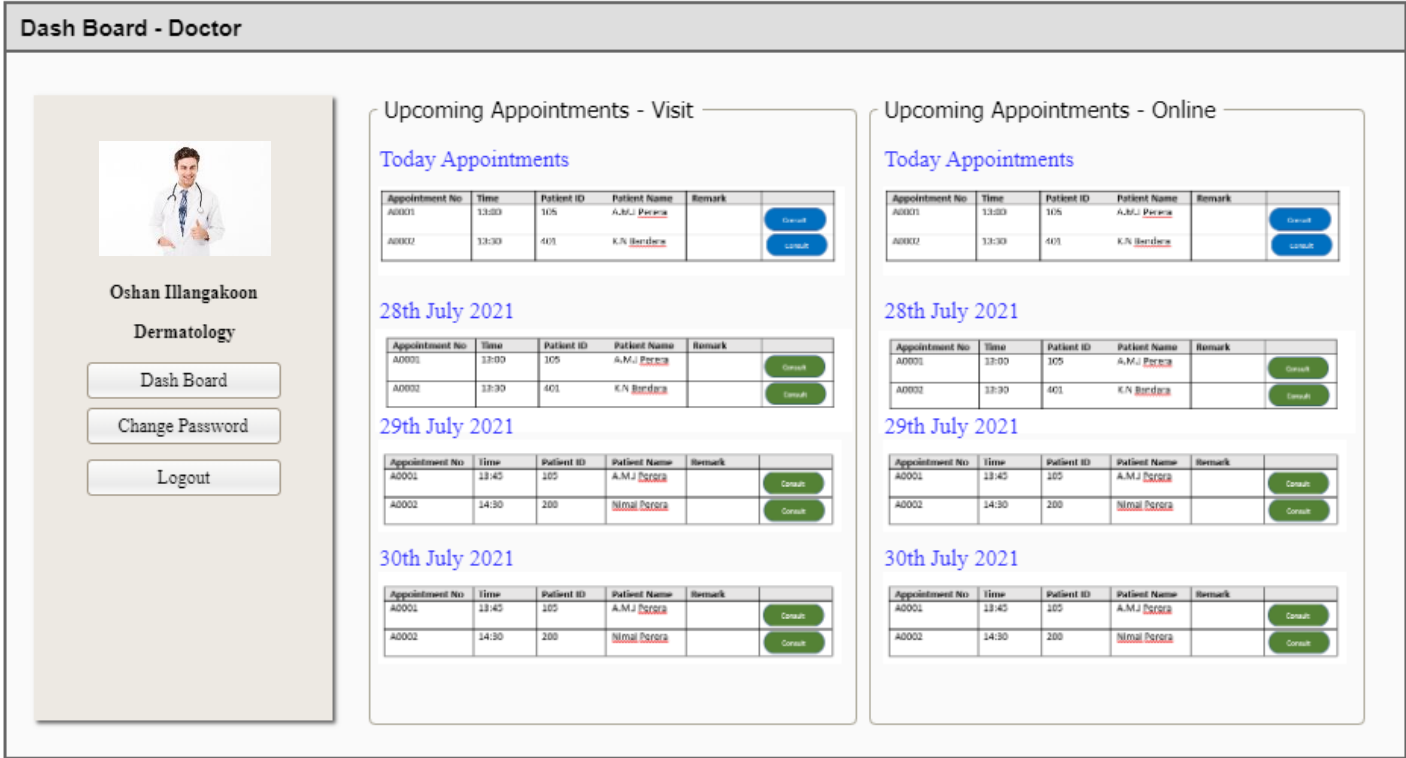


Figure 3.10 User Interface-Doctor Dashboard

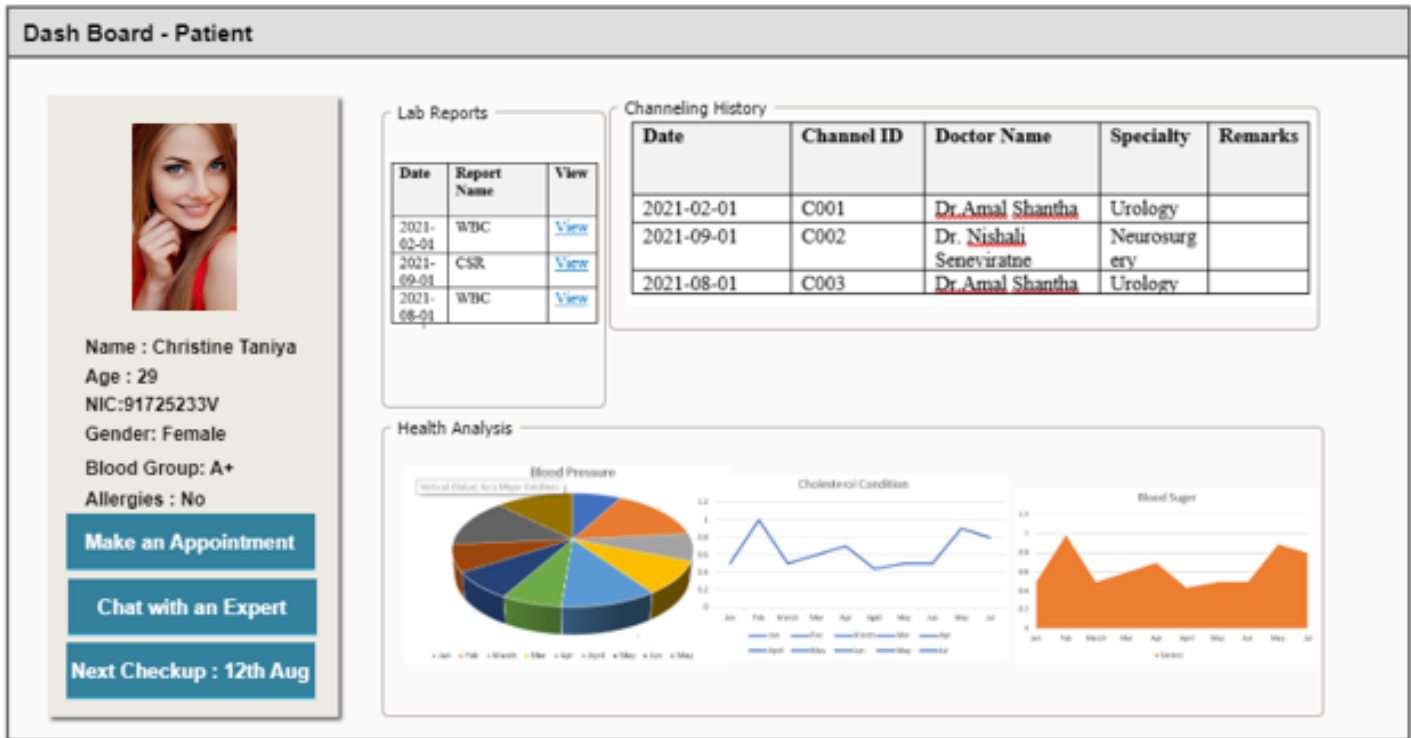


Figure 3.11 User Interface-Patient Dashboard

## CHAPTER 4: IMPLEMENTATION

Implementation is the phase that transforms the requirements (functional and non-functional) and the design of the software into an executable application.

The Information System was implemented, using several system implementation tools and technologies, to fulfill the requirements which were found in the analysis phase and developed the system to satisfy the client.

The ER diagram, code design pattern, implementation environment, brief description of implementation tools are included in this chapter.

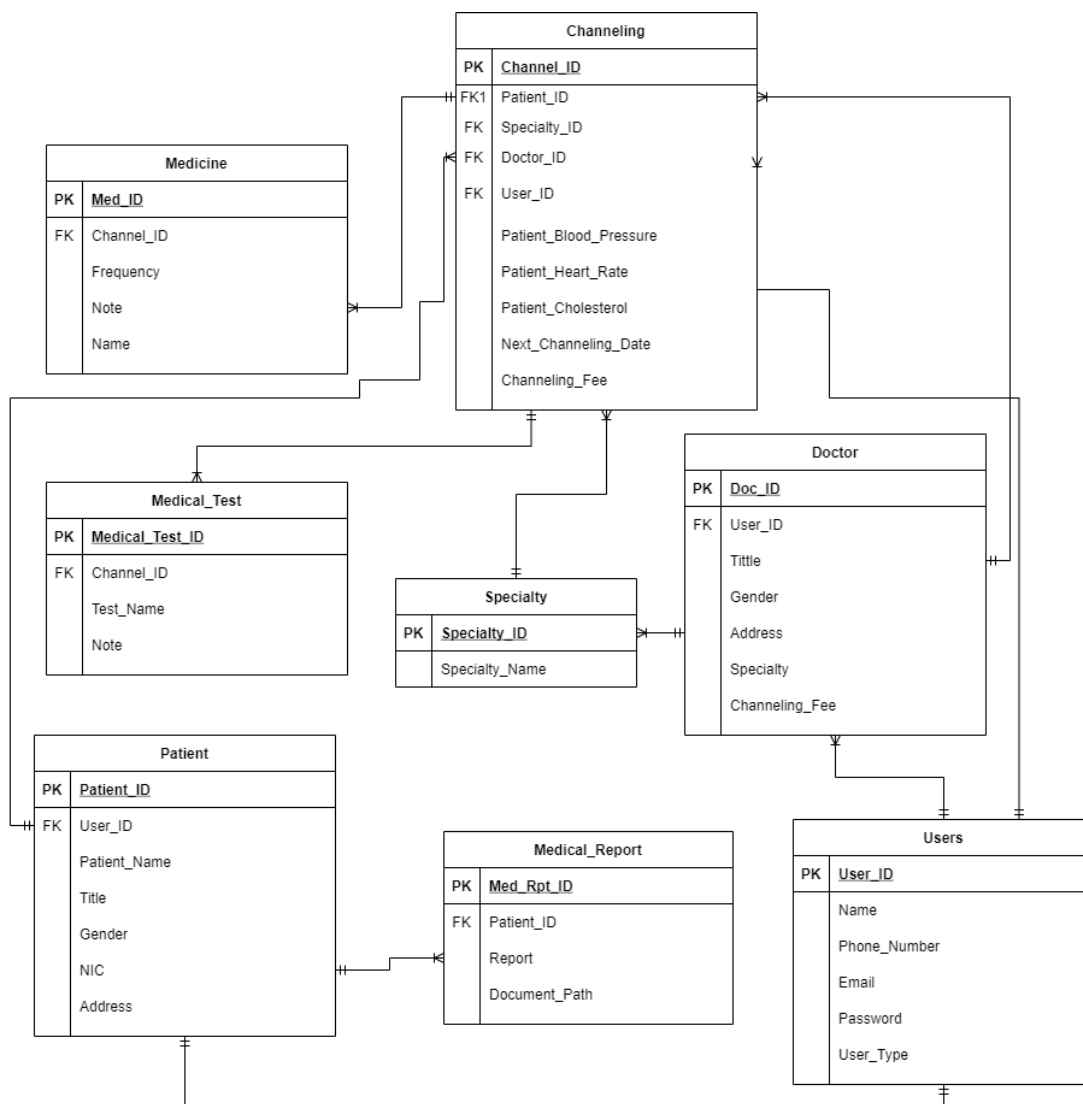


Figure 4.1 ER Diagram –‘iMedicare’ Application

## 4.1 MVC Design Pattern

Adapted design pattern for system implementation and file organization is MVC design pattern. This MVC design pattern is a common architectural pattern which used to design and create interfaces and the structure of the application. This pattern divides the application in to three parts (Models, Views and Controllers) that are dependent and connected to each other (Anon., n.d.). This pattern motivates creating reliable, reusable and consistent codes for the application.

The file and folders structure of the MVC model can be seen as follows.

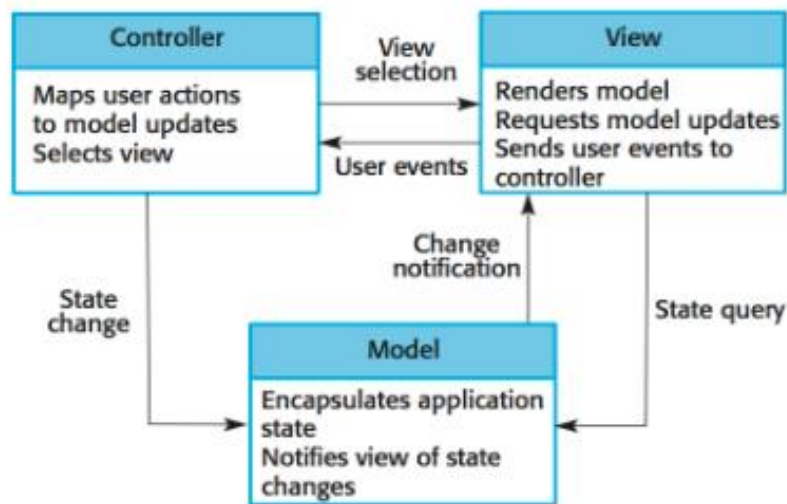


Figure 4.2 MVC Model Diagram

(Sommerville, n.d.)

## 4.2 Related Technologies

For implementing a web-based system, there are numerous development languages, frameworks, and databases available. So, before beginning the implementation of the 'iMediCare' Application, the following technologies were investigated in order to select an appropriate developing language, framework, and database. **Error! Reference source not found.**

Frame works	
<b>Node.js</b>	It is a JavaScript framework for the server. However, it is more than just a framework; it is a complete environment.
<b>Laravel</b>	It is a free and open source PHP web framework designed for developing cutting-edge web applications using the MVC architectural pattern..
<b>ASP.NET</b>	It is one of the best Microsoft-built web frameworks, and developers regard it as a powerful tool for creating dynamic websites.

<b>Angular.js</b>	It is an open-source JavaScript web framework that was created specifically for single-page web applications using the MVC architectural pattern. It is a framework for front-end development.
<b>Bootstrap</b>	It is a front-end framework for mobile devices.
<b>Wordpress</b>	A PHP-based CMS (content management system). This framework currently powers approximately 20% of all websites.
<b>Drupal</b>	A PHP-based CMS framework.
<b>Programming Languages</b>	
<b>Javascript</b>	Used by all web browsers, Meteor, and lots of other frameworks
<b>Java</b>	Android (Google) and many desktop applications use it.
<b>PHP</b>	Is a server scripting language that can be used to create dynamic and interactive web pages.
<b>XML</b>	Is a markup language that defines a set of rules for encoding documents so that they can be read by both humans and machines.
<b>DataBases</b>	
<b>MongoDB</b>	MongoDB is a document database, which means that data is stored in chunks.
<b>MySQL</b>	Is a SQL database that has been open-sourced.
<b>Oracle</b>	It is an enterprise SQL database available
<b>MS SQL</b>	Is RDBMS developed by Microsoft

**Table 4.1 Web Development Technologies**

*(Malhotra, 2017) (Anon., n.d.) (Anon., n.d.) (Anon., 2015) (Anon., n.d.)*

### 4.3 Selected Implementation Tools

#### Integrated Development Environment (IDE)

Selected integrated development environment for the development of ‘iMedicare’ application is NetBeans. NetBeans runs on Windows, macOS, Linux and Solaris also NetBeans can be used in Java ,PHP, C, C++, HTML5, JavaScript developments. (Anon., n.d.)

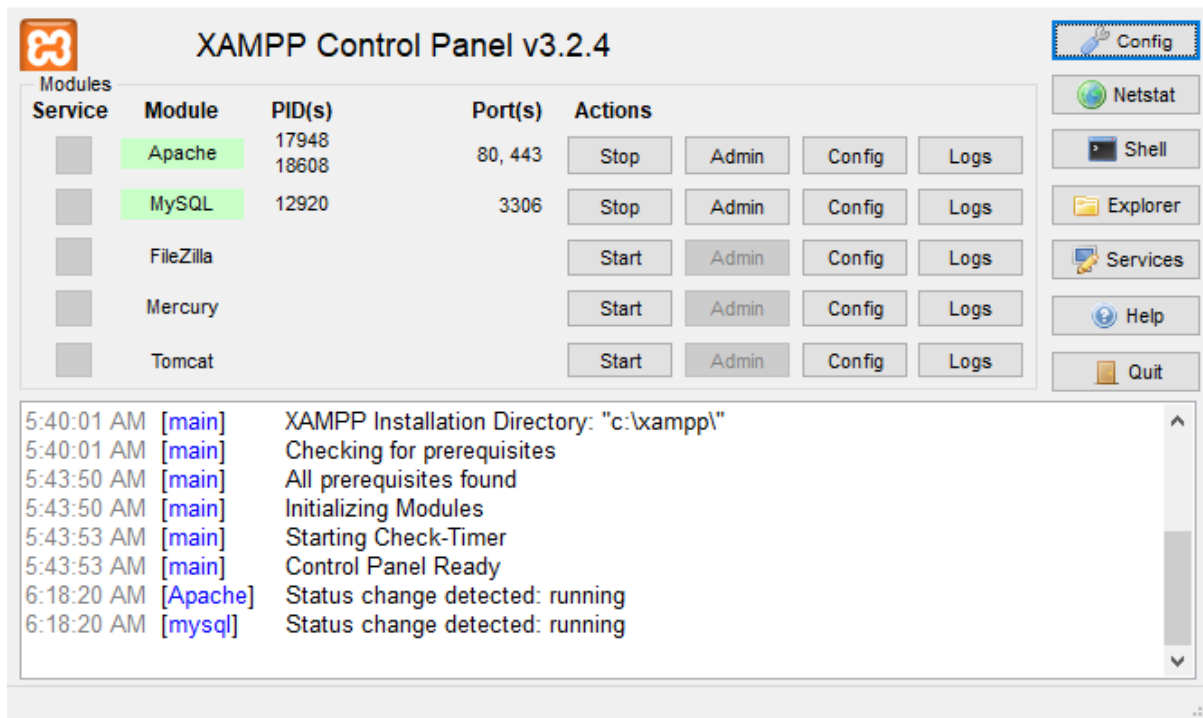


**Figure 4.3 NetBeans IDE**



## Development Environment

XAMMP is a one of the most popular development environments that can be use in PHP developments. As the development environment XAAMP was installed with Apache server and MySQL database server.



**Figure 4.4 XAMPP Control Panel**

## Development Framework

“A framework is a basic conceptual structure used to solve or address complex issues, usually a set of tools, materials or components. Especially in a software context the word is used as a name for different kinds of toolsets, component bases; it has since become a kind of buzzword or fashionable keyword.” (toolbox.com, n.d.)

Following Frameworks are used in the ‘iMedicare’ Application Development

### 1. CodeIgniter Framework

Since the selected design pattern is MVC design pattern it is considered to use CodeIgniter as the PHP MVC framework. It is one the most popular framework that use in developing web application under MVC design pattern. CodeIgniter provides Out of the box libraries for connecting to the database and to perform various kind of operations. (guru99, n.d.)

## 2. Bootstrap Framework

Bootstrap is a front-end user interface designing framework. It is capable of developing responsive web pages that can be viewed in any device. Responsive design creates websites that automatically adjust to look good and function well on any size screen.

### 4.4 MVC Design Pattern

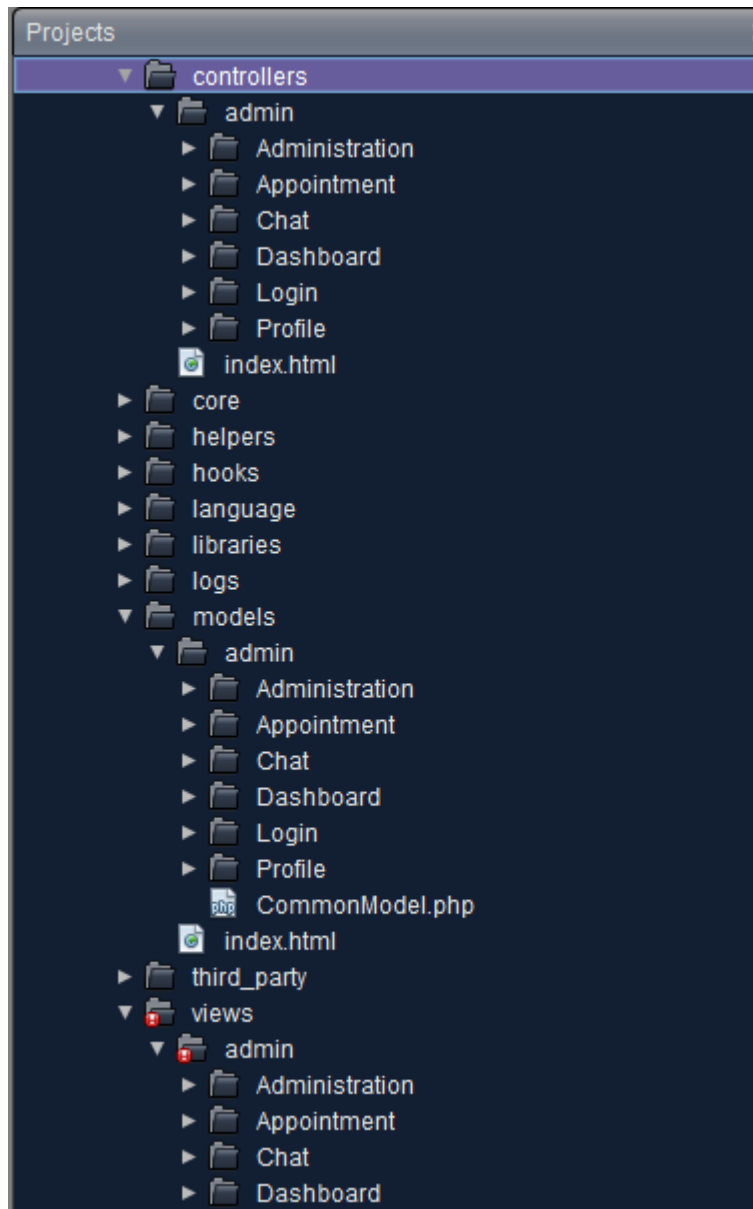


Figure 4.5 Folder Structure in the system

## 4.5 Sample pseudo code for Doctors view upcoming channel details and consult a patient.


### Step 1

**Get upcoming channel details for today** (SQL select query to Appointment details from the appointment table) key = doctor\_id (login doctor) , src\_app\_date (appointment date)

// data array structure => ([src\_doctor\_id] => 1, [src\_app\_date] => date('Y-m-d'))

```
$data['appointments'] = $this->AppointmentModel->get_appointments($data);
```

**view those in the dashboard**

Visit	Dr. Seth vishwanath jaya wardana	Mahesh Madushanka	2021-07-29	1	Confirmed	
-------	----------------------------------	-------------------	------------	---	-----------	---

### Step 2

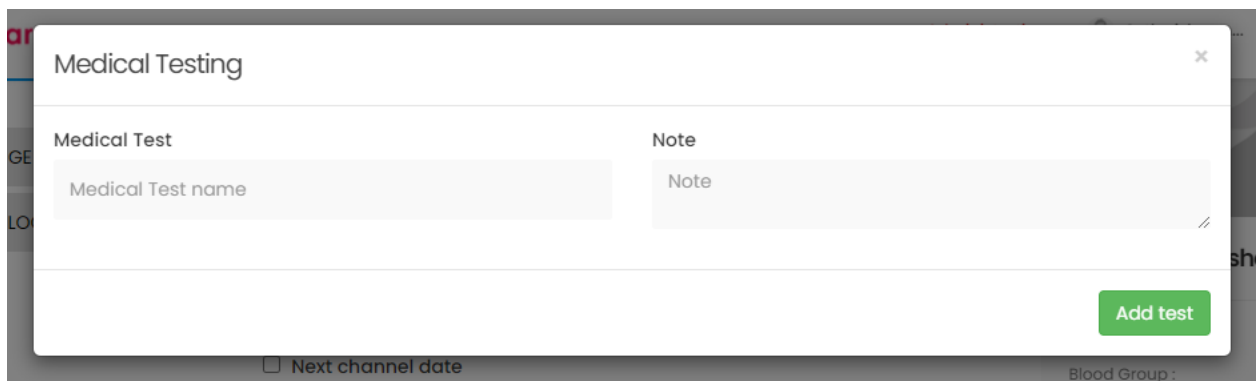
**update the record for that particular consultation.**

**Add patient records** - Blood pressure, Heart rate, Cholesterol , Blood sugar , Height (cm) and Weight (kg)

Blood pressure	Heart rate	Cholesterol
0.00	0.00	0.00
Blood sugar	Height (cm)	Weight (kg)
0.00	0.00	0.00

**Add required test** – click required test test button and add tests

```
$save_data = array(  
    'test_name' => $medicalTestName,  
    'note' => $medicalTestNote,  
    'channeling_id' => $channeling_id,  
    'created_by' => $this->session->userdata('user_id'),  
    'created_on' => date('Y-m-d H:i:s')  
);  
  
$this->DashboardModel->save_medicalTests($save_data);
```



Medical Testing

Medical Test

Medical Test name

Note

Note

Add test

Next channel date

Blood Group :

**Add Medicine** - click **Add Medicine** button and add medicine

```
$save_data = array(  
    'frequency' => $frequency,  
    'note' => $medicineNote,  
    'dosage' => $dosage,  
    'medicine_name' => $medicineName,  
    'channeling_id' => $channeling_id,  
    'created_by' => $this->session->userdata('user_id'),  
    'created_on' => date('Y-m-d H:i:s')  
);  
  
$this->DashboardModel->save_medicine($save_data);
```

Add medicine
✕

Medicine

Dosage

Frequency

Note

### Submit consultation

Update consultation all data to channeling table.

```

$str_query = "";
$str_query .= " UPDATE tbl_channelling SET status = 'Doctor checked'";
$str_query .= " , doctor_notes = '". $doctor_recommend. "' ";
$str_query .= " , blood_pressure = '". $bloodPressure. "' ";
$str_query .= " , heart_rate = '". $heartRte. "' ";
$str_query .= " , blood_suger = '". $bloodSuger. "' ";
$str_query .= " , cholesterol = '". $cholesterol. "' ";
$str_query .= " , height = '". $height. "' ";
$str_query .= " , weight = '". $weight. "' ";
$str_query .= " , next_channeling_date = '". $next_channeling_date. "' ";
$str_query .= " , is_next_channel = '". $is_next_channel. "' ";
$str_query .= " where id = '". $channeling_id. "' ";

$this->db->query($str_query);

```

## CHAPTER 5: TESTING & EVALUATION

System evaluation is the process of determining whether the project objectives were satisfied or not. According to that, this chapter will evaluate project objectives. If any failures to achieve those objectives, it will be discussed with the reason. Further Testing process with the test plan will be discussed in this chapter. Client evaluation will also be included.

### 5.1 Project Objectives Evaluations

The main objective of 'iMediCare' Application is to facilitate make decisions by the doctor providing patient medical history and analysis based on previous records. The system also helps to carry out the basic operation within the channeling center. So, when it considers overall software with the features of it, the decision-making ability of the doctor and basic day today functions of the medical center will be improved by every feature on it.

Following Table 4-1 *Evaluation of System Objectives* shows how far each and every objective were satisfied with the 'iMediCare' Application.

Objective	Level of objective satisfaction
Create an integrated system to patients and doctors where both users can easily access the information.	High
Create a system to provide an automated solution to keep patient wise records,	High
Create a system to provide an online channeling facility where a patient can easily book an appointment with the doctor without time waste and provide options to connect with doctors at times where physical interactions are not possible (audio, video channeling)	Medium
Create a system to minimize the risk of misjudgments by the doctor based on analysis of past medical history.	Low
Create a system to provide an easy option to share medical reports with clients securely and convenient way.	High
Create a system to manage digital notice board and send reminders	High

**Table 4.1 Evaluation of System Objectives**

## 5.2 Testing Process

### Objectives of the testing

1. Improving quality of the system so that customer will be delighted.
2. Improving the process of development of software so that problems can be prevented before they become a major issue.

In order to achieve above objectives, both black box and white box testing are conducted to assure the quality of product. Therefore, the internal logic of the coding and external functionality of the system were tested.

Following test plan was executed to complete the testing phase successfully.

Type of testing	Test method
Unit testing	Every testable code segment will be tested during development.
Regression testing	Regression testing is done to confirm that a recent program or code change has not adversely affected existing features.
System testing	Test whether system requirements were satisfied or not.
User Evaluation(UAT)	User Evaluation was done at customer site

**Table 4.2 Test Plan**

Following test cases were planned to test the output of every functionality.

*Table 4.3 Test Cases - Amin Module* shows the all test cases for admin module.

#	Page /Function	Test Description	Expected Result
1.	Login	Login without entering username AND password.	Prompt user to enter required fields.
2.		Login without entering username OR password	Prompt user to enter required field
3.		Login with invalid username AND password	Indicate error by notifying username or password is incorrect
4.		Login with invalid username OR password	Indicate error by notifying username or password is incorrect
5.		Login with correct username and Password	Log in to the system
6.	Logout	Logout from the account	Logout from the user account and redirect to the home page
7.	Doctor Registration	Submitting doctor records without adding mandatory values	Doctor information submission should fail without mandatory values

8.		Use invalid format on the fields and submit the information (E.g: enter NIC using string values)	Information submission should fail with invalid values.
9.		Enter all information correctly and submit	Doctor Information should submit and save on the database
10.		View each doctor's information	All saved doctor's information should be shown
11.	Patient Registration	Submitting Patient records without adding mandatory values	Patient Information submission should fail without mandatory values
12.		Use invalid format on the fields and submit the patient information (E.g enter email as abbc.com)	Information submission should fail with invalid values
13.		Enter different values in "password" and "confirm password" fields	Error message should be indicated as "passwords do not match"
14.		Enter all information correctly and submit	Patient Information should submit and save on the database
15.	Doctor Specialty Registration	Enter Specialty and submit	Specialty Information should submit and save on the database
16.	Medical Reports	Submitting Medical Report without adding mandatory values	Medical Report submission should fail without mandatory values
17.		Search entered Patient records from search patient search bar	Patient should be available to select
18.		Enter all information correctly and submit	Medical Report should submit and save on the database

**Table 4.3 Test Cases - Amin Module**



All the test cases related to make an appointment were listed as bellow. Refer **Table 4.4 Test Cases – Make an appointment**

#	Page /Function	Test Description	Expected Result
19.	Make an Appointment	Submit make an appointment without adding any values	Information submission should fail without adding any values
20.		Submit information without adding patient name	Information submission should fail without patient name
21.		Enter non-existing doctor name	Validation message should be shown as “no results found”
22.		Enter non-existing specialty	Validation message should be shown as “no results found”
23.		Load available time slots	Saved available time slot should load on the relevant dropdown based on the selected doctor
24		Enter all information correctly and submit	Appointment should submit and save on the database
25.	Cancel Appointment	Cancel any appointment before appointment date	Selected channel appointment deleted from the database

**Table 4.4 Test Cases – Make an appointment**

All the test cases related to the Up Coming Appointments module were listed under **Table 4.5 Test Cases – View upcoming appointments**

#	Page /Function	Test Description	Expected Result
36.	View Upcoming Appointments	Load pending appointments for the day for particular doctor	Load all saved pending appointment for the selected dates.

**Table 4.5 Test Cases – View upcoming appointments**

All the test cases related to the Consultation module were listed under **Table 4.6 Test Cases - Consultation**

#	Page /Function	Test Description	Expected Result
---	----------------	------------------	-----------------

27.	Consultation	Click on the consultation button in the doctor dashboard	Should be directed to the consultation screen
28.		Submit without adding any values	Information submission should fail without adding any values
29		Submit consultation without adding mandatory values	Information submission should fail without adding mandatory values
30		Enter all information correctly and submit	Consultation record should submit and save on the database

**Table 4.6 Test Cases - Consultation**

All the test cases related to the Channeling history module were listed under **Table 4.7 Test Cases – Channeling history**

#	Page /Function	Test Description	Expected Result
31.	Channeling history	Click on the channeling history in the patient profile or consultation screen	Load all saved consultations in a list view
32.		Click on view more on one record	Load consultation record according to the selected record

**Table 4.7 Test Cases – Channeling history**

Test Cases related to notification module is listed as bellow. Refer Table 4-6 **Test Cases - Notification Module**

#	Page /Function	Test Description	Expected Result
33.	Generate automatic notifications	Generate SMS/email notification regarding user registration	SMS/email should be successfully sent to the user
34.		Generate SMS/email notification regarding next appointment reminder	SMS/email should be successfully sent to the user
35.		Generate SMS/email notification regarding successful appointment creation	SMS/email should be successfully sent to the user

**Table 4.8 Test Cases - Notification Module**

Test Cases related to Lab report module is listed as bellow. Refer **Table 4.9 Test Cases – Lab Reports**

#	Page /Function	Test Description	Expected Result
36.	Lab Reports	Click on the lab reports in the patient's profile.	Load all saved lab reports in a list view
3a7.		on view more on one record	Load lab report according to the selected record

**Table 4.9 Test Cases – Lab Reports**

### Test Results

Above mentioned test cases were tested under two phases (phase I and phase II). Test results for admin module were listed.

#	Page /Function	Test Description	Expected Result	Test Result	
				Phase I	Phase II
1.	Login	Login without entering username AND password	Prompt user to enter required fields.	Passed	Passed
2.		Login without entering username OR password	Prompt user to enter required field	Passed	Passed
3.		Login with invalid username AND password	Indicate error by notifying username or password is incorrect	Passed	Passed
4.		Login with invalid username OR password	Indicate error by notifying username or password is incorrect	Passed	Passed
5.		Login with correct username and Password	Log in to the system	Passed	Passed
6.	Logout	Logout from the account	Logout from the user account and redirect to the home page	Passed	Passed
7.	Doctor Registration	Submitting doctor records without adding mandatory values	Doctor information submission should fail without mandatory values	Passed	Passed
8.		Use invalid format on the fields and submit the information (E.g: enter NIC using string values)	Information submission should fail with invalid values.	Passed	Passed

9.		Enter all information correctly and submit	Doctor Information should submit and save on the database	Passed	Passed
10.		View each doctor's information using search bar	All saved doctor's information should be shown	Passed	Passed
11.	Patient Registration	Submitting Patient records without adding mandatory values	Patient Information submission should fail without mandatory values	Passed	Passed
12.		Use invalid format on the fields and submit the patient information(E.g enter email as abbc.com)	Information submission should fail with invalid values	Passed	Passed
13.		Enter different values in "password" and "confirm password" fields	Error message should be indicated as "passwords do not match"	Passed	Passed
14.		Enter all information correctly and submit	Patient Information should submit and save on the database	Passed	Passed
15.	Doctor Specialty Registration	Enter Specialty and submit	Specialty Information should submit and save on the database	Passed	Passed
16.	Medical Reports	Submitting Medical Report without adding mandatory values	Medical Report submission should fail without mandatory values	Passed	Passed
17.		Search entered Patient records from search patient search bar	All saved patient's information should be shown	fail	Passed
18.		Enter all information correctly and submit	Medical Report should submit and save on the database	fail	Passed

**Table 4.10 Test Result - Admin Module**

*Refer Appendix C to see all test results.*

### 5.3 Client Evaluation

The locally hosted 'iMediCare' Application is checked and tested by the owners of the Medicare Medical Centre. Actual data were entered to find out whether the system is satisfying the functional and non-functional requirement of the system properly.

Based on the testing which was done by the user, they have good impression about the overall functionalities of the system. That was recognized by the user evaluation form which was designed for evaluating the system by user. Refer **Figure 4.11 User Evaluation Form**

## User Evaluation Form

Checked by: .....

Job Role: .....

Please kindly fill the relevant fields in the following table, indicating your level of satisfaction about the overall system functions. Your honest feedback will be given benefits for achieving the objective of the system.

Rating			
Excellent	Good	Average	Poor
A	B	C	D

No.	System Feature	Rating
1	Log In and Log Out	
2	User Registration	
3	Doctor Specialty Registration	
4	Consultation	
5	Make an Appointment	
6	Cancel Appointment	
7	View upcoming appointment	
8	Generate Manual Notifications	
9	Generate Automatic Notification	
10	Report Generation	

Special Narration:

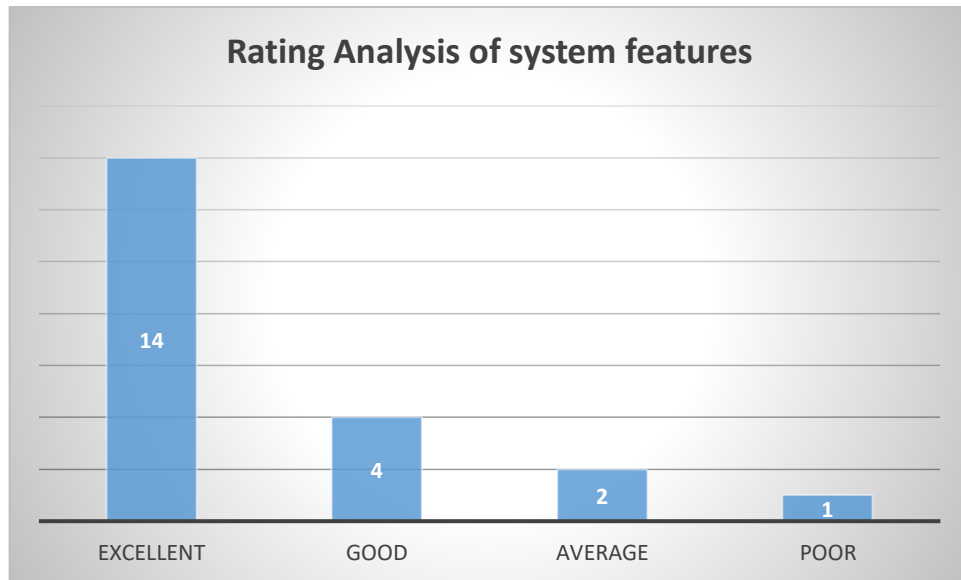
.....

Signature

.....

Date

**Figure 4.11 User Evaluation Form**



**Figure 5.1 User feedback Analysis**

Above (*Figure 5.1 User feedback Analysis***Error! Reference source not found.** chart shows that how the users (owner/Patient) gave feedback for this system in evaluation form.

## **CHAPTER 6: Conclusion**

The project's goal was to create a user-friendly system that could retrieve a patient's past medical history, which would aid doctors in making accurate diagnoses, as well as a variety of other features that would help with day-to-day operations at the channeling center.

Through the developed system, Patients were able to interact with medical center as well as the doctors more effectively and easily.

So, even it is having some future improvements of the system, it is able to conclude that every phase of the SDLC were completed successfully.

### **6.1 Lessons learned**

During the development of the system, it was possible to apply the majority of the theories that I had learned over the previous few years. As a result, putting such theories into practice helped me to broaden my understanding. In addition to that working with MVC architecture, integrating APIs into the system, and understanding how to work with Bootstrap are some of the major knowledge areas I obtained during the system development.

Several tools were employed in the development of the system. NetBeans, Xampp Server, PHP MyAdmin, Pencil wire frame drawing tool, and Selenium testing tool are just a few examples of technology I've never used before.

Through this Project, I have also gained some knowledge about project management and report writing.

### **6.2 Deficiencies of the system**

- Video call and chat with expert is currently integrated only with WhatsApp. It is better if we can have separate module developed for this purpose without relying on other applications. Due to the time limitation it was not implemented for this project.
- There is no option to update Patient's lifetime history to the system. Only channeling history with this medical center is currently can be view in the system.

- Currently, the system does not handle drug inventory. It would be preferable if the system could give a complete solution for all of the functionalities carried out within the medical center.
- During the project's execution, the Payment Management module is not considered. If it is offered, patients will be able to make payments more easily through the system, and they will have a complete system that will make engaging with the medical center easier.

### **6.3 Future improvement of the work**

- Payment management module (including payment gateway) can be incorporate in the system to have complete channeling appointment module.
- Incorporate refund options once payment module in implemented to further provide facilities to the patient.
- The system is providing video channeling facility for the patients. This situation arises during situations like patient cannot physically present to the physician. Hence it is difficult for the physician to get details like body temperature, blood pressure etc. The system can be improved to get these reading though communication with an mobile application which developed to get information through sensors.
- As discussed in above section Payment management module can be implemented to have more user-friendly system.
- Inventory management system can be implemented to maintain medicine stocks in the medical center.



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# Appendices

## Appendix A: Design Documentation

### Use Case Diagrams for Main Modules of 'iMediCare' System for Doctor-Patient Interactions

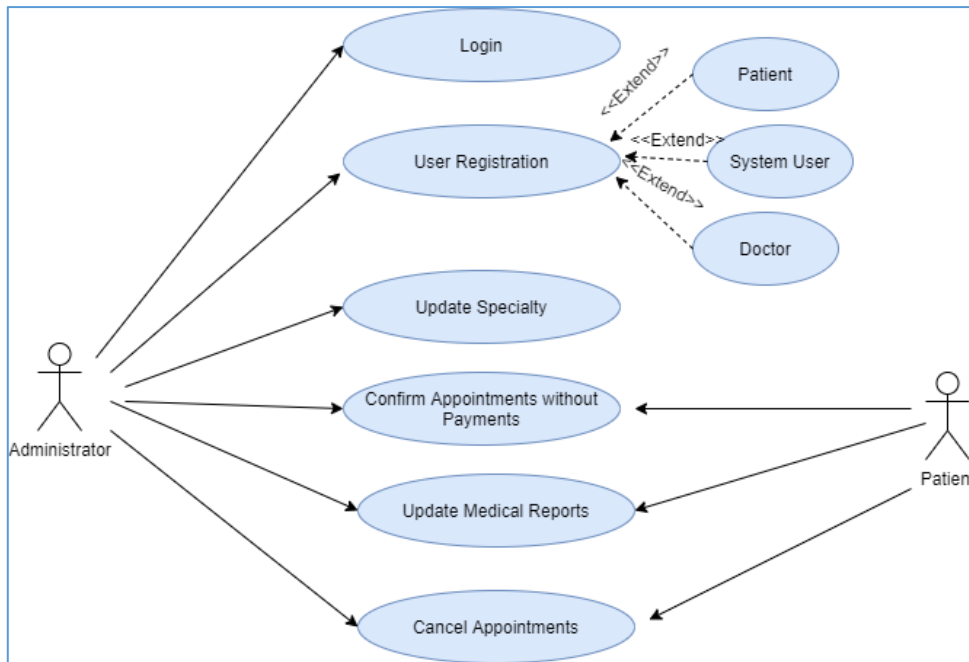


Figure A: 1 Use Case Diagram for Admin Module

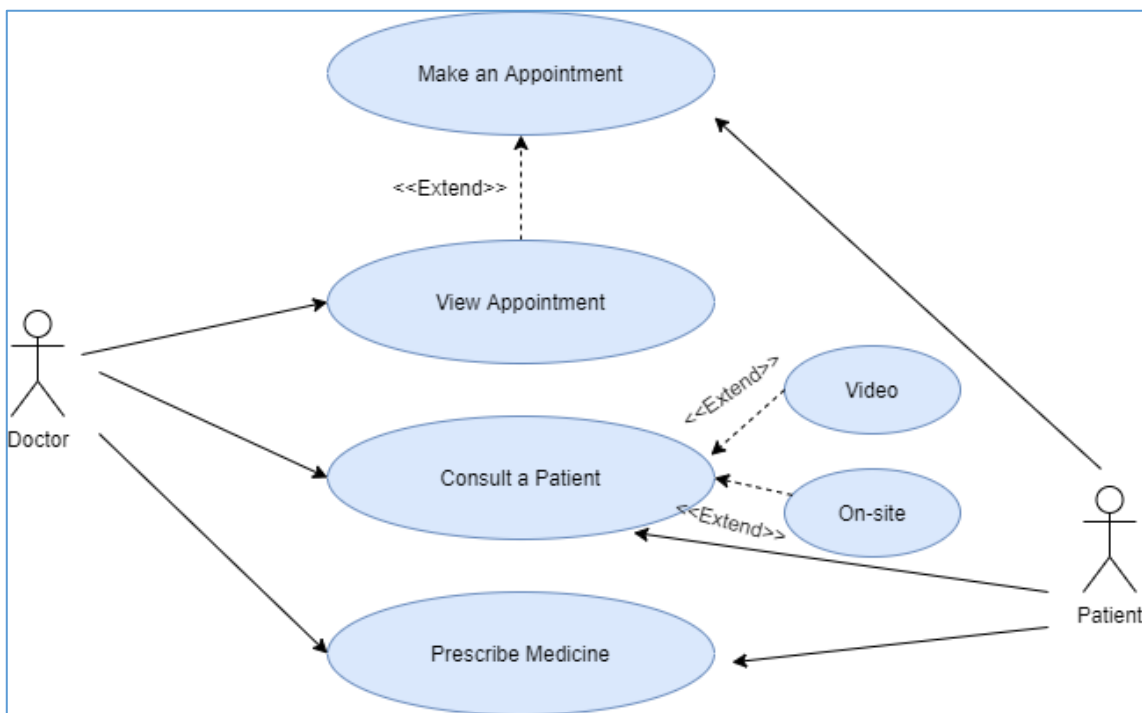


Figure A: 2 Use Case Diagram for Channeling

- **Use Case Description – Doctor Registration**

Refer *Table A: 1 Use Case Description - Doctor Registration* **Error! Reference source not found.** for doctor registration.

<b>Use Case</b>	Doctor Registration
<b>Actors</b>	Administrator
<b>Description</b>	
Administrator can be able to register a new doctor in the system	
<b>Pre-Conditions</b>	
Logged in to the system as Administrator	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate to the doctor Registration Page.</li> <li>2. Enter all mandatory Information.</li> <li>3. Enter doctor availability details.</li> <li>4. Submit the information</li> </ol>	
<b>Post-Conditions</b>	
If the doctor registration is done successfully in the system, then doctor will be notified by email regarding the registration.	

**Table A: 1 Use Case Description - Doctor Registration**

- **Use Case Description -Generate Reports**

Refer *Table A: 2 Use Case Description - Generate Report* **Error! Reference source not found.** for doctor registration.

<b>Use Case</b>	Generate Reports
<b>Actors</b>	Administrator
<b>Description</b>	
The Administrator can be able to generate reports in the system.	
<b>Pre-Conditions</b>	
Administrator should have accessed system and landed on Admin panel.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Navigate MIS Report section</li> <li>2. Select required report type</li> <li>3. Enter parameters.</li> <li>4. Generate Reports.</li> </ol>	
<b>Post-Conditions</b>	
None	

**Table A: 2 Use Case Description - Generate Report**

- **Use Case Description -Ask an expertise**

Refer *Table A: 3 Use Case Description -Ask an expertise* for chat with medical expert.

<b>Use Case</b>	Chat with an Expertise
<b>Actors</b>	Patient
<b>Description</b>	
The Patient can be able to chat with an expertise in the system.	
<b>Pre-Conditions</b>	
Patient should have logged in the system and landed on the patient Dashboard	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Click on chat with an expert button.</li> <li>2. Navigate to all expert details registered in the system.</li> <li>3. Select expert and click on chat button.</li> <li>4. Enter required info and send to the expert.</li> </ol>	
<b>Post-Conditions</b>	
None	

**Table A: 3 Use Case Description -Ask an expertise**

- **Use Case Description -Next Check-up date**

Refer *Table A: 4 Use Case Description -Next Check-up date* **Error! Reference source not found.** **Error! Reference source not found.** for Next Checkup date

<b>Use Case</b>	Next Check-up date
<b>Actors</b>	Patient
<b>Description</b>	
The Patient can be able to view next check-up date	
<b>Pre-Conditions</b>	
Doctor should have entered the next check-up date in the consultation screen. Patient should have logged in the system and landed on the patient dashboard.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. View Channeling dates on the dashboard.</li> </ol>	
<b>Post-Conditions</b>	
None	

**Table A: 4 Use Case Description -Next Check-up date**

- **Use Case Description -Confirm Appointment for appointments without payments**

Refer *Table A: 5 Use Case Description -Confirm Appointment and generate Token* generate token.

<b>Use Case</b>	Confirm appointment
<b>Actors</b>	Administrator
<b>Description</b>	
The Administrator can be able to confirm the appointments for each appointment if the payment is not made.	
<b>Pre-Conditions</b>	
Administrator should have logged in the system and landed on the admin panel.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. Click on appointment section</li> <li>2. View all appointment based on the date</li> <li>3. Click on edit icon</li> <li>4. Click on conform button.</li> </ol>	
<b>Post-Conditions</b>	
After successful confirmation the patient should receive a notification email and SMS	

**Table A: 5 Use Case Description -Confirm Appointment and generate Token**

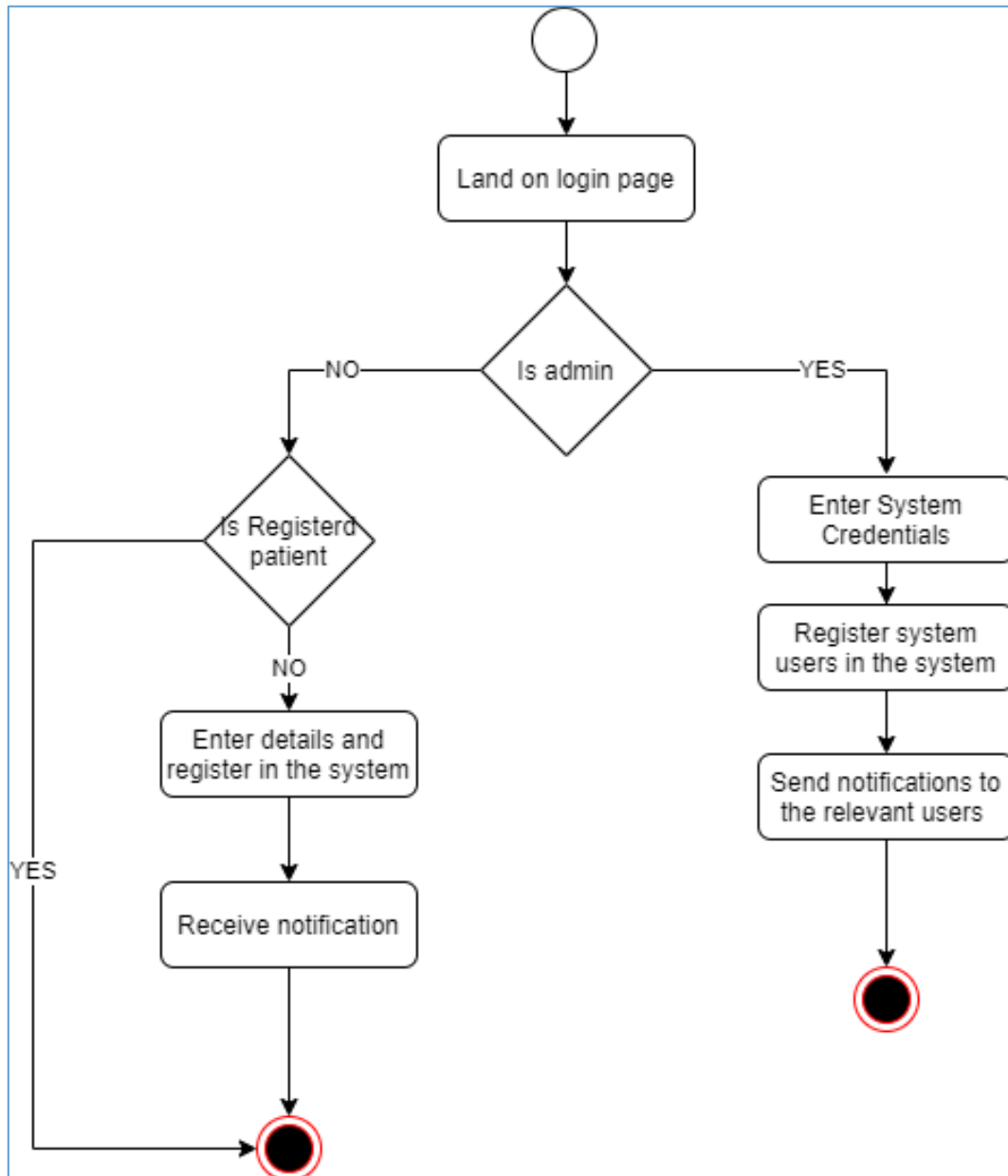
- **Use Case Description -Receive Notification**

Refer *Table A: 6 Use Case Description -Receive Notification* **Error! Reference source not found.** for Receive Notifications

<b>Use Case</b>	Receive Notifications
<b>Actors</b>	Patient
<b>Description</b>	
Patients are receiving notifications via SMS, email or notification.	
<b>Pre-Conditions</b>	
Patient should be registered in the system with the given contact details.	
<b>Flow of events</b>	
<ol style="list-style-type: none"> <li>1. View notifications via SMS, email.</li> </ol>	
<b>Post-Conditions</b>	

**Table A: 6 Use Case Description -Receive Notification**

Refer *Figure A: 3 Activity Diagram for User Registration* for the details of user registration by the Administrator or self-registration by the patient.

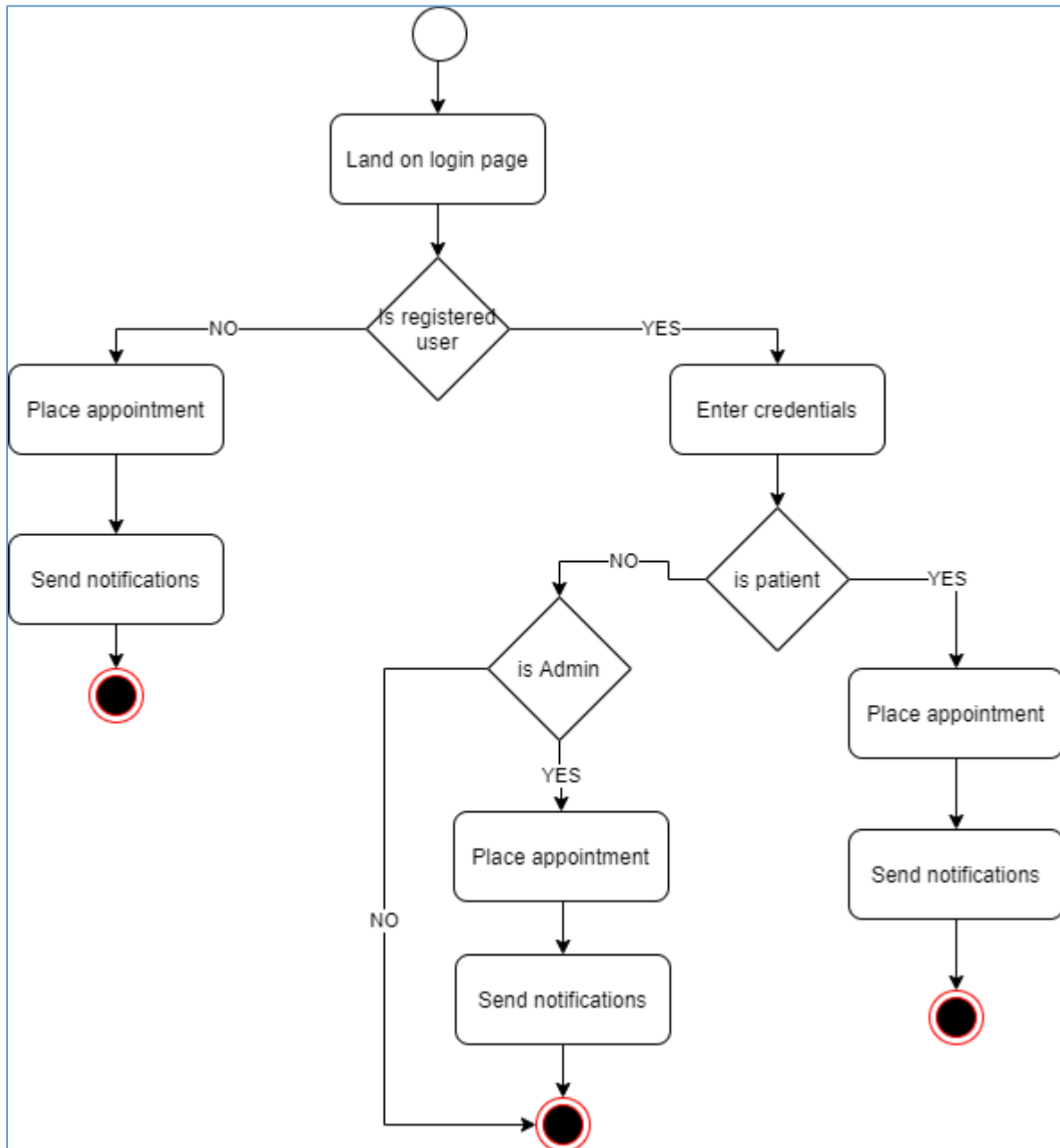


**Figure A: 3 Activity Diagram for User Registration**



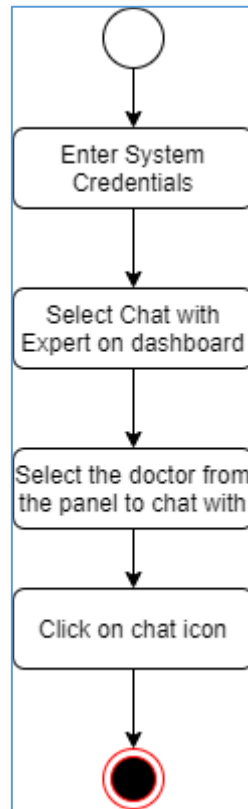


Refer **Figure A: 4 Activity Diagram for Place an Appointment** for the details how a user can place an appointment through the system.



**Figure A: 4 Activity Diagram for Place an Appointment**

Refer **Figure A: 5 Activity Diagram for Chat with an Expert** how user can chat with an expertise using chat option.

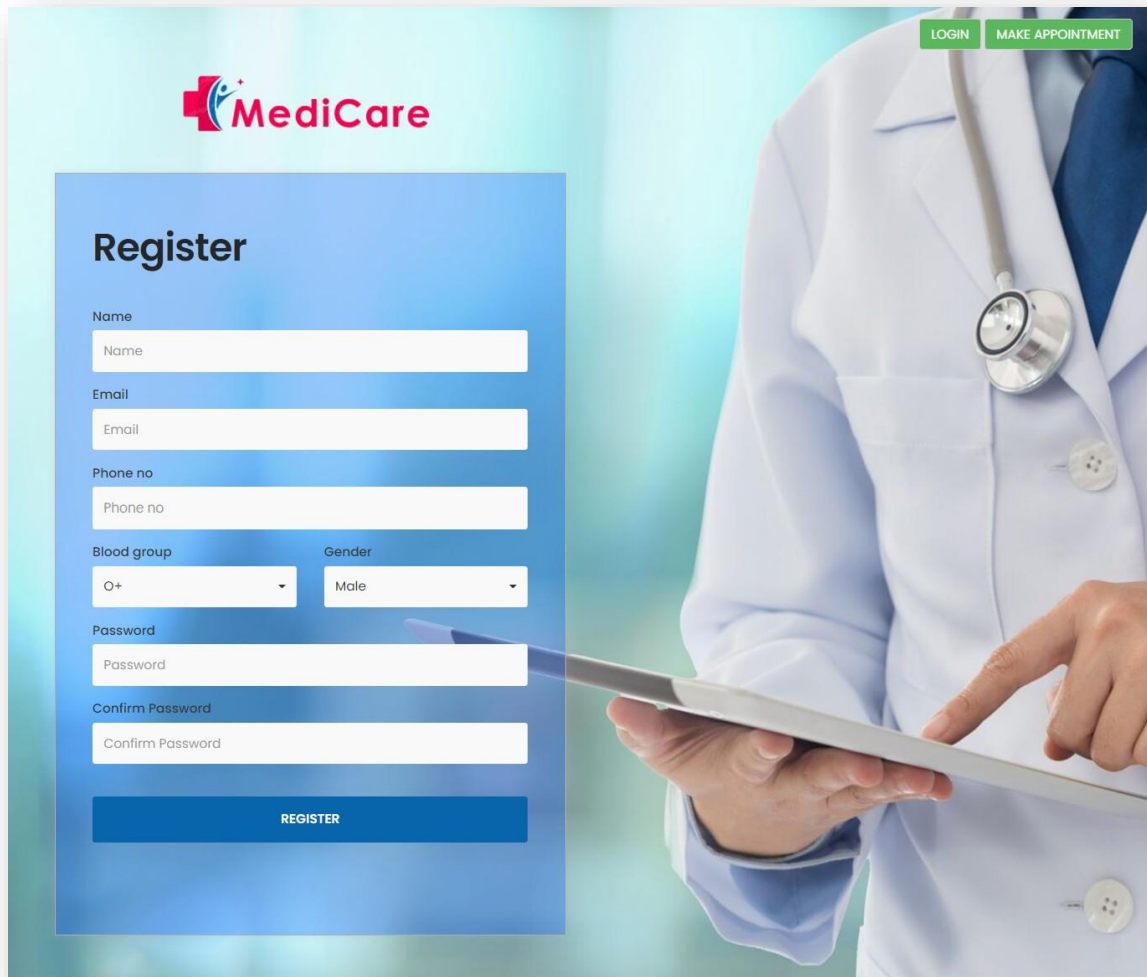


**Figure A: 5 Activity Diagram for Chat with an Expert**

## Appendix B: User Documentation

### Patient Registration

Patients can register themselves using the following interface. When filling out all of the fields, user must input valid data with the appropriate format. Once the registration is complete, the patient will receive an automatic email or SMS with their login and password.



The image shows a screenshot of a web application for patient registration. The background features a doctor in a white coat with a stethoscope, holding a tablet. In the top right corner, there are two green buttons: "LOGIN" and "MAKE APPOINTMENT". The "MediCare" logo is in the top left. The registration form is titled "Register" and includes the following fields:

- Name:
- Email:
- Phone no:
- Blood group:
- Gender:
- Password:
- Confirm Password:

A blue "REGISTER" button is located at the bottom of the form.

Figure B: 1 Patient Registration

## System Login

A user can log in to the system by providing a valid email address and password. The configuration of a username and password is done in the user registration level. Logging in with the proper email and password combination will take you to the dashboard of the corresponding user and the view of the dashboard depends of the logged-in user's user type.



**Figure B: 2 System Login**

## Doctor Registration

The following interface can be used to register a new doctor in the system. Once the registration is complete, each doctor will be assigned a unique ID.

The screenshot shows the 'Doctor' registration form in the MediCare system. The interface includes a top navigation bar with contact information and a user profile section on the left. The main form area contains fields for personal and professional details, a section for doctor availability, and a submit button.

**MediCare** | +94 112 252 252 2 | info@medicare.com

**System admin** | Make an appointment | Administration | System admin | Log-out

**System admin**  
r/m user

- DASHBOARD
- APPOINTMENT
- MEDICAL REPORTS
- DOCTORS**
- PATIENT
- SPECIALTY
- USERS

CHANGE PASSWORD | LOG OUT

### Doctor

Title	Gender	Name
Mr.	Male	Name
Email		Phone no
admin@gmail.com		Phone no
NIC no		Address
NIC		Address
Doctor speciality		Channelling fee (LKR)
Select		0.00
Password		Confirm Password
***		Confirm Password

### Doctor availability

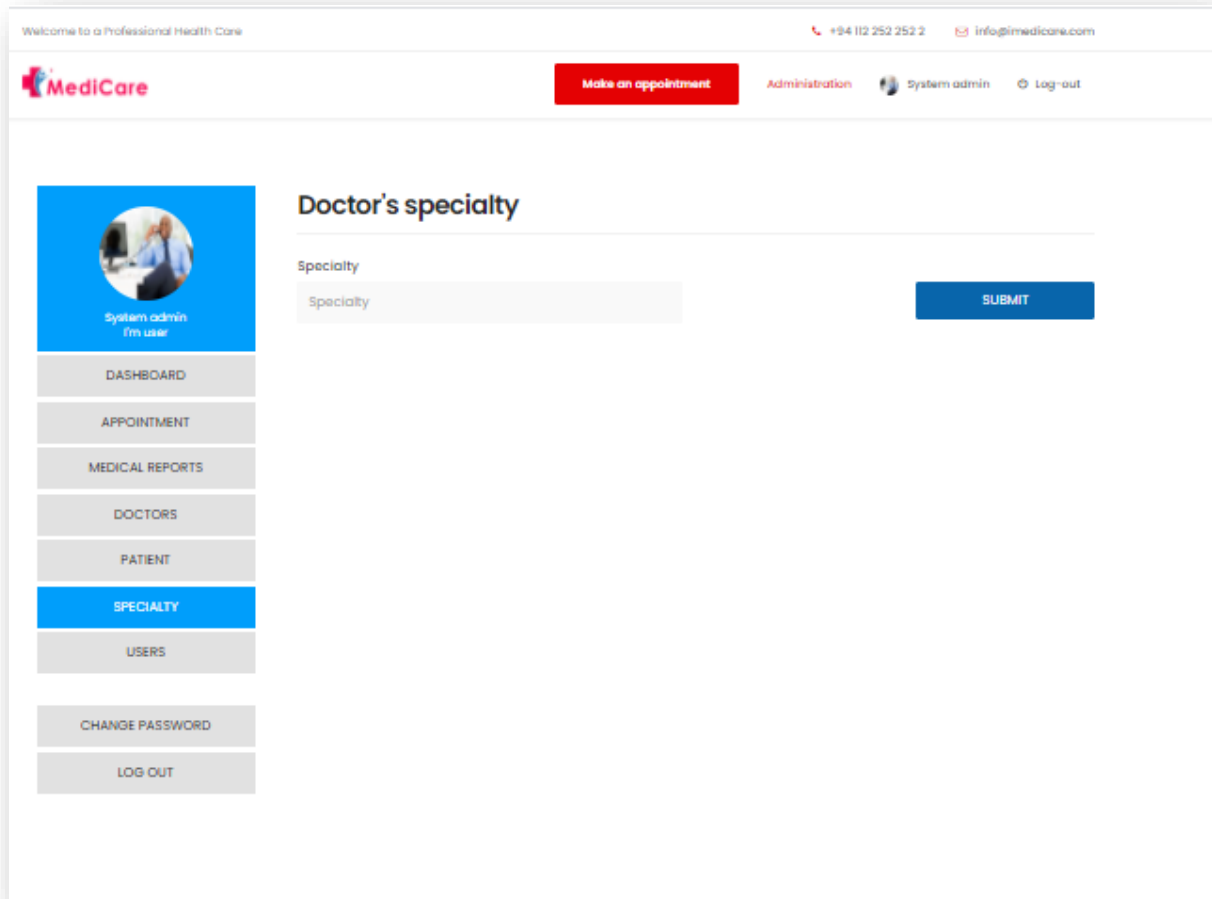
<input type="checkbox"/> Monday 04:00PM to 06:00PM	<input type="checkbox"/> Tuesday 04:00PM to 06:00PM	<input type="checkbox"/> Wednesday 04:00PM to 06:00PM	<input type="checkbox"/> Thursday 04:00PM to 06:00PM
<input type="checkbox"/> Friday 04:00PM to 06:00PM	<input type="checkbox"/> Saturday 04:00PM to 06:00PM	<input type="checkbox"/> Sunday 04:00PM to 06:00PM	

**SUBMIT**

Figure B: 3 Doctor Registration

## Register Doctor Specialty

Specialty details can be added to the system using below window.



The screenshot displays the MediCare web application interface. At the top, there is a header with the text "Welcome to a Professional Health Care" on the left, and contact information "+94 112 252 252 2" and "info@imedicare.com" on the right. Below the header, the MediCare logo is on the left, and a navigation bar contains a red "Make an appointment" button, and links for "Administration", "System admin", and "Log-out".

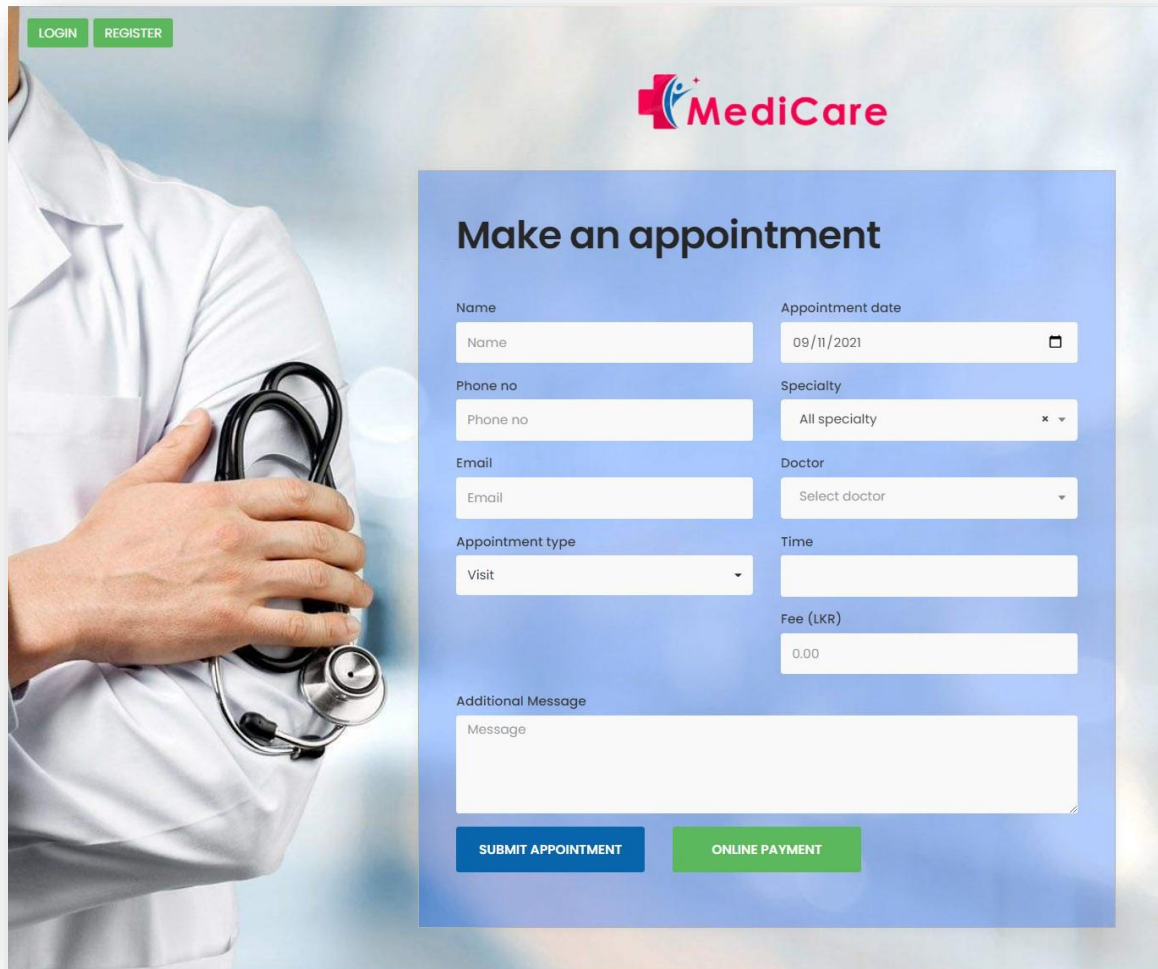
The main content area is titled "Doctor's specialty". On the left side of this area is a vertical sidebar menu with the following items: "System admin / I'm user" (with a profile picture), "DASHBOARD", "APPOINTMENT", "MEDICAL REPORTS", "DOCTORS", "PATIENT", "SPECIALTY" (highlighted in blue), "USERS", "CHANGE PASSWORD", and "LOG OUT".

The "Doctor's specialty" form consists of a text input field labeled "Specialty" and a blue "SUBMIT" button.

**Figure B: 4 Register Doctor Specialty**

## Make an Appointment

The following window can be used to make an appointment for a specific doctor. After filling out the appropriate fields, the user can either submit the appointment without paying or pay online and submit the appointment details.



The screenshot shows a web interface for 'MediCare' with a 'Make an appointment' form. The form is set against a background image of a doctor in a white coat holding a stethoscope. At the top left, there are 'LOGIN' and 'REGISTER' buttons. The 'MediCare' logo is at the top center. The form title is 'Make an appointment'. The form fields are arranged in two columns:

- Name:** Text input field with placeholder 'Name'.
- Appointment date:** Date picker field showing '09/11/2021'.
- Phone no:** Text input field with placeholder 'Phone no'.
- Specialty:** Dropdown menu with 'All specialty' selected.
- Email:** Text input field with placeholder 'Email'.
- Doctor:** Dropdown menu with 'Select doctor' selected.
- Appointment type:** Dropdown menu with 'Visit' selected.
- Time:** Text input field.
- Fee (LKR):** Text input field with '0.00' entered.
- Additional Message:** Text area with placeholder 'Message'.

At the bottom of the form, there are two buttons: 'SUBMIT APPOINTMENT' (blue) and 'ONLINE PAYMENT' (green).

**Figure B: 5 Make an Appointment**



## Confirm Appointment-without payments

The system administrator must confirm any unpaid appointments. Using the window below, you can perform three actions. The Update button can be used to update the patient's information, and the Confirm button can be used to confirm the appointment. The cancel button can also be used to cancel a patient-created appointment.

Welcome to a Professional Health Care +94 112 252 252 2 info@imedicare.com

**MediCare** Make an appointment Administration System admin Log-out

### Appointments

[New](#)

**Patient**  
Amanda Illankoon x -

**Name**  
Amanda Illankoon

**Phone no**  
0770455618

**Email**  
amanda.illankoon@gmail.com

**Date**  
07/29/2021 📅

**Specialty**  
Pediatrics x -

**Doctor**  
Dr.Oshan Illankoon x -

**Fee (LKR)**  
1500.00

**Time**  
04:00PM to 06:00PM

**Appointment type**  
Visit ▾

**Additional Message**  
Message

UPDATE CANCEL CONFIRM

**Figure B: 6 Confirm Appointment**

## Patient Profile

Using the window below, patient can add or change patient profile information. This profile window also allows you to modify patient profile image.

Welcome to a Professional Health Care +94 112 252 252 2 [info@imedicare.com](mailto:info@imedicare.com)

**MediCare** [Make an appointment](#) Administration Amanda Illan... [Log-out](#)

### Profile

Title	Gender	Name
Miss	Female	Amanda Illankoon
Email	Phone no	
amanda.illangakoon@gmail.com	0770455618	
NIC no	Address	
867393927V	No. 101/ A/4, Malabe road, Kothalawala,	
Birth day	Blood group	
01/01/1900	O+	
Allergies		
Allergies		
Special concern		
Special concern		

[Edit image](#)

[UPDATE DETAILS](#)

**Figure B: 7 Patient Profile**

## Patient Dashboard

Patient dash board can be used to view every information available for each patient. Channeling History, profile information. Lab Report details and health charts are the main information that provide through patient dash board. Also, it contains option to make an appointment. chat with expert option can also be used to contact professional expert using this dashboard window.

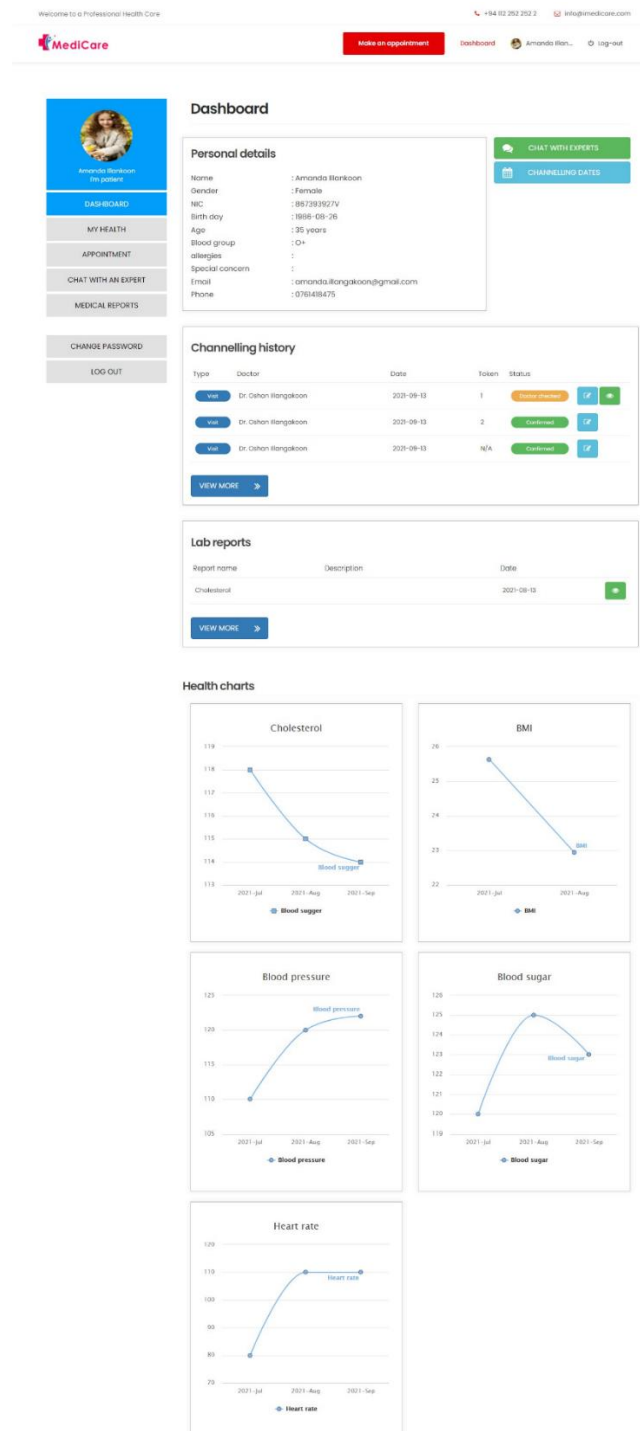
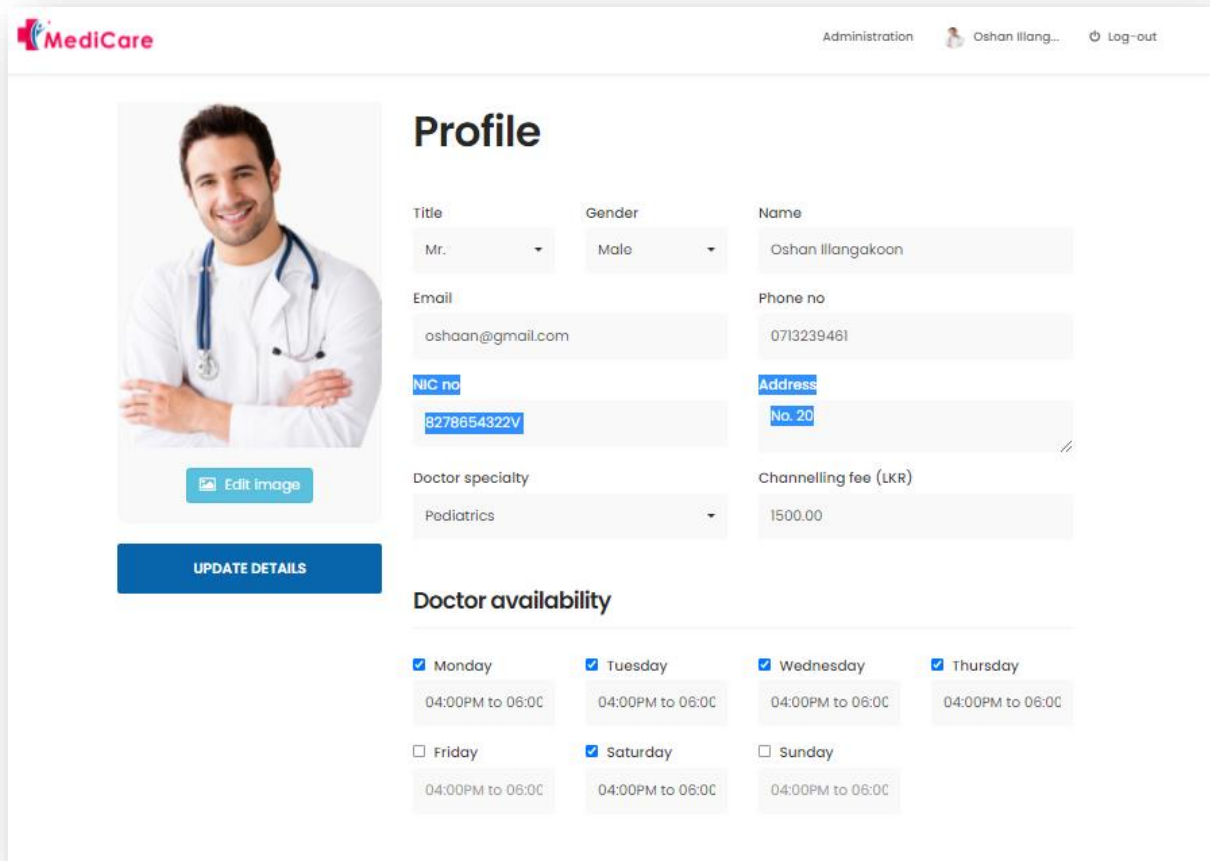


Figure B: 8 Patient Dashboard

## Doctor Profile

Doctors can add or edit information to their profile by using the window below. doctor can also change the profile image anytime.



**MediCare** Administration Oshan Illang... Log-out

### Profile

**Title** Mr. **Gender** Male **Name** Oshan Illangakoon

**Email** oshaan@gmail.com **Phone no** 0713239461

**NIC no** 8278654322V **Address** No. 20

**Doctor specialty** Pediatrics **Channelling fee (LKR)** 1500.00

**Doctor availability**

<input checked="" type="checkbox"/> Monday 04:00PM to 06:00C	<input checked="" type="checkbox"/> Tuesday 04:00PM to 06:00C	<input checked="" type="checkbox"/> Wednesday 04:00PM to 06:00C	<input checked="" type="checkbox"/> Thursday 04:00PM to 06:00C
<input type="checkbox"/> Friday 04:00PM to 06:00C	<input checked="" type="checkbox"/> Saturday 04:00PM to 06:00C	<input type="checkbox"/> Sunday 04:00PM to 06:00C	

**Figure B: 9 Doctor Profile**

## Doctor Dashboard

Doctor Profile details and appointment details are showing on the doctor dashboard as shown below.

Welcome to a Professional Health Care +94 112 252 252 2 info@imedicare.com

**MediCare** Administration Oshan Illang... Log-out

**Dashboard**

Oshan Illankoon  
I'm doctor

DASHBOARD

APPOINTMENT

CHANGE PASSWORD

LOG OUT

### Today appointments (Visits)

Type	Patient	Token	Time	Status	
Visit	Amanda Illankoon	1	04:00PM to 06:00P M	Confirmed	👁️
Visit	Amanda Illankoon	2	04:00PM to 06:00P M	Confirmed	👁️

### Today appointments (Online)

Type	Patient	Video type	Time	Status	
Online	Amanda Illankoon	zoom	04:00PM to 06:00P M	Confirmed	👁️ 📊


**Figure B: 10 Doctor Dashboard**

## Consultation

Upon clicking on the eye icon in doctor dashboard, the doctor gets directed to the consultation window. Consultation window can be used to enter consultation details of the patient. Those details are kept in the database so that the patient can see them on the patient dash board and the doctors can see them when they conduct the channelling for that patient again.

Welcome to a Professional Health Care +94 12 252 252 2 [info@medicare.com](mailto:info@medicare.com)

**MediCare** Dashboard [Oshon Wang...](#) [Log-out](#)



Osman Rajagopalan  
for doctor

DASHBOARD

APPOINTMENT

CHANGE PASSWORD

LOG OUT

### Channelling details

Blood pressure	Heart rate	Cholesterol
0.00	0.00	0.00
Blood suger	Height (cm)	Weight (kg)
0.00	0.00	0.00

Abdomen

Respiration

Nervous system

### Doctor consultation

P/C (present condition)

PMH (Past medical history)

Next channel date  
09/11/2021

### Medicine

Medicine	Dosage
Medicine	Dosage
Frequency	Note
Frequency	Note

[Add medicine](#)

### Medical Testing

Medical Test	Description
Medical Test name	Note


[Add test](#)

[PRINT](#) [SUBMIT](#)

### CHANNELLING HISTORY

PATIENT DETAILS

GO TO PATIENT DASHBOARD



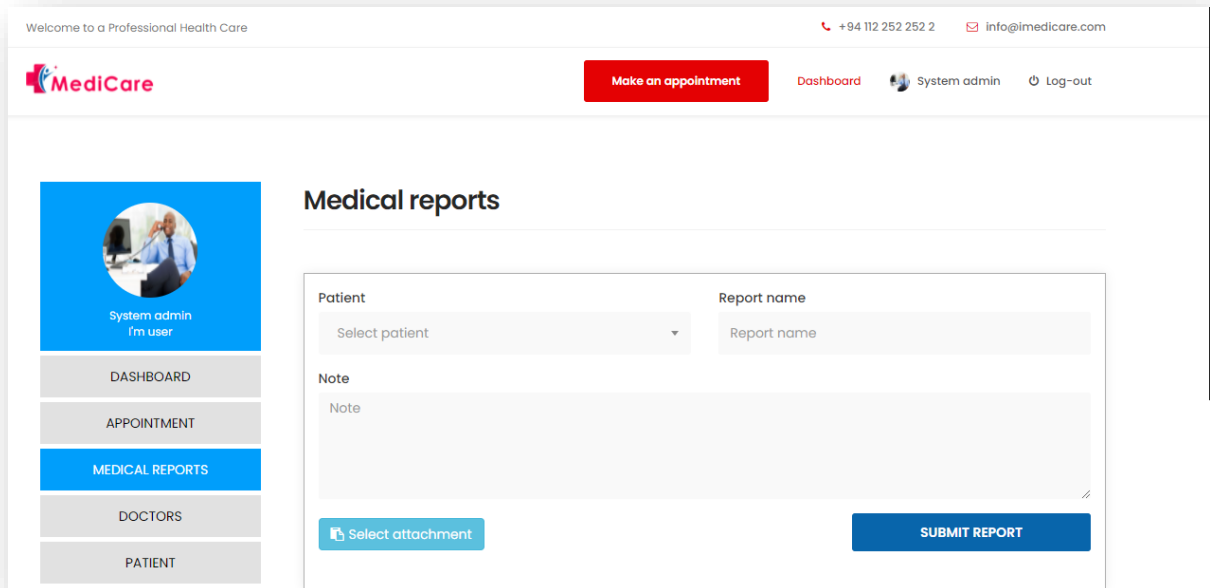
**Amanda Illankoon**

0761488476  
Female  
Blood Group : O+  
Age : 35 years

Figure B: 11 Consultation

## Upload Medical Reports

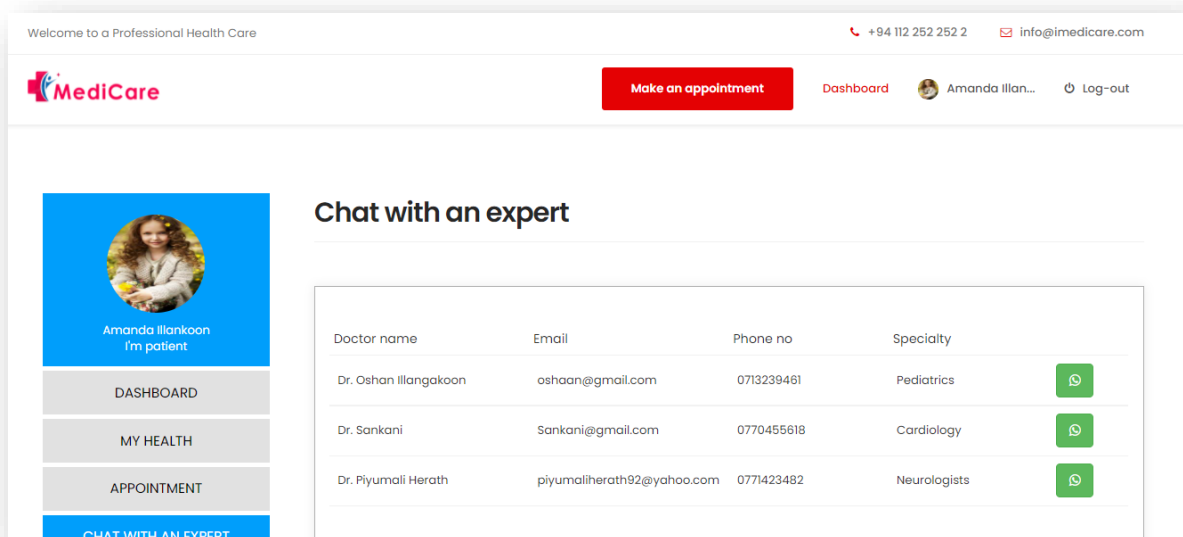
Medical reports for patients can be uploaded by the system administrator. After they've been uploaded, the reports can be viewed by both the patient and the doctors at a later time.



**Figure B: 12 Upload Medical Reports**

## Chat with Experts

Patients are facilitated to contact any professional experts via this portal. Upon clicking on the chat with an expert as shown below, the user gets directed to the WhatsApp.



**Figure B: 13 Chat with Expert**

## Appendix C: Test Results

All the test results related to make an appointment test cases are listed as bellow. Refer **Table C: 1 Test Result – Make an Appointment.**

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
19.	Make an Appointment	Submit make an appointment without adding any values	Information submission should fail without adding any values	Passed	Passed
20.		Submit information without adding patient name	Information submission should fail without patient name	Passed	Passed
21.		Enter non-existing doctor name	Validation message should be shown as “no results found”	Passed	Passed
22.		Enter non-existing specialty	Validation message should be shown as “no results found”	Passed	Passed
23.		Load available time slots	Saved available time slot should load on the relevant dropdown based on the selected doctor	Passed	Passed
24		Enter all information correctly and submit	Appointment should submit and save on the database	Passed	Passed
25.	Cancel Appointment	Cancel any appointment before appointment date	Selected channel appointment deleted from the database	Passed	Passed

**Table C: 1 Test Result – Make an Appointment**



All the test results related to the Up Coming Appointments module test cases are listed under **Table C: 2 Test Results – View Upcoming Appointments.**

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
36.	View Upcoming Appointments	Load pending appointments for the day for particular doctor	Load all saved pending appointments for the selected dates.	Passed	Passed

**Table C: 2 Test Results – View Upcoming Appointments**

All the test results related to the Consultation module test cases are listed under **Table C: 3 Test Results - Consultation.**

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
27.	Consultation	Click on the consultation button in the doctor dashboard	Should be directed to the consultation screen	Passed	Passed
28.		Submit without adding any values	Information submission should fail without adding any values	Passed	Passed
29		Submit consultation without adding mandatory values	Information submission should fail without adding mandatory values	Passed	Passed
30		Enter all information correctly and submit	Consultation record should submit and save on the database	Passed	Passed

**Table C: 3 Test Results - Consultation**

All the test results related to the Channeling history module test cases are listed under **Table C: 4 Test Results – Channeling History**.

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
31.	Channeling history	Click on the channeling history in the patient profile or consultation screen	Load all saved consultations in a list view	Failed	Passed
32.		Click on view more on one record	Load consultation record according to the selected record	Failed	Passed

**Table C: 4 Test Results – Channeling History**

Test results related to notification module test cases are listed as bellow. Refer **Table C: 5 Test Results - Notification Module**.

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
33.	Generate automatic notifications	Generate SMS/email notification regarding user registration	SMS/email should be successfully sent to the user	Failed	Passed
34.		Generate SMS/email notification regarding next appointment reminder	SMS/email should be successfully sent to the user	Failed	Passed
35.		Generate SMS/email notification regarding successful appointment creation	SMS/email should be successfully sent to the user	Failed	Passed

**Table C: 5 Test Results - Notification Module**

Test results related to Lab report module test cases are listed as bellow. Refer *Table C: 6 Test Results – Lab Reports*.

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
36.	Lab Reports	Click on the lab reports in the patient's profile.	Load all saved lab reports in a list view	Passed	Passed
3a7.		on view more on one record	Load lab report according to the selected record	Passed	Passed

**Table C: 6 Test Results – Lab Reports**

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