

# eDoctor: An Online Medical Service

by

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A project submitted to the Department of Computer Science and Engineering  
in partial fulfillment of the requirements for the degree of  
B.Sc. in Computer Science

Department of Computer Science and Engineering  
Brac University  
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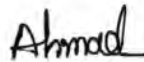
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# Declaration

It is hereby declared that

1. The project submitted is my own original work while completing degree at Brac University.
2. The project does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The project does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

**Student's Full Name & Signature:**



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# Approval

The project titled “eDoctor: An Online Medical Service” submitted by

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Of Fall, 2023 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of B.Sc. in Computer Science on January 18, 2024.

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# Ethics Statement

## Abstract

The COVID-19 situation has demonstrated the value of telemedicine in healthcare. During the pandemic it was not safer to visit a hospital physically therefore telemedicine has played a vital role on improving the standard and accessibility of healthcare. Telemedicine refers to the provision of medical services remotely using a telecommunications network. Most of the rural people of Bangladesh doesn't get appropriate medical service. To address this issue and deliver better healthcare a telemedicine web application called eDoctor, is created. Through this platform, patients can schedule online consultations with healthcare providers, access health records, and manage prescriptions. The eDoctor will help patients with shorter consultation wait times and greater convenience for rural people. Additionally, it will optimize healthcare resources by reducing the need for physical infrastructures.

**Keywords:** eDoctor, Telemedicine, Telehealth, Online Medical Service, Virtual Health care, Web App.

## **Dedication**

I want to dedicate all of my efforts and struggles in my academic career to my incredible father. I never would have progressed this far in life without him.

## **Acknowledgement**

First and foremost, thanks to the Almighty Allah, my project was finished without any significant setbacks.

Secondly, I would like to convey my sincere gratitude to my sir Md. Abdur Rahman and Dr. Muhammad Iqbal Hossain for providing me with the fantastic opportunity to complete this excellent project which helped me in conducting extensive research and allowed me to learn an enormous amount of new knowledge.



# Table of Contents

Declaration	i
Approval	ii
Ethics Statement	iv
Abstract	v
Dedication	vi
Acknowledgment	vii
Table of Contents	viii
List of Figures	x
List of Tables	xi
<b>1 Introduction</b>	<b>1</b>
1.1 Background . . . . .	1
1.2 Problem Statement . . . . .	1
1.3 Objectives . . . . .	1
1.4 Web Application . . . . .	1
1.5 MERN Stack . . . . .	2
1.6 Next.js . . . . .	2
1.7 WebSocket . . . . .	2
1.8 WebRTC . . . . .	2
<b>2 Literature Review</b>	<b>3</b>
2.1 Web Application for Online Medical Service . . . . .	3
2.2 Existing App Review . . . . .	3
2.2.1 DocTime[1] . . . . .	3
2.2.2 LifePlus Bangladesh[2][2] . . . . .	4
2.2.3 Maya[3] . . . . .	4
2.2.4 Medico[4] . . . . .	4
2.3 Work Plan . . . . .	4
<b>3 eDoctor what is it?</b>	<b>6</b>
3.1 Project Summary . . . . .	6
3.2 Development Method . . . . .	6

<b>4</b>	<b>Design and Analysis</b>	<b>7</b>
4.1	Use Case Diagram . . . . .	7
4.2	Activity Diagram . . . . .	8
4.3	Sequence Diagram . . . . .	8
4.4	Product analysis . . . . .	9
4.5	Benefits . . . . .	10
4.5.1	Multilingualism . . . . .	10
4.5.2	Instant Consultation . . . . .	10
4.5.3	Chat . . . . .	10
4.5.4	Digital Prescription . . . . .	10
4.5.5	Blog . . . . .	10
<b>5</b>	<b>Product Description</b>	<b>11</b>
5.1	User Management . . . . .	11
5.1.1	User Types . . . . .	11
5.2	Web API . . . . .	11
5.2.1	API Endpoint . . . . .	11
5.2.2	API Relationship . . . . .	11
5.2.3	Login API . . . . .	12
5.3	User Management . . . . .	12
5.4	Doctor Registration . . . . .	13
5.5	Login . . . . .	13
5.6	Dashboard . . . . .	14
5.7	Doctor Verification . . . . .	15
5.8	Doctor Search and Filers . . . . .	15
5.9	Live Consultation . . . . .	17
5.10	Chat with Doctor . . . . .	17
5.11	Blog . . . . .	18
5.12	Digital Prescription . . . . .	18
<b>6</b>	<b>Conclusion</b>	<b>20</b>
6.1	Future Prospect . . . . .	20
	<b>Bibliography</b>	<b>21</b>

# List of Figures

2.1	Work Plan	5
4.1	eDoctor Use Case Diagram	7
4.2	eDoctor Activity Diagram	8
4.3	eDoctor Sequence Diagram	9
5.1	API Relationship	12
5.2	Patient Registration	12
5.3	Doctor Registration	13
5.4	Login	14
5.5	Dashboard	15
5.6	Doctor Verification	15
5.7	Specialty	16
5.8	Doctor Search	16
5.9	Live Consultation	17
5.10	Chat Page	18
5.11	Blog Preview	19

# List of Tables

# Chapter 1

## Introduction

### 1.1 Background

E-hospitals are a result of the rapid advancements of technology and need for innovative solutions in the healthcare sector. With the widespread adoption of the internet and digital communication tools, the healthcare sector has witnessed a significant transformation in the way medical services are delivered to patients. Although the traditional hospital is effective at providing in-person care, it has some drawbacks. So, we need a digital platform, like E-hospital which can address those issues.

### 1.2 Problem Statement

Bangladesh has a rural population of 61.05%. So, this massive population can't access to appropriate medical care. Generally, People used to go to traditional health care but there are some issues with traditional health care, including longer waiting times for appointments which may cause the death of their lives, additional financial cost for reaching the healthcare, wastage of time, need for physical infrastructure etc.

### 1.3 Objectives

The main objectives of this web application are as follows:

- Enhancing accessibility to healthcare services, particularly for individuals residing in remote areas or facing mobility challenges
- Reducing wait times
- Minimizing the need for physical infrastructure
- Ensuring the privacy and security of patients' sensitive health information.

### 1.4 Web Application

A web server facilitates the operation of software applications, commonly referred to as web applications. These applications can be accessed by users through a web

browser when an active internet connection is available. Unlike computer-based software packages stored locally on user devices, web applications utilize both client-side and server-side technologies to provide dynamic and interactive user experiences. The client-side, running on the user's device, typically employs HTML, CSS, and JavaScript to manage the user interface and interactions. On the other hand, the server-side manages the backend infrastructure, processes data, handles requests, and interacts with databases or external systems.

## 1.5 MERN Stack

The MERN stack is widely recognized as a leading web development stack for constructing dynamic and full-stack web applications. Comprising MongoDB, Express.js, React.js, and Node.js, each component in the stack serves a specific purpose. This stack offers a robust and efficient environment for developing modern, scalable, and interactive web applications. Its popularity stems from using JavaScript across the entire stack and providing access to reliable tools and frameworks. Here's an overview of each technology in the MERN stack:

- **MongoDB:** A NoSQL database storing data in a JSON-like format called BSON, offering scalability, high performance, and seamless integration with JavaScript.
- **Express.js:** A minimal and flexible web application framework for Node.js, simplifying server-side application development with robust features for routing, middleware management, and handling HTTP requests and responses.
- **React.js:** A front-end JavaScript library for constructing user interfaces, allowing developers to create reusable UI components through a component-based approach.
- **Node.js:** A server-side JavaScript runtime environment that empowers developers to run JavaScript on the server.

## 1.6 Next.js

Next.js, a React-based framework, facilitates modern web app development with server-side rendering, static site generation, and integrated routing.

## 1.7 WebSocket

WebSocket, a communication protocol, supports bidirectional channels over a long-lived connection, contrasting with short-lived HTTP connections.

## 1.8 WebRTC

WebRTC enables real-time communication within web browsers, supporting features like audio/video communication, peer-to-peer data exchange, and secure encryption.

# Chapter 2

## Literature Review

### 2.1 Web Application for Online Medical Service

Although, Bangladesh healthcare has changed significantly over the past decades, the healthcare of Bangladesh has been lagging behind the developed countries of the world due to accessibility to healthcare services, particularly for individuals residing in remote areas or facing mobility challenge, insufficient number of healthcare and lack of application of Telemedicine. Telemedicine or E-hospitals are essential to address those problems and the issues that traditional healthcare has, like the long wait time for appointment, additional financial cost. However, there are some telemedicine applications that has potential to change the healthcare system of Bangladesh. Like-

- DocTime
- Life Plus Bangladesh
- Maya etc.

Nevertheless, I think still there are so much deficiency of telemedicine application in Bangladesh. So, I built my project in order to minimizing that deficiency.

### 2.2 Existing App Review

There are many telemedicine app in the market and I have reviewed some of them and most of them are in English language and some of them has limitation.

#### 2.2.1 DocTime[1]

It provides online medical service. It has both the mobile and web application. Some of it's feature are as follows:

- Live consultation on Video call
- Option to search doctor by speciality
- Prescriptions download
- Medicine delivery
- Sample collection at home for diagnostic test

### 2.2.2 LifePlus Bangladesh[2][2]

It also has mobile and web application. Main feature are as follows:

- Live video consultation
- Option to search doctor by hospital or speciality
- Medicine delivery
- Ambulance service available
- Home nursing care
- Diagnostic test booking

### 2.2.3 Maya[3]

It has only mobile application. Main features are as follows:

- Live video consultation
- Prescription option available
- Option to ask Question
- Blog for accurate health knowledge
- Shop for purchase health related products

### 2.2.4 Medico[4]

This has only mobile application. Some of it's main feature are as follows:

- Live video/audio call consultation
- Online prescription
- Ambulance service all over the country
- Medicine reminder

## 2.3 Work Plan

The above diagram shows the total work plan for this project. Here, I have divided my work into several steps or tasks. The task description are as follow:

**Initial Setup:** In this step, I will initialize the project like creating empty repository with farmwork' boilerplate code and push it to GitHub. As already I have decided I will work with the popular MERN stack, so I will create two separate repositories for Front-end and Back-end. Where Front-end repo will have all React related code and Back-end repo will have Node and Express related code.

**Functional Requirement:** Here, I'll put together all the necessary functional requirement for this project. The functional requirement refers the description or



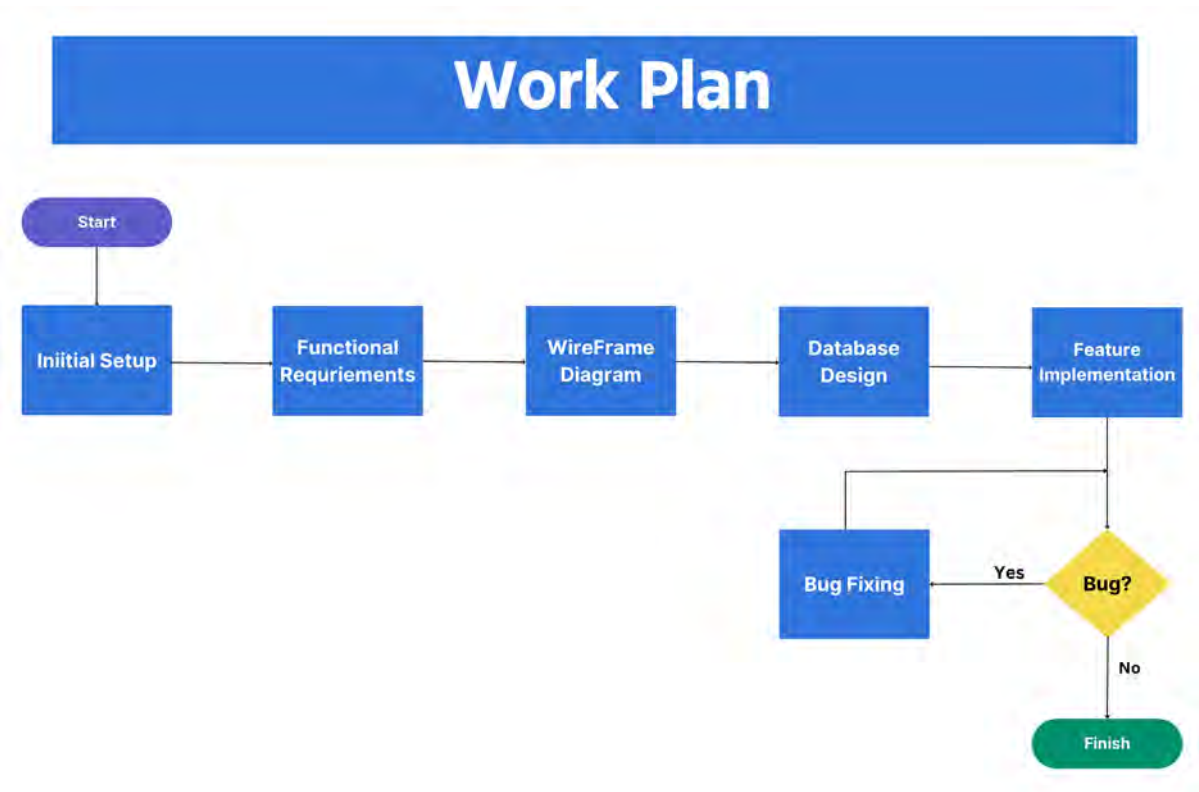


Figure 2.1: Work Plan

feature of service that the system offers.

**Wire Frame Diagram:** Here, I will create the Wire Frame diagram for the project. Wire Frame diagram refers the visual representation of how the web app will look. It illustrates all the element require from the client side. **Database Design:** In this section, the Database will be designed like designing the scheme, model and the relation of Database etc.

**Feature Implementation:** At this stage, every feature will be implemented one by one. I will give priority to Front-end first then Back-end because without the Front-end, Back-end is not useful.

**Bug Fixing:** Finally, the bug of every feature will be solved here. Every new feature can lead some bug. So this stage is very important because without this stage the whole app can crash or couldn't get the desired output.

# Chapter 3

## eDoctor what is it?

### 3.1 Project Summary

The eDoctor is a telemedicine web application that allows doctors to give medical services to patients over the internet. The app contains features like online medical consultations, appointment scheduling, and prescription management. Patients can also access their medical history and test results using the app. The eDoctor will benefit patients by reducing consultation wait times and providing better convenience for those living in rural areas. E-hospital apps are intended to increase access to medical treatment, provide easy and efficient services, and reduce the pressure on traditional healthcare institutions. To secure the privacy of patient the HIPAA compliance will implemented.

### 3.2 Development Method

The waterfall methodology is a linear project management strategy in which requirements are collected at the beginning of the project and then a sequential project plan is developed to suit those requirements. In waterfall model, the requirements never change. Since my requirements for this app will not change, I will go with the waterfall methodology. There are five stage of this method which are Requirements gathering, Analysis, Design, Implementation, Testing, Maintenance.

# Chapter 4

## Design and Analysis

A UML diagram is a UML (Unified Modelling Language)-based diagram used for representing systems and software visually. It is quite similar to blueprints used in other fields of engineering. In order to understand the designs, and proposed implementation of complex software systems, software engineers generate UML diagrams.

### 4.1 Use Case Diagram

A graphical representation of a user's potential interactions with a system is called a use case diagram. Usually, actors, use cases, and their relationships are shown in use case diagrams.

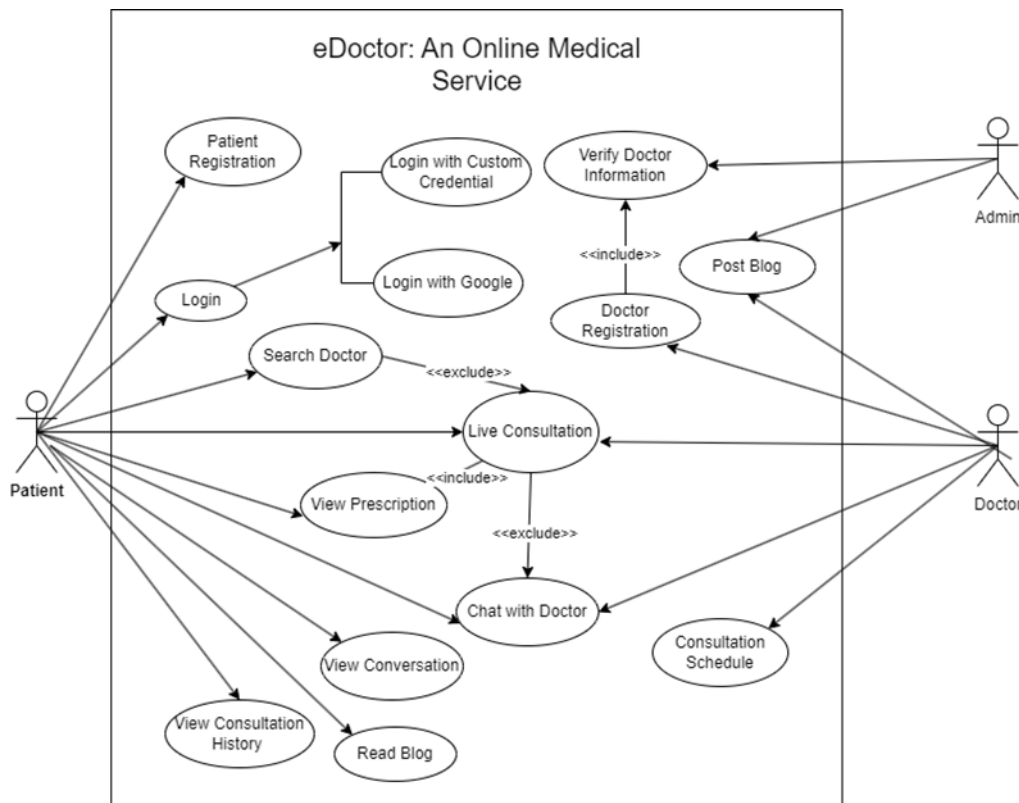


Figure 4.1: eDoctor Use Case Diagram

## 4.2 Activity Diagram

Similar to a flowchart or data flow diagram, an activity diagram visually displays a series of actions in a system.

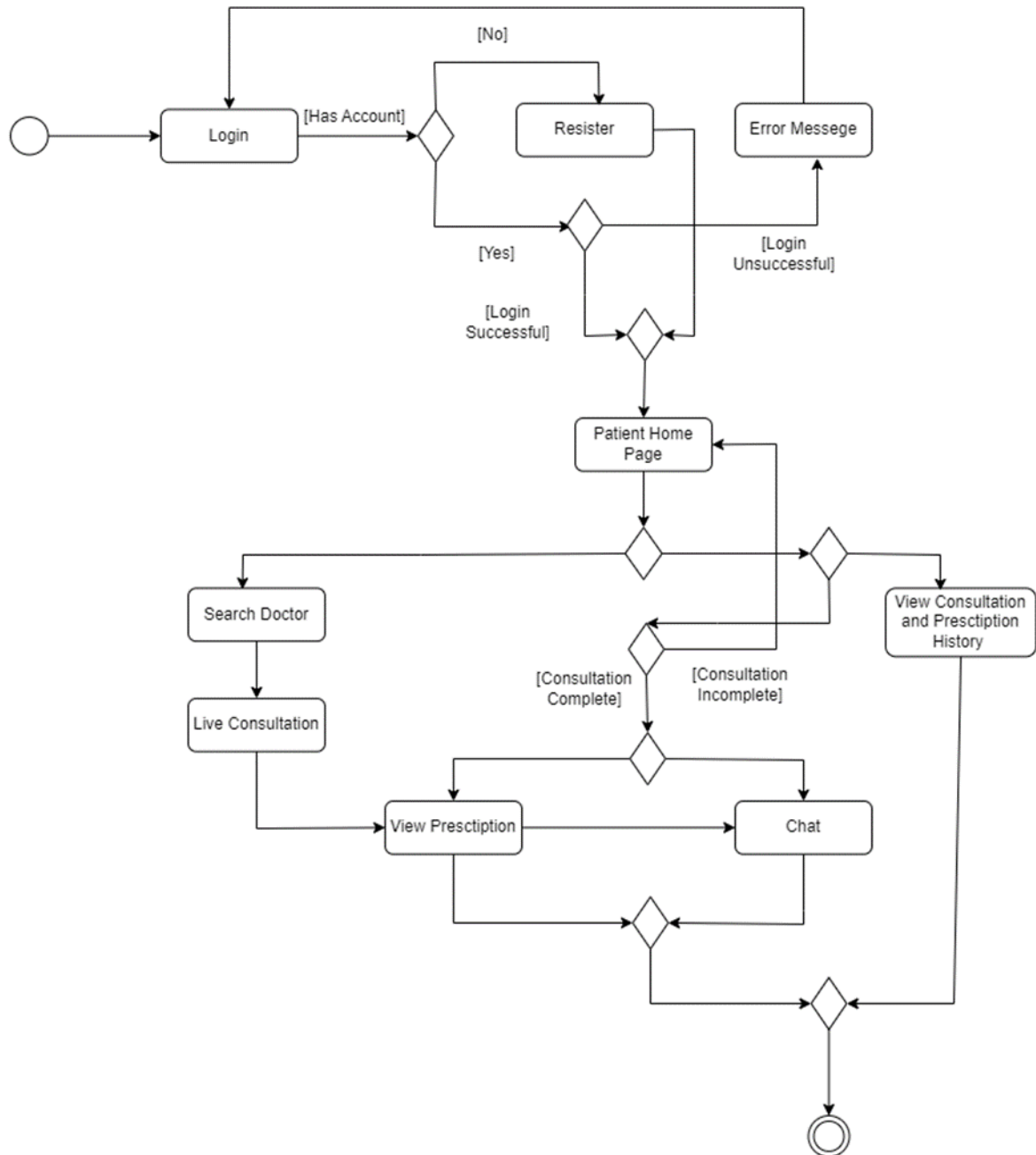


Figure 4.2: eDoctor Activity Diagram

## 4.3 Sequence Diagram

A sequence diagram is simply the sequential order in which objects interact with one another, or the order in which these interactions occur. By depicting the objects

and the messages they pass, sequence diagrams show the behavior of objects in a use case.

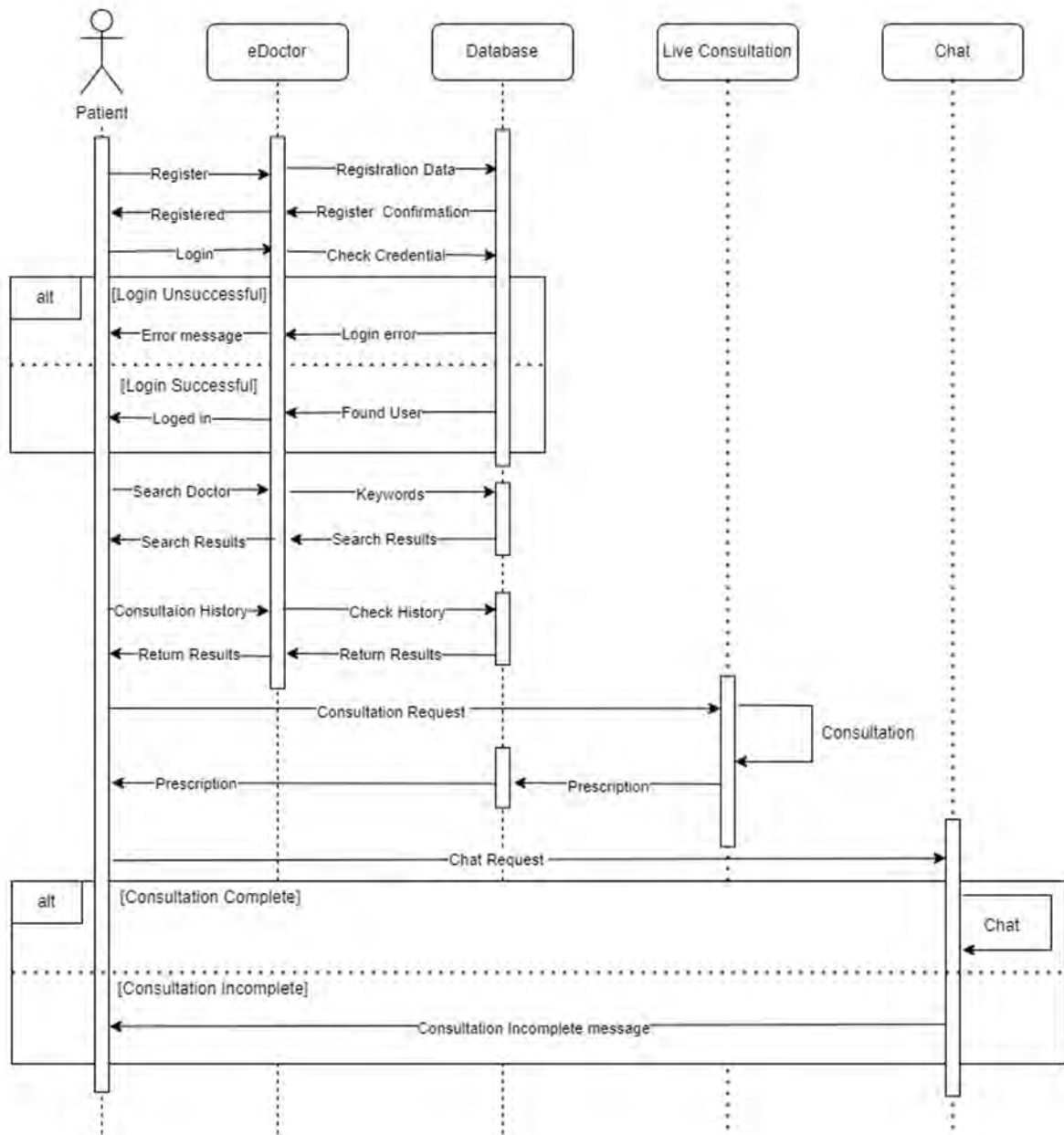


Figure 4.3: eDoctor Sequence Diagram

## 4.4 Product analysis

eDoctor is an omnibus web app developed to assist patients by offering online medical care. These services include a doctor-patient chat feature, a live video consultation, digital prescriptions, and appointment history.

The vast majority of Bangladesh’s rural residents do not receive adequate medical care. The city patient also faces longer waiting times for appointments, additional financial cost for reaching the healthcare and hassle of traffic congestion. The pa-

tient who lives in a city deal with lengthier wait times for appointments, additional travel expenses to get to the hospital, and traffic congestion.

## **4.5 Benefits**

Proposed web application will help on many effective cases.

### **4.5.1 Multilingualism**

Many rural residents lack literacy skills and have difficulty understanding or feeling at ease with the English language. As a result, this app supports both Bangla and English language.

### **4.5.2 Instant Consultation**

Traditional healthcare required patients to schedule appointments before waiting in a queue to visit a doctor, taking up a lot of their important time. Thus, this app offers instant video consultation rather than requiring you to schedule an appointment.

### **4.5.3 Chat**

It appears helpful to talk with the doctor after the consultation. That is why this software has a chat option. Patient can chat with the doctor after the consultation.

### **4.5.4 Digital Prescription**

The loss or damage of a prescription can be a serious loss for the patient because it is so important to them for future appointment. In this app, Patient need not be concerned since it will be saved digitally in this case.

### **4.5.5 Blog**

Patient can read blog which are posted by the doctors or the admin, by which patient can gather valuable knowledge about health and can make them live longer.

# Chapter 5

## Product Description

### 5.1 User Management

#### 5.1.1 User Types

This project's web application has a variety of users. Those users can be classified into three types which are – Patient, Doctor, Admin.

A central authority will oversee the management of all types of authorized users, which will also have authority to verify the doctor's information after registration and ability to write a blog post. User Manipulation are as follows:

- Verify Doctor
- Edit User
- Create User

### 5.2 Web API

An API, or Application Programming Interface, is a set of rules and protocols that allows different software applications or systems to communicate with each other over the internet.

#### 5.2.1 API Endpoint

An API endpoint is a specific URL or where a web API can be accessed to perform a particular operation or retrieve specific data. Each API endpoint corresponds to a particular resource or feature offered by the API and is distinguished by a certain path and method (such as GET, POST, PUT, or DELETE). API endpoints are essential for specifying which resource to interact with and what to do with that.

#### 5.2.2 API Relationship

The purpose of the REST APIs is to allow web applications to save or retrieve database data. These APIs are divided into many modules. These include the Chat, Admin, Blog, Search Doctor, and Registration modules.

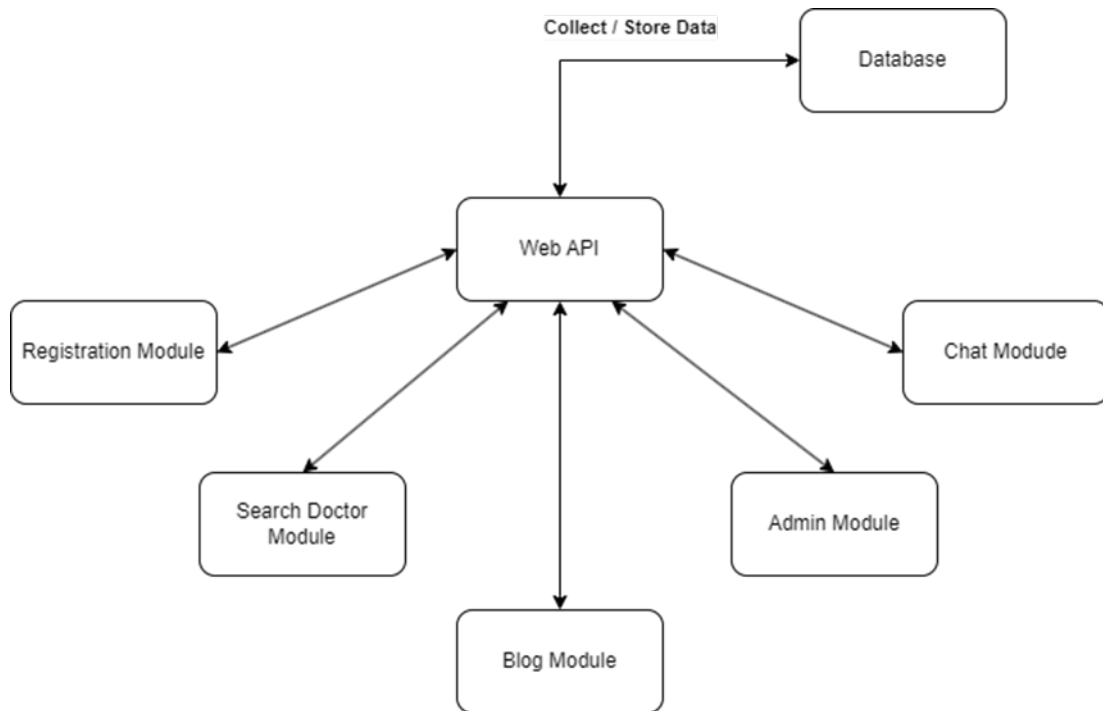


Figure 5.1: API Relationship

### 5.2.3 Login API

The user must enter their email address as both their username and password. When a case fails, the customer will receive the appropriate message. The endpoint is used for Login is `-/api/login`

## 5.3 User Management

Figure 5.2: Patient Registration

In order to use the application, the user must have to register to the system. For

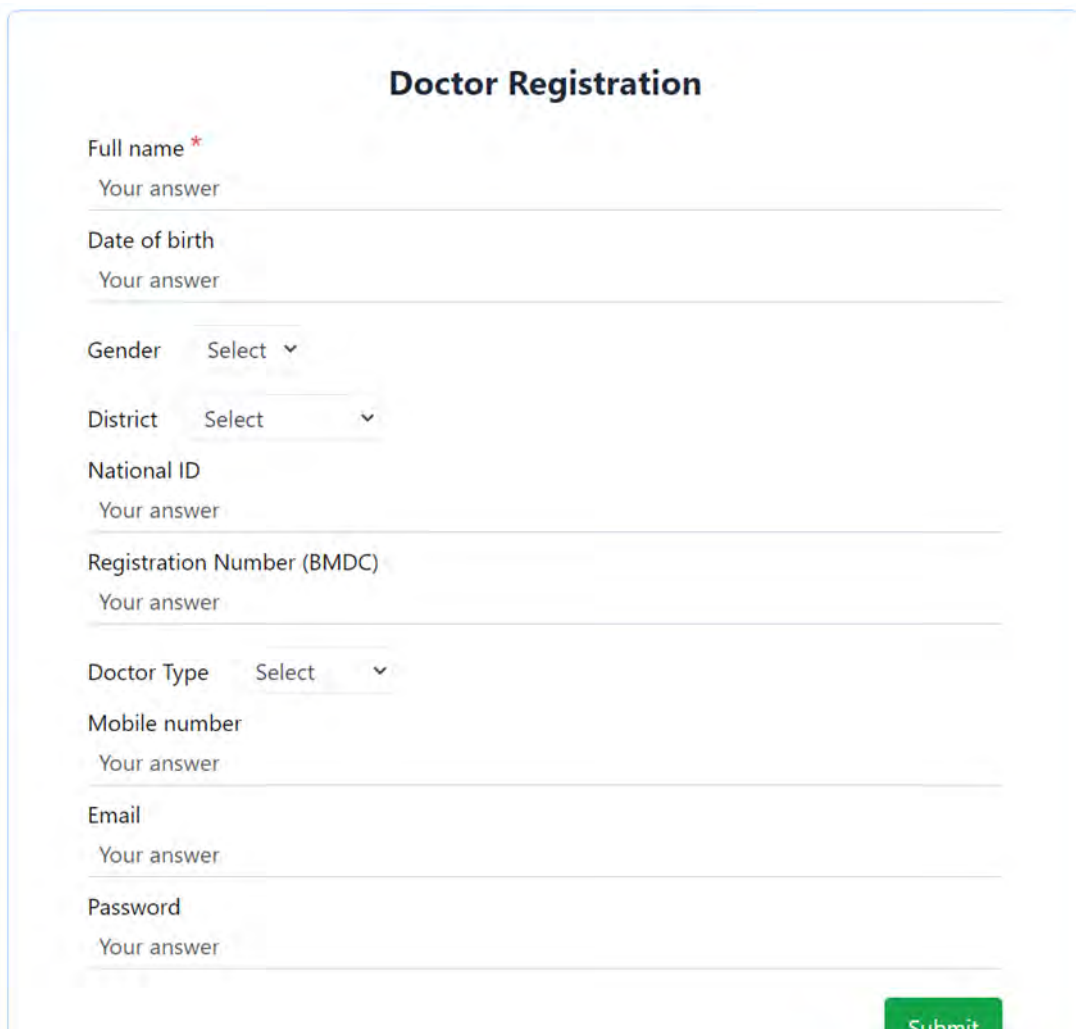


form validation, React Hook Form is used. So, it can check if mobile number or email is valid or not. The following information is needed to register :

- Name
- Mobile Number
- Password

## 5.4 Doctor Registration

In order to give live consultation through the application, the doctor also need to register to the system. The following information is needed to register – First Name, Last Name, Gender, Date of Birth, District, NID, BMDC Number, Doctor Type, Mobile Number, Email and Password. Here, React Hook Form is also used.



The image shows a web form titled "Doctor Registration". The form contains the following fields and controls:

- Full name \***: A text input field with the placeholder "Your answer".
- Date of birth**: A text input field with the placeholder "Your answer".
- Gender**: A dropdown menu with the placeholder "Select".
- District**: A dropdown menu with the placeholder "Select".
- National ID**: A text input field with the placeholder "Your answer".
- Registration Number (BMDC)**: A text input field with the placeholder "Your answer".
- Doctor Type**: A dropdown menu with the placeholder "Select".
- Mobile number**: A text input field with the placeholder "Your answer".
- Email**: A text input field with the placeholder "Your answer".
- Password**: A text input field with the placeholder "Your answer".

A green "Submit" button is located at the bottom right of the form.

Figure 5.3: Doctor Registration

## 5.5 Login

User can login to the app in two ways which are as follows:

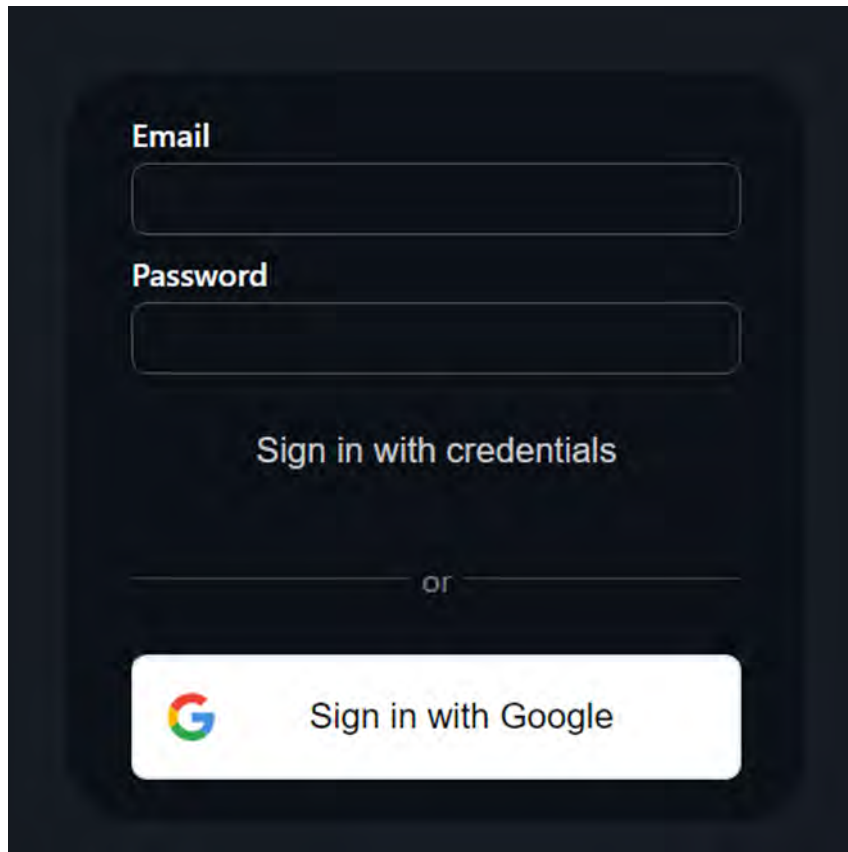


Figure 5.4: Login

- Login with Email and Password
- Login with Google account

After Registration user can log in to their account with their email address. For that username and password is required. This web application will call the API in background – `api/login`. Submitting those, system will check if the account exists with that username or those are correct if so, it will allow user to go to patient home page. For login, NextAuth is used where JSON Web Token (JWT) is applied which will be used to access other information later on.

## 5.6 Dashboard

The authenticated user will be navigated to the dashboard. On this dashboard, user can easily navigate to different page through the dashboard menu. There will be link to message, prescription and consultation history. On message tab, user can view all previous conversations and messages. Also, a new conversation can be created. Then on the prescription option, user can view current and previous prescription and download them. Lastly, patient can go to the consultation history page by selecting it on the menu where a list will be show with the details of any consultation.

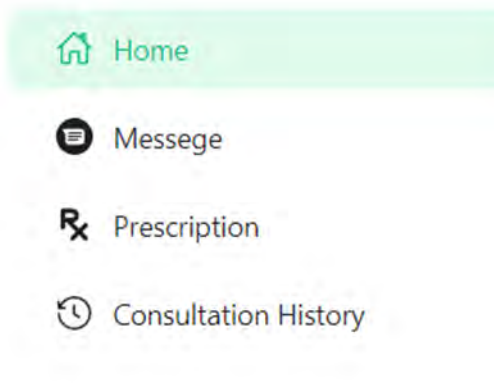


Figure 5.5: Dashboard

## 5.7 Doctor Verification

Name	Email	Mobile	Gender	Nid	Registration Number (BMDC)	Doctor Type	Action
Buse Solmaz	buse.solmaz@example.com	01646767921	female	658982346975345	82346975345	Medical	approve
Phillipe Grewal	philippe.grewal@example.com	01546364972	male	658982346975345	82346975345	Dental	approve
Ines Norberg	ines.norberg@example.com	01346517939	female	658982346975345	82346975345	Veterinary	approve

Figure 5.6: Doctor Verification

To make the admin page more protected, NextAuth middleware is used. Because it will run before accessing any page even when the page are static. Here, admin can view all the request of the doctor and admin can justify those and approve the request. Approving the request, the database will be updated and patient can see the new approved doctor in the doctor list page.

## 5.8 Doctor Search and Filers

Before visit a doctor, patient need to select a specialty in which specialist doctor the want to visit. Since there will be significant number of doctors, this will help by reducing the time to search a doctor. Selecting one category, patient will go to doctor search and filters page where user can see the doctor list. In this page only verified doctor will be shown. On left there will be option to filter and sort. Whether any option change there will be a Get request to the backend and with that response, user can view the desired output.

There are two option to filters which are:

- Online now

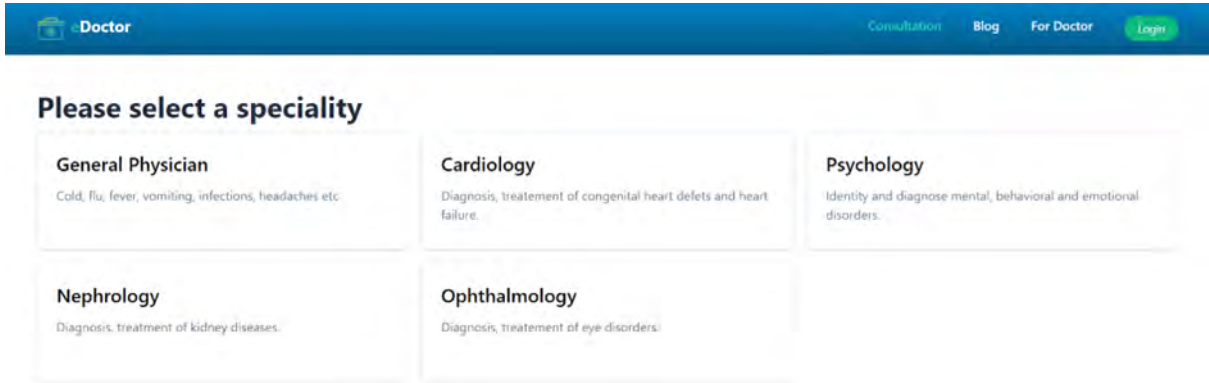


Figure 5.7: Specialty

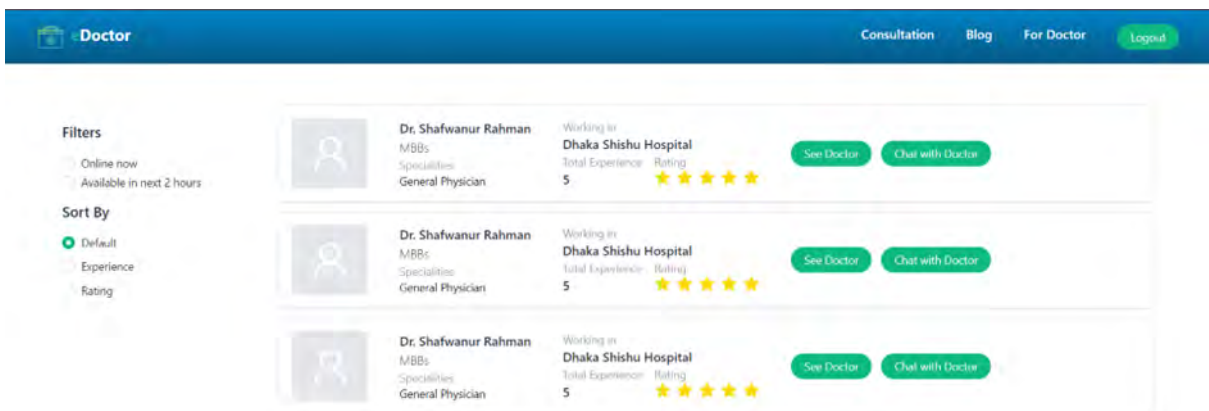


Figure 5.8: Doctor Search

- Available in next 2 hours

Also, there are option to sort the doctor list. In there will be three options which are:

- Default
- Experience
- Rating

## 5.9 Live Consultation



Figure 5.9: Live Consultation

Patient can visit a doctor instantly on clicking the see doctor button in the doctor list page which will call the doctor and doctor can answer the call. Upon answering the call, live video consultation can be done simultaneously. There will be functionality to mute camera, mic and end call.

Here this live consultation will be peer-to-peer connection (Only two user) with the help of the WebRTC. Clicking the button, patient will send an SDP (Session Description Protocol) offer to the doctor through the WebSocket. After that doctor will receive that offer and clicking the answer button will send the SDP answer to the patient. This process is called signaling. Exchanging, the two users signal through the WebSocket, WebRTC will take over the conversation. For WebSocket, socket.io is used and for WebRTC simple peer is used in client side.

## 5.10 Chat with Doctor

On clicking the chat with doctor button in the doctor list page, patient will only redirect to the chat page if the user is logged in (has active token), otherwise they

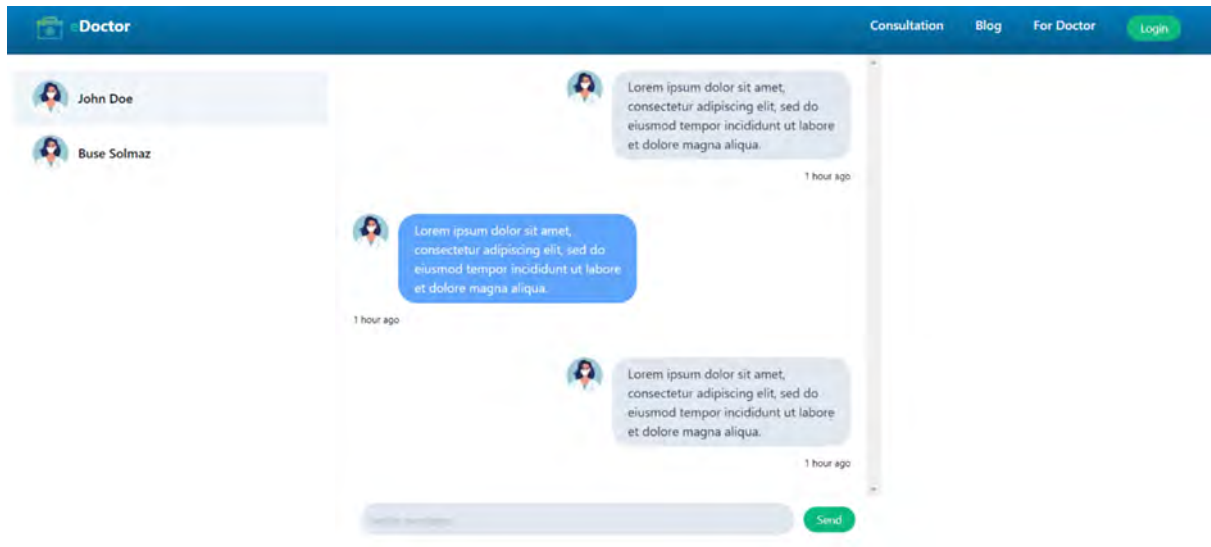


Figure 5.10: Chat Page

will be redirect to the login page.

In this page, on left there will be the list of the all conversation and besides that there will be a chat box. In this view user can chat with doctor instantly with the help of web socket. For web socket, socket.io is used in the server and client. So, users will send the message privately to a specific user will the unique socket id. That message will be broadcast to that specific user only.

For the new conversation, there will be a Post request to the backend with the both user id and it will save in the conversation database. Later with the help of this database, all conversation of a user can be fetched. Also, for each message there will be Post to the server. So that user can see the previous messages of any conversation.

## 5.11 Blog

On Blog page user can view all blogs preview by ascending order. When user will click the Read More button, it will let them to the single blog page and will show the full blog.

Blog can be posted by Admin and Doctors only. In the blog create page admin or doctor can create a new blog. In that page it will have a post request to the blog table.

## 5.12 Digital Prescription

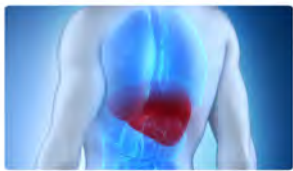
Upon clicking the prescription tab of the dashboard menu, patient will navigate to the prescription tab. In that tab patient can see the digital prescription after the consultation of a doctor. Also, they can see previous prescription in this window. There has a download option available to download the prescription as pdf.



### EARLY WARNING SIGNS OF KIDNEY DISEASE

Millions of people are living with various types of kidney diseases and most of them don't even have the faintest idea about it. This is why kidney disease is often known as a 'Silent Killer' as most people do not feel any difference until the disease is advanced. While people get their blood pressure, sugar and cholesterol levels checked on a regular basis, they fail to get a simple creatinine test done in their blood, to detect any unidentified kidney problems.

[Read More](#)



### Symptoms of liver disease

Liver problems develop silently with no obvious symptoms in the early stages yet the disease is largely preventable through lifestyle changes...

Figure 5.11: Blog Preview

# Chapter 6

## Conclusion

### 6.1 Future Prospect

Rural people of Bangladesh are already making a significant shift toward technology and digitization. Nowadays, it's quite common to see a smartphone in the hands of the general public. But they still truly dependent of local medical services. So, its time to move forward to E-hospital as well.

Moreover, this telemedicine app is the most convenient and very useful. As it is written in Bangla language so even the rural people can easily get their desired medical service. It gives you the valuable features like, online consultations with skilled healthcare providers, access health records, and manage prescriptions.



# Bibliography

- [1] “Doctime - online doctor and telemedicine services in bd,” *Doctime*, [Online]. Available: <https://doctime.com.bd/>.
- [2] “Lifeplus bangladesh — digital health bangladesh,” *LifePlus*, [Online]. Available: <https://lifeplusbd.com/>.
- [3] “Maya - it’s ok to ask for help,” *Google Play, Maya Digital Health Pte. Ltd*, [Online]. Available: <https://play.google.com/store/search?q=maya&c=apps>.
- [4] “Medico,” *Googele Play, Medico Bio Limited*, [Online]. Available: <https://play.google.com/store/apps/details?id=bio.medico.patient>.