



**Daffodil**  
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## **DIU E-HEALTH SYSTEM**

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This Project documentation has been submitted in fulfillment of the requirements  
for the Degree of Bachelor of Science in Information Technology.

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## Approval

This Project titled on “DIU E-Health System”, submitted by “Semonty Rahman, ID:213-51-049”, to the Department of Information Technology & Management, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Information Technology & Management, and approval as to its style and contents.

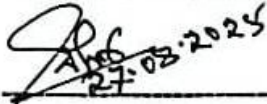
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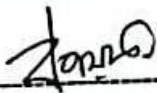
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## DECLARATION

I hereby confirm that I, Semonty Rahman have undertaken this project under the supervision of Professor Dr. Imran Mahmud, Head of The Department of Software Engineering Daffodil International University. I affirm that this project, in its entirety, is my own work and has not been previously submitted for fulfillment of any other academic degree

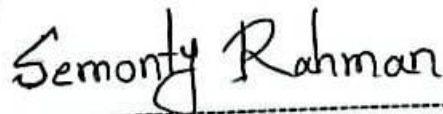
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# Chapter 1: Introduction

## 1.1 Background

The healthcare industry has undergone significant digital transformations in recent years, with technology playing a very important role in transforming the health industry, like improving patient care, improving administrative processes, and improving the overall healthcare experience. The DIU eHealth System has been developed as a comprehensive digital health platform designed to address the healthcare needs of patients, doctors, and administrators.

In this system, various kinds of healthcare services such as including appointment scheduling, healthcare record management, prescription handling, blood donation and fund-raising with medical intents, are integrated into a unified platform or system. This integration means to improve accessibility, efficiency and quality of healthcare delivery and to reduce the administrative burden and improve communication between healthcare providers and patients.

## 1.1 Problem Statement

Traditional healthcare systems face many kinds of challenges that affect the quality and efficiency of healthcare delivery:

- Fragmented patient information across different departments and healthcare facilities
- Inefficient appointment scheduling processes leading to long wait times and resource underutilization
- Limited accessibility to medical records for both patients and healthcare providers
- Challenges in coordinating blood donation activities and managing blood supply
- Difficulties in organizing fundraising initiatives for medical purposes
- Inadequate communication channels between patients and healthcare providers
- Paper-based processes leading to inefficiencies, errors, and environmental waste

These challenges highlight the need for a comprehensive digital health system that integrates various healthcare services, enhances information sharing, which is able to improve the overall healthcare experience for all stakeholders.

## 1.2 Motivation

The motivation behind developing the DIU eHealth System which have several key factors:

- **Improving Patient Experience:** By providing a user-friendly platform which have appointment scheduling, access to medical records, and communication with healthcare providers, the system aims to enhance the overall patient experience.
- **Enhancing Healthcare Efficiency:** Through digitization of healthcare processes, the system seeks to reduce administrative burden, minimize errors, and optimize resource utilization.
- **Expanding Healthcare Access:** The digital platform makes healthcare services more accessible, particularly for those with mobility issues or in remote areas.
- **Promoting Data-Driven Healthcare:** By centralizing patient data, the system enables more informed decision-making and personalized care.
- **Supporting Community Health Initiatives:** The integration of blood donation and fundraising features reflects a commitment to community health and solidarity.
- **Advancing Healthcare Innovation:** The system serves as a platform for introducing innovative healthcare technologies and approaches.

## 1.3 Objectives

The DIU eHealth System aims to achieve the following objectives:

- To develop a comprehensive digital health platform that integrates various healthcare services
- To streamline the appointment scheduling process for patients and healthcare providers
- To establish a secure and accessible medical record system for patients and authorized healthcare providers
- To facilitate efficient prescription management from creation to delivery
- To create a coordinated system for blood donation and fundraising initiatives
- To enhance communication between patients and healthcare providers through digital channels
- To provide administrators with robust tools for managing healthcare operations
- To ensure the security and privacy of health information in compliance with relevant regulations

## 1.4 Expected Outcome

The successful implementation of the DIU eHealth System is expected to yield the following outcomes:

- A fully functional integrated digital health platform accessible to patients, healthcare providers, and administrators
- Improved efficiency in healthcare delivery through streamlined processes and reduced administrative burden
- Enhanced patient satisfaction due to improved access to healthcare services and information
- Better coordination of blood donation activities and fundraising initiatives
- Increased transparency and accountability in healthcare operations
- Data-driven insights for healthcare planning and resource allocation
- Improved communication and collaboration among healthcare stakeholders

## 1.5 Report Layout

This documentation is organized into seven chapters, each focusing on different aspects of the DIU eHealth System:

- Chapter 1: Introduction - Provides an overview of the system, including background, motivation, objectives, and expected outcomes.
- Chapter 2: Software Requirement Specification - Details the functional and non-functional requirements of the system, along with use cases, activity diagrams, sequence diagrams and ER diagram.
- Chapter 3: Design Specification - Explains the design aspects of the system, including front-end design, back-end design, and interaction design.
- Chapter 4: Implementation and Testing - Describes the implementation of various components of the system and the testing procedures applied.
- Chapter 5: Conclusion and Future Scope - Summarizes the achievements of the system and outlines potential future enhancements.
- Chapter 6: Appendix - Contains supplementary material, including system design details and database information.
- Chapter 7: References - Lists the sources consulted during the development of the system and this documentation.

## 1.6 Comparative Studies

To ensure that the DIU eHealth System meets industry standards and addresses current healthcare needs, a comparative study was conducted with several existing healthcare systems:

Feature	DIU eHealth	System A	System B	System C
Appointment Scheduling	✓	✓	✓	✓
Medical Records Management	✓	✓	✓	✓
Prescription Management	✓	✓	✓	×
Blood Donation Coordination	✓	×	×	✓
Fundraising for Medical Purposes	✓	×	×	×
Multi-role User System	✓	✓	✓	✓
Mobile Responsiveness	✓	✓	×	✓

Table 1.6 Comparative studies analysis

This comparative study highlights the comprehensive nature of the DIU eHealth System, particularly its unique integration of blood donation coordination and fundraising features. While most systems cover basic healthcare functionalities like appointment scheduling and medical records management, the DIU eHealth System distinguishes itself by addressing broader community health needs.

## 1.7 Scope of the Project

The scope of the DIU eHealth System encompasses:

- User registration and authentication system for patients, doctors, and administrators
- Appointment scheduling and management for patients and doctors
- Medical records management, including creation, viewing, and updating of patient records
- Prescription management system for doctors and patients
- Blood donation coordination, including donation requests and tracking
- Fundraising platform for medical purposes, including campaign creation and donation tracking
- Administration tools for managing users, appointments, and system operations
- Communication channels between patients and healthcare providers
- Reporting and analytics for healthcare operations

The system is designed to be deployed in healthcare facilities, with web-based access for users. It not planned to replace direct medical care it just enhance the efficiency and accessibility of healthcare services.

## 1.8 Challenges

The development and implementation of the DIU eHealth System faced several challenges:

- **Data Security and Privacy:** Ensuring the security and privacy of sensitive health information while maintaining accessibility for authorized users.
- **System Integration:** Integrating various components of the system into a cohesive whole while maintaining data integrity and system performance.
- **User Adoption:** Encouraging users, particularly those less familiar with digital technologies, to adopt and effectively use the system.
- **Technical Infrastructure:** Establishing the necessary technical infrastructure to support the system, including servers, databases, and network connectivity.
- **Regulatory Compliance:** Ensuring compliance with healthcare regulations and standards regarding data management, privacy, and security.
- **Scalability:** Designing the system to accommodate growth in users and data while maintaining performance and reliability.

These challenges were solved through careful planning, rigorous testing, user training, and continuous system improvement based on stakeholder feedback and evolving future requirements.

# Chapter 2: Software Requirement Specification

## 2.1 Business Process Modeling

Business Process Modeling (BPM) is a methodical process for understanding, documenting and enhancing business processes. For the DIU eHealth System, BPM was used for identification and optimize key healthcare processes, making sure that the system is efficacious in terms of supporting the needs of all stakeholders.

### 2.1.1 Key Processes

The following key processes were identified and modeled for the DIU eHealth System:

#### **User Registration and Authentication Process**

- User registration with personal and role-specific information
- Verification of user credentials
- Authentication for system access
- Role-based access control

#### **Appointment Management Process**

- Patient request for appointment
- Doctor availability check
- Appointment scheduling and confirmation
- Appointment rescheduling or cancellation
- Appointment reminder notifications

#### **Medical Record Management Process**

- Creation of new medical records by doctors
- Update of existing medical records
- Attachment of documents to medical records
- Viewing of medical records by authorized users
- Archiving of inactive records

### **Prescription Management Process**

- Creation of prescriptions by doctors
- Review and update of prescriptions
- Viewing of prescriptions by patients
- Printing or sharing of prescriptions

### **Blood Donation Management Process**

- Blood donation registration
- Blood donor screening
- Blood collection and storage
- Blood request processing
- Matching donors with recipients

### **Fund Donation Management Process**

- Creation of fundraising campaigns
- Approval of fundraising requests
- Processing of donations
- Tracking of donation progress
- Acknowledgment of donors

### **Administrative Management Process**

- User account management
- System configuration and maintenance
- Reporting and analytics
- Audit trail monitoring

## **2.1.2 Benefits of BPM**

The Business Process Modeling approach provided several benefits to the DIU eHealth System development:

- Clear identification of process requirements and stakeholder needs
- Identification and elimination of redundant or inefficient processes
- Better alignment of system functionality with business objectives
- Improved communication among development team members and stakeholders
- Enhanced ability to respond to changing requirements and processes

## 2.2 Requirement Collection and Analysis

The requirements for the DIU eHealth System were collected and analyzed using several methods:

- **Stakeholder Interviews:** Interviews were conducted with patients, doctors, nurses, administrative staff, and hospital management to understand their needs, challenges, and expectations.
- **Focus Groups:** Focus group discussions were organized with representatives from different stakeholder groups to gather collective insights and requirements.
- **Review of Existing Systems:** Analysis of existing healthcare systems to identify strengths, weaknesses, and gaps to be addressed in the new system.
- **Document Analysis:** Review of healthcare processes, regulatory requirements, and industry best practices to inform system requirements.
- **Prototyping and Feedback:** Development of system prototypes and collection of feedback from potential users to refine requirements.

The requirements gathered were analysed, categorised and prioritised, considering their importance, feasibility and compatibility with system objectives.

This structured approach to requirement collection and analysis ensured that the DIU eHealth System fulfils the needs of all stakeholders and make sure technically feasible and compliant with healthcare best practices.

## 2.3 Stakeholders

The DIU eHealth System serves several stakeholder groups, each with specific roles, needs, and interactions with the system:

Stakeholder	Role	Primary Needs	System Interactions
Patients	Primary users seeking healthcare services	<ul style="list-style-type: none"> <li>- Easy appointment scheduling</li> <li>- Access to medical records</li> <li>- Communication with doctors</li> <li>- Prescription access</li> </ul>	<ul style="list-style-type: none"> <li>- Register and maintain profile</li> <li>- Schedule appointments</li> <li>- View medical records</li> <li>- Request blood/funds</li> <li>- Donate blood/funds</li> </ul>
Doctors	Healthcare providers delivering medical services	<ul style="list-style-type: none"> <li>- Efficient patient management</li> <li>- Easy access to patient records</li> <li>- Prescription management</li> <li>- Appointment scheduling</li> </ul>	<ul style="list-style-type: none"> <li>- Manage patient appointments</li> <li>- Create/update medical records</li> <li>- Write prescriptions</li> <li>- View patient history</li> </ul>
Admin Staff	Personnel managing administrative aspects System administrators with highest privileges	<ul style="list-style-type: none"> <li>- User management</li> <li>- System oversight</li> <li>- Report generation</li> <li>- Process management</li> <li>- Complete system control</li> <li>- Security management</li> <li>- Configuration options</li> <li>- Admin user management</li> </ul>	<ul style="list-style-type: none"> <li>- Manage user accounts</li> <li>- Oversee blood donation</li> <li>- Approve fundraising</li> <li>- Generate reports</li> <li>- Configure system settings</li> <li>- Manage admin accounts</li> <li>- Monitor system security</li> <li>- System-wide data access</li> </ul>

Stakeholder	Role	Primary Needs	System Interactions
Blood Donors	Individuals donating blood	<ul style="list-style-type: none"> <li>- Easy donation registration</li> <li>- Donation tracking</li> <li>- Health verification</li> <li>- Donation history</li> </ul>	<ul style="list-style-type: none"> <li>- Register as donor</li> <li>- Schedule donations</li> <li>- View donation history</li> <li>- Receive notifications</li> </ul>
Fund Donors	Individuals contributing financial support	<ul style="list-style-type: none"> <li>- Secure donation process</li> <li>- Campaign transparency</li> <li>- Donation tracking</li> <li>- Acknowledgment</li> </ul>	<ul style="list-style-type: none"> <li>- View fundraising campaigns</li> <li>- Make donations</li> <li>- Track donation usage</li> <li>- Receive acknowledgment</li> </ul>

Table 2.3 Stakeholder authorities

Understanding the diverse needs and interactions of all stakeholders of this system was crucial in designing a system that is effectively serves all users while maintaining appropriate access controls and security measures.

## 2.4 Functional Requirements

The functional requirements of the DIU eHealth System's requirements which are define the specific behaviors and features that the system must provide. These requirements are organized by major system components:

### User Management

ID	Description	Stakeholders	Priority
FR-01	The system shall allow users to register with different roles (patient, doctor, admin)	All Users	High
FR-02	The system shall validate and store user information securely	All Users, Admin	High
FR-03	The system shall provide secure authentication mechanisms for all users	All Users	High
FR-04	The system shall support password reset functionality	All Users	Medium
FR-05	The system shall allow users to update their profile information	All Users	Medium
FR-06	The system shall enforce role-based access controls to system features and data	Admin, Super-Admin	High

Table 2.4.1 User functional requirements

## Appointment Management

ID	Description	Stakeholders	Priority
FR-07	The system shall allow patients to request appointments with available doctors	Patients	High
FR-08	The system shall display doctor availability based on their schedule	Patients, Doctors	Medium
FR-09	The system shall allow doctors to accept, reject, or reschedule appointment requests	Doctors	High
FR-10	The system shall send notifications for appointment confirmations, reminders, and changes	Patients, Doctors	Medium
FR-11	The system shall allow patients to cancel or reschedule appointments within defined time constraints	Patients	Medium
FR-12	The system shall maintain a history of appointments for both patients and doctors	Patients, Doctors, Admin	Low

Table 2.4.2 Appointment management functional requirements

## Medical Records Management

ID	Description	Stakeholders	Priority
FR-13	The system shall allow doctors to create new medical records for patients	Doctors	High
FR-14	The system shall support the attachment of documents and images to medical records	Doctors	Medium
FR-15	The system shall allow authorized doctors to update existing medical records	Doctors	High
FR-16	The system shall allow patients to view their own medical records	Patients	Medium
FR-17	The system shall maintain a complete history of changes to medical records	Doctors, Admin	Medium
FR-18	The system shall provide search and filter capabilities for medical records	Doctors, Admin	Low

Table 2.4.3 Medical records management functional requirements

### Prescription Management

ID	Description	Stakeholders	Priority
FR-19	The system shall allow doctors to create prescriptions for patients	Doctors	High
FR-20	The system shall support the inclusion of medication details, dosage, and instructions	Doctors	High
FR-21	The system shall allow doctors to review and update prescriptions	Doctors	Medium
FR-22	The system shall allow patients to view and print their prescriptions	Patients	Medium
FR-23	The system shall maintain a history of prescriptions for each patient	Patients, Doctors	Low

Table 2.4.4 Prescription management functional requirements

### Blood Donation Management

ID	Description	Stakeholders	Priority
FR-24	The system shall allow users to register as blood donors	Blood Donors, Admin	High

ID	Description	Stakeholders	Priority
FR-25	The system shall collect and validate donor information, including blood type	Blood Donors, Admin	High
FR-26	The system shall allow users to request blood donations	Patients, Admin	High
FR-27	The system shall match blood donation requests with available donors	Admin	Medium
FR-28	The system shall track blood donation activities and history	Admin, Blood Donors	Medium

Table 2.4.5 Blood donation management functional requirements

### **Fund Donation Management**

ID	Description	Stakeholders	Priority
FR-29	The system shall allow users to donate funds for healthcare causes	Fund Donors	High
FR-30	The system shall support creation of fundraising campaigns	Admin	Medium
FR-31	The system shall track donation progress and goals	Admin, Fund Donors	Medium
FR-32	The system shall send acknowledgment to donors	Admin, Fund Donors	Low

Table 2.4.6 Fund donation management functional requirements

### Administrative Functions

ID	Description	Stakeholders	Priority
FR-33	The system shall allow admin users to manage user accounts	Admin, Super-Admin	High
FR-34	The system shall provide reporting and analytics capabilities	Admin, Super-Admin	Medium
FR-35	The system shall allow configuration of system parameters	Super-Admin	Medium
FR-36	The system shall maintain audit trails of critical operations	Admin, Super-Admin	Medium

Table 2.4.7 Administrative functions functional requirements

### Communication

ID	Description	Stakeholders	Priority
FR-37	The system shall provide a contact form for general inquiries	All Users	Medium
FR-38	The system shall send email notifications for important events	All Users	Medium

ID	Description	Stakeholders	Priority
FR-39	The system shall maintain a FAQ section for common questions	All Users	Low
FR-40	Super-Admin and Admin can post notices. All users (Faculty, Students) can view the notices in real-time.	Super-Admin, Admin, Faculty, Students	Super-Admin = High, Admin = High, Faculty = Low, Student = Low

Table 2.4.8 Communication functional requirements

## 2.5 Non-Functional Requirements

Non-functional requirements define quality attributes and constraints that affect the overall operation and user experience of the DIU eHealth System:

### Performance

ID	Description	Stakeholders	Priority
NFR-01	The system shall respond to user interactions within 2 seconds under normal load conditions	All Users	High
NFR-02	The system shall support at least 1000 concurrent users without degradation in performance	Super-Admin, Admin	Medium
NFR-03	Database queries shall complete within 1 second for simple queries and 5 seconds for complex queries	All Users	Medium

ID	Description	Stakeholders	Priority
NFR-04	The system shall be able to handle peak loads during appointment scheduling periods with minimal degradation	Patients, Doctors	High

Table 2.5.1 Performance functional requirements

### Safety & Security

ID	Description	Stakeholders	Priority
NFR-05	The system shall encrypt all sensitive data, including patient information and credentials	All Users	High
NFR-06	The system shall implement secure authentication and authorization mechanisms	All Users	High
NFR-07	The system shall maintain audit logs for all critical operations	Admin, Super-Admin	Medium
NFR-08	The system shall implement protection against common web vulnerabilities (SQL injection, XSS, CSRF)	All Users	High
NFR-09	The system shall automatically log out inactive sessions after 15 minutes	All Users	Medium
NFR-10	The system shall comply with relevant healthcare data protection regulations	All Users	High

Table 2.5.2 Safety & security functional requirements

### Reliability & Availability

ID	Description	Stakeholders	Priority
NFR-11	The system shall have an uptime of at least 99.9% (excluding scheduled maintenance)	All Users	High
NFR-12	The system shall implement data validation to prevent corruption and inconsistencies	All Users	High
NFR-13	The system shall handle errors gracefully with appropriate user feedback	All Users	Medium
NFR-14	The system shall maintain data integrity in case of system failures	Admin, Super-Admin	High
NFR-15	The system shall support scheduled maintenance with minimal disruption	All Users	Medium

Table 2.5.3 Reliability & availability functional requirements

### Maintainability and Supportability

ID	Description	Stakeholders	Priority
NFR-16	The system shall follow a modular design approach to facilitate maintenance	Admin, Super-Admin	Medium

ID	Description	Stakeholders	Priority
NFR-17	The system shall include detailed documentation for administrators and support staff	Admin, Super-Admin	Medium
NFR-18	The system shall log errors and exceptions with sufficient context for troubleshooting	Admin, Super-Admin	Medium
NFR-19	The system shall allow for configuration changes without requiring code modifications	Super-Admin	Medium
NFR-20	The system shall support updates and patches with minimal downtime	All Users	High

Table 2.5.4 Maintainability & supportability functional requirements

### Usability

ID	Description	Stakeholders	Priority
NFR-21	The system shall have an intuitive user interface that requires minimal training	All Users	High
NFR-22	The system shall provide clear error messages and guidance for users	All Users	Medium
NFR-23	The system shall be accessible on various devices (desktop, tablet, mobile)	All Users	High

ID	Description	Stakeholders	Priority
NFR-24	The system shall comply with basic web accessibility standards	All Users	Medium
NFR-25	The system shall provide help documentation and tooltips for complex features	All Users	Low

Table 2.5.3 Usability functional requirements

### Backup and Recovery

ID	Description	Stakeholders	Priority
NFR-26	The system shall perform daily backups of all data	Admin, Super-Admin	High
NFR-27	The system shall retain backups for at least 30 days	Admin, Super-Admin	Medium
NFR-28	The system shall support point-in-time recovery in case of data loss or corruption	Admin, Super-Admin	High
NFR-29	The system shall have a documented disaster recovery plan	Admin, Super-Admin	Medium
NFR-30	The system shall provide a mechanism for exporting and importing user data	Admin, Super-Admin	Low

Table 2.5.4 Backup & recovery functional requirements

## 2.6 Use Case Diagram and Description

The following use case diagrams illustrate the interactions between users and the DIU eHealth System:

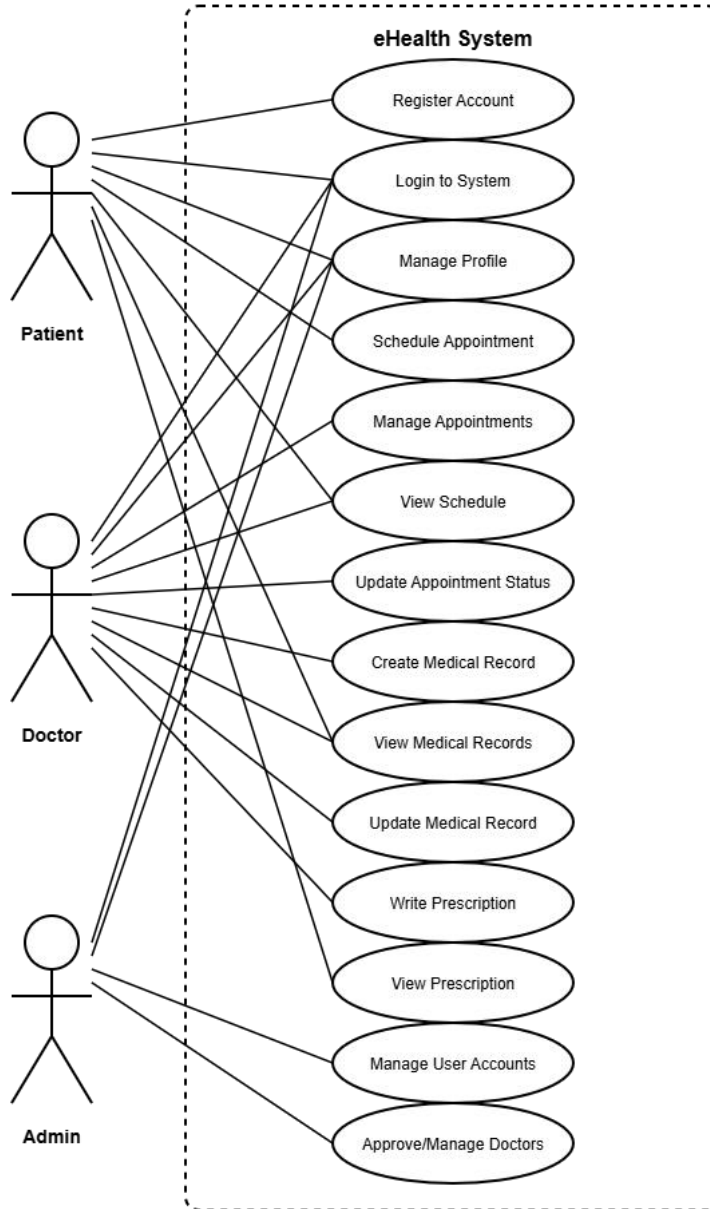


Figure 2.6.1 Use case diagram with all functionality

### Use Case Diagram Explanation

The use case diagram above illustrates the key functionalities of the eHealth system and how different actors interact with these functionalities.

## Actors

- **Patient/User:** Regular users who access healthcare services through the system.
- **Doctor:** Healthcare providers who deliver medical services through the system.
- **Admin:** System administrators who manage users, approve doctors, and oversee system operations.

## Key Functionality Groups

### User Management

- **Register Account:** New users can create accounts in the system
- **Login to System:** All users authenticate to access the system
- **Manage Profile:** Users can update their personal information

### Appointment Management

- **Schedule Appointment:** Patients can book appointments with doctors
- **Manage Appointments:** Doctors can view and manage their appointments
- **View Schedule:** Users can check appointment schedules
- **Update Appointment Status:** Doctors can mark appointments as completed, cancelled, etc.

### Medical Records

- **Create Medical Record:** Doctors create patient medical records
- **View Medical Records:** Both patients and doctors can view records (with appropriate access controls)
- **Update Medical Record:** Doctors can update existing medical records

### Prescription Management

- **Write Prescription:** Doctors can create prescriptions for patients
- **View Prescription:** Patients can view their prescriptions

## **Blood Donation System**

- **Request Blood Donation:** Patients can request blood donations
- **Register as Blood Donor:** Users can register to donate blood
- **Manage Blood Donations:** Admins oversee the blood donation process

## **Fund Donation System**

- **Create Fundraising Campaign:** Users can create fundraising campaigns
- **Donate to Campaign:** Users can donate to fundraising campaigns
- **Manage Fund Campaigns:** Admins approve and manage fundraising campaigns

## **Administrative Functions**

- **Manage User Accounts:** Admins manage user accounts
- **Approve/Manage Doctors:** Admins approve doctor registrations and manage doctor accounts
- **Generate Reports:** Admins generate system reports and analytics

## 2.7 Sequence Diagram

This page contains sequence diagrams for key workflows in the eHealth system. Each diagram shows the interactions between users, the frontend interface, controllers, and the database during specific processes.

### 2.7.1 User Registration and Authentication Sequence

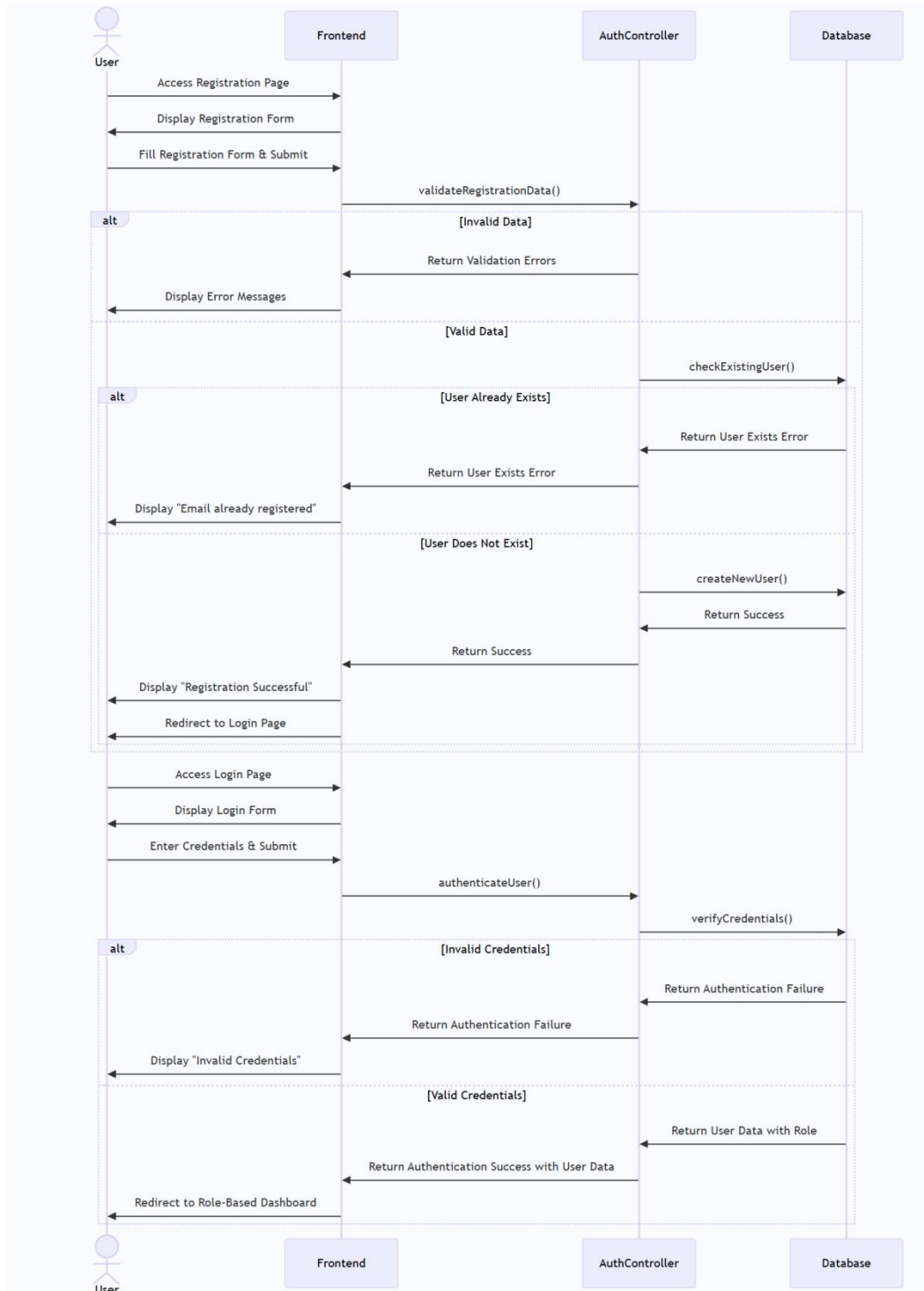


Figure 2.7.1 User registration & authentication (Sequence diagram)

This diagram illustrates the process of user registration and authentication. It shows how user data is validated, checked for duplicates, and stored in the database during registration. For authentication, it demonstrates the verification of credentials and role-based redirection.

## 2.7.2 Appointment Scheduling Sequence

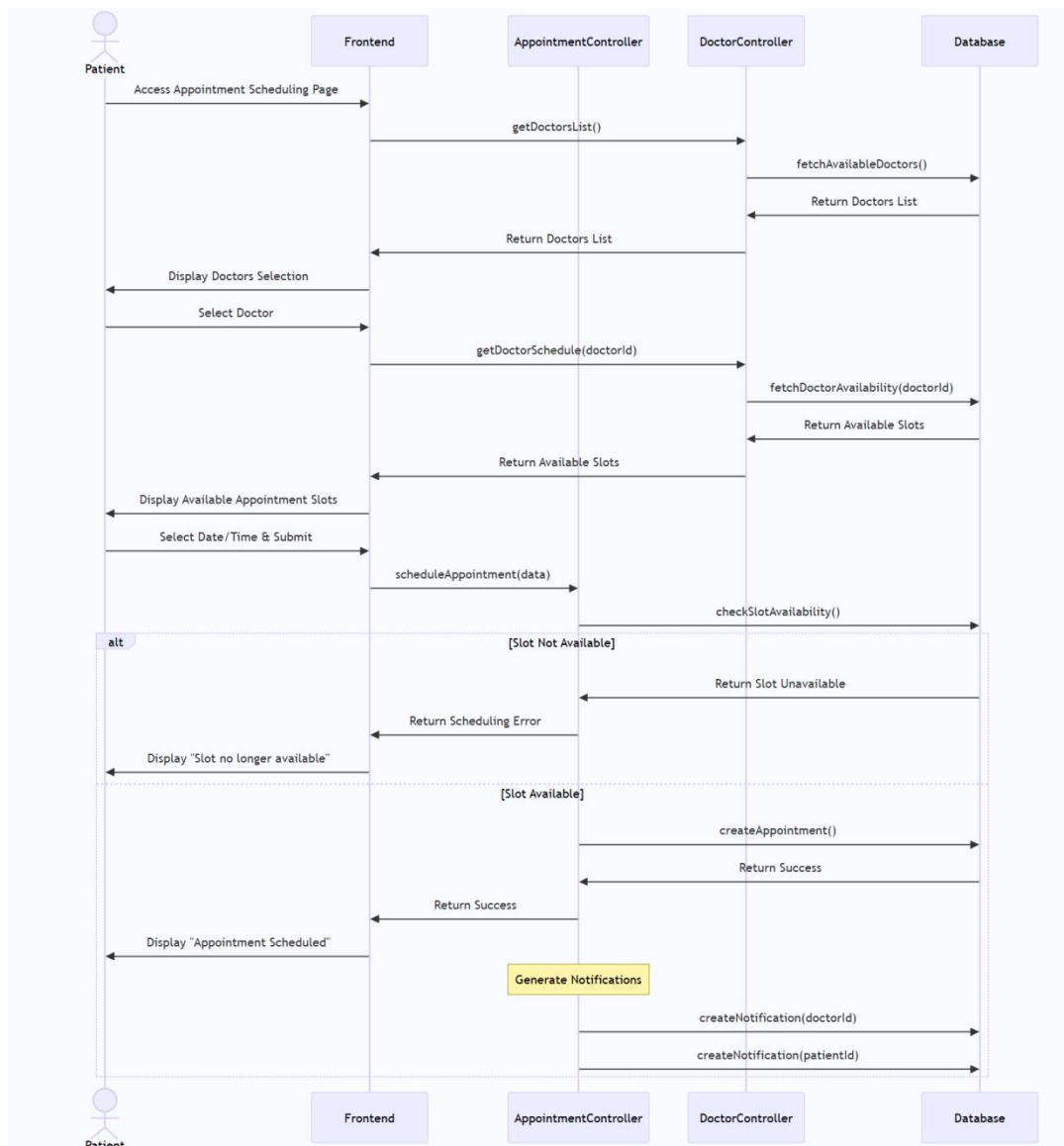


Figure 2.7.2 Appointment Scheduling (Sequence diagram)

This sequence diagram shows the process of scheduling an appointment. It demonstrates how patients can view available doctors, check their schedules, and book appointments. It also includes error handling for unavailable time slots and notification generation for both doctor and patient.

## 2.7.3 Medical Record Management Sequence

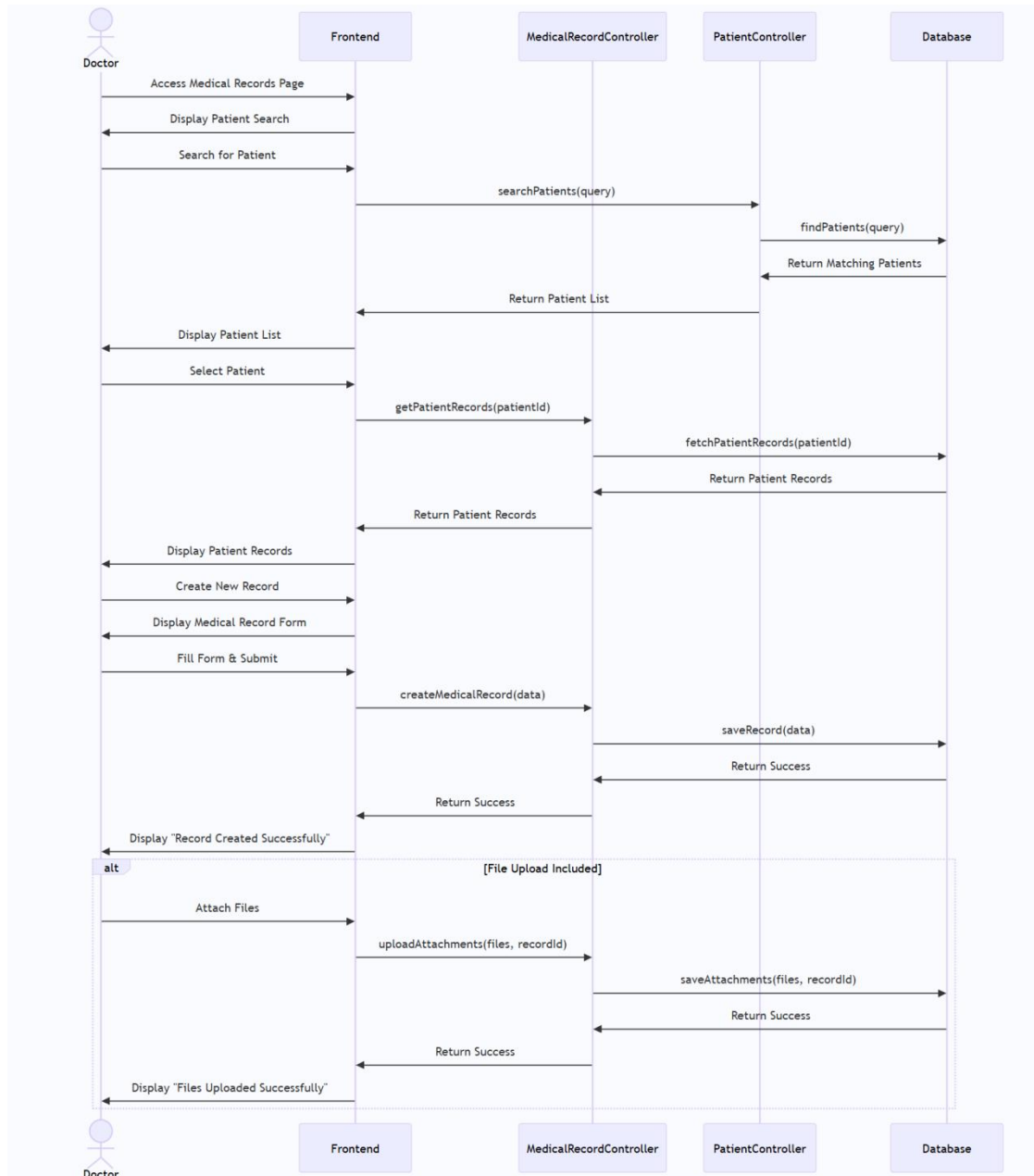


Figure 2.7.3 Medical record management (Sequence diagram)

This diagram illustrates the process of managing medical records. It shows how doctors can search for patients, view their existing records, create new records, and attach relevant files to those records.

## 2.7.4 Prescription Management Sequence

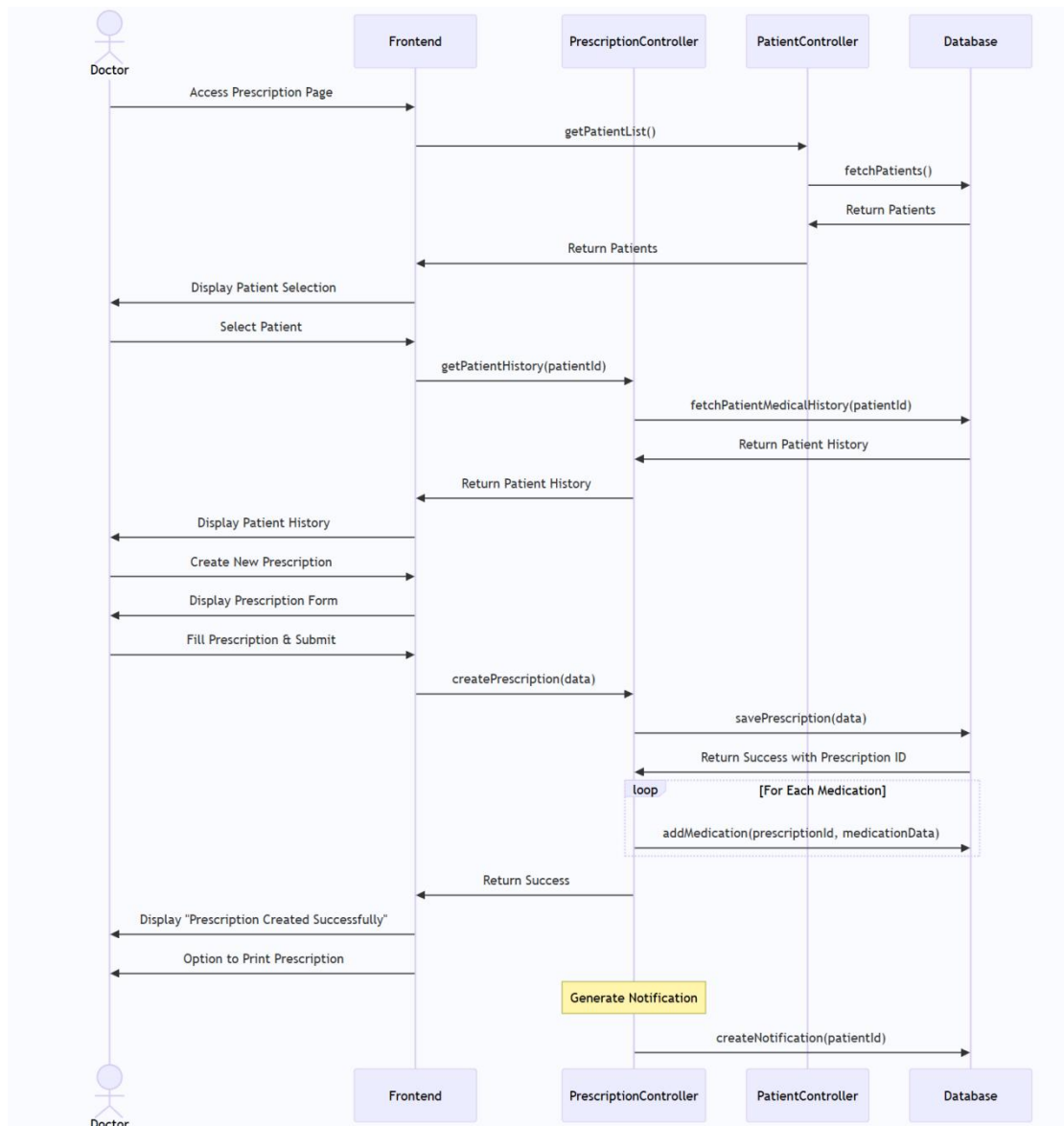


Figure 2.7.4 Prescription management (Sequence diagram)

This sequence diagram demonstrates how doctors create prescriptions for patients. It shows the selection of patients, review of their medical history, creation of prescriptions with multiple medications, and notification of patients about new prescriptions.

## 2.7.5 Blood Donation Request Sequence

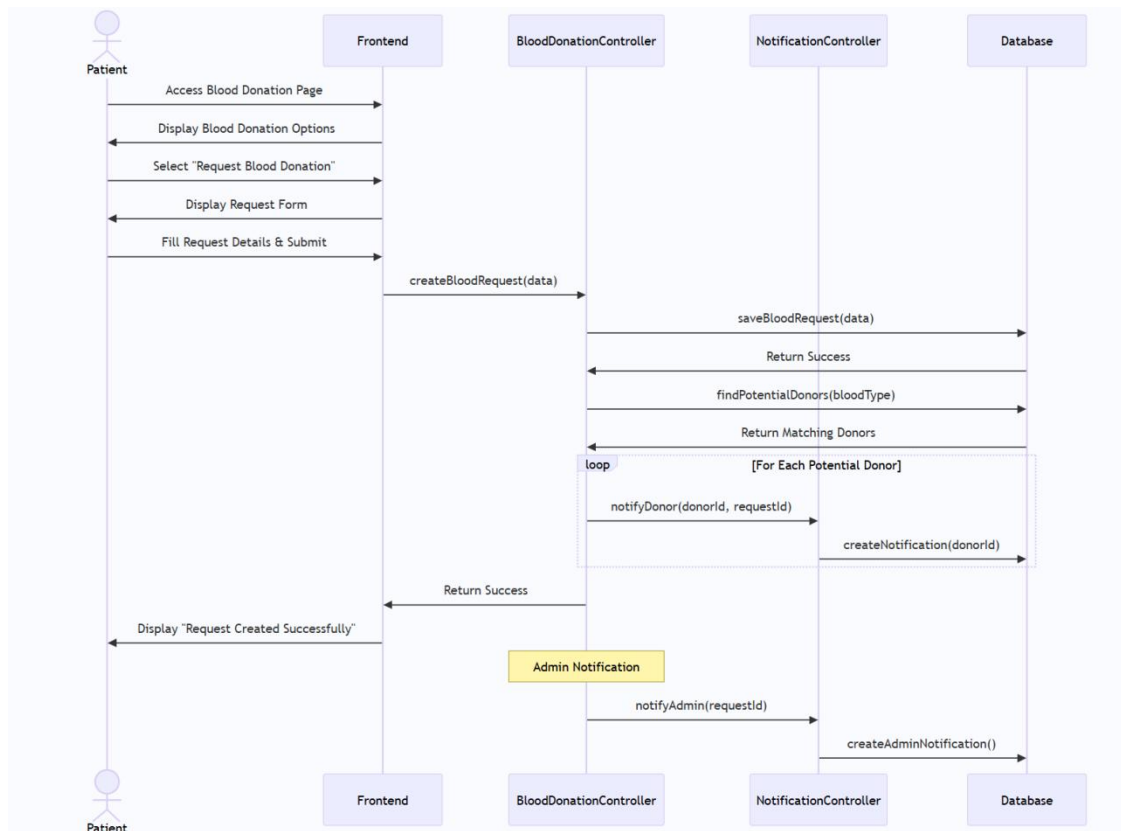


Figure 2.7.5 Blood donation request (Sequence diagram)

This diagram shows the process of requesting blood donations. It illustrates how patients can create blood donation requests, how potential donors with matching blood types are identified and notified, and how administrators are informed about new requests.

## 2.7.6 Fund Donation Campaign Sequence

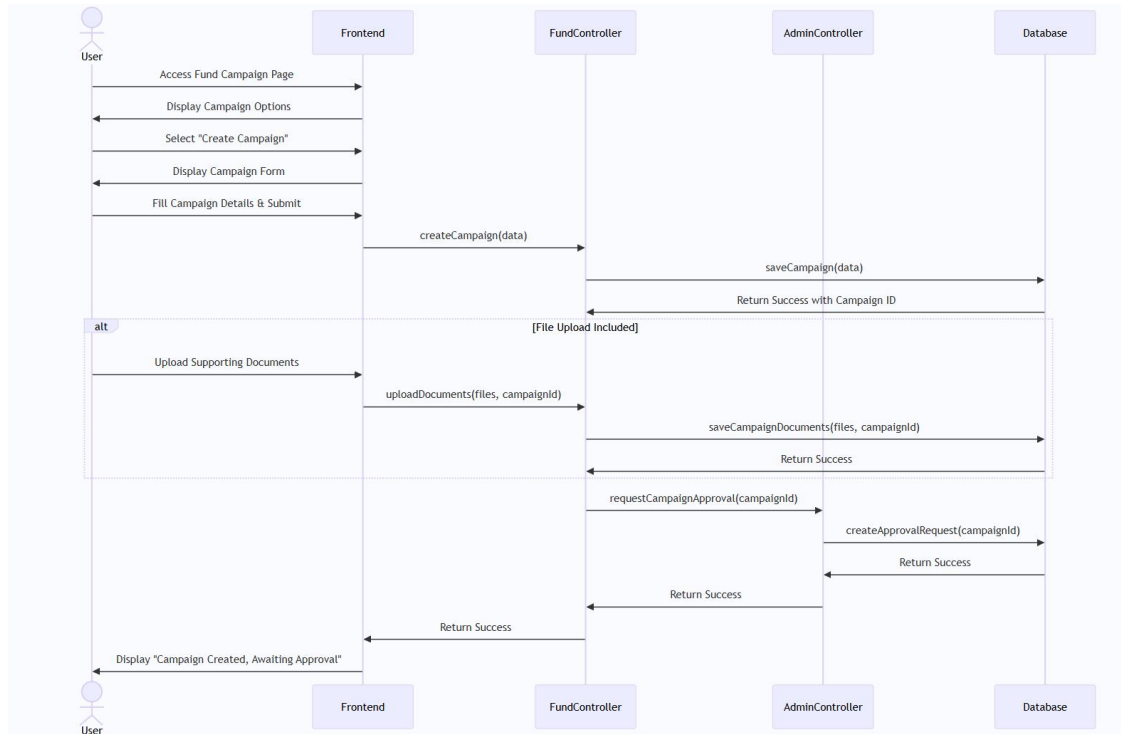


Figure 2.7.6 Fund donation campaign (Sequence diagram)

This sequence diagram illustrates the process of creating a fundraising campaign. It shows how users who can create campaigns, upload supporting documents, and submit to them for admin approval before their request becomes publicly visible.

## 2.7.7 Admin Doctor Approval Sequence

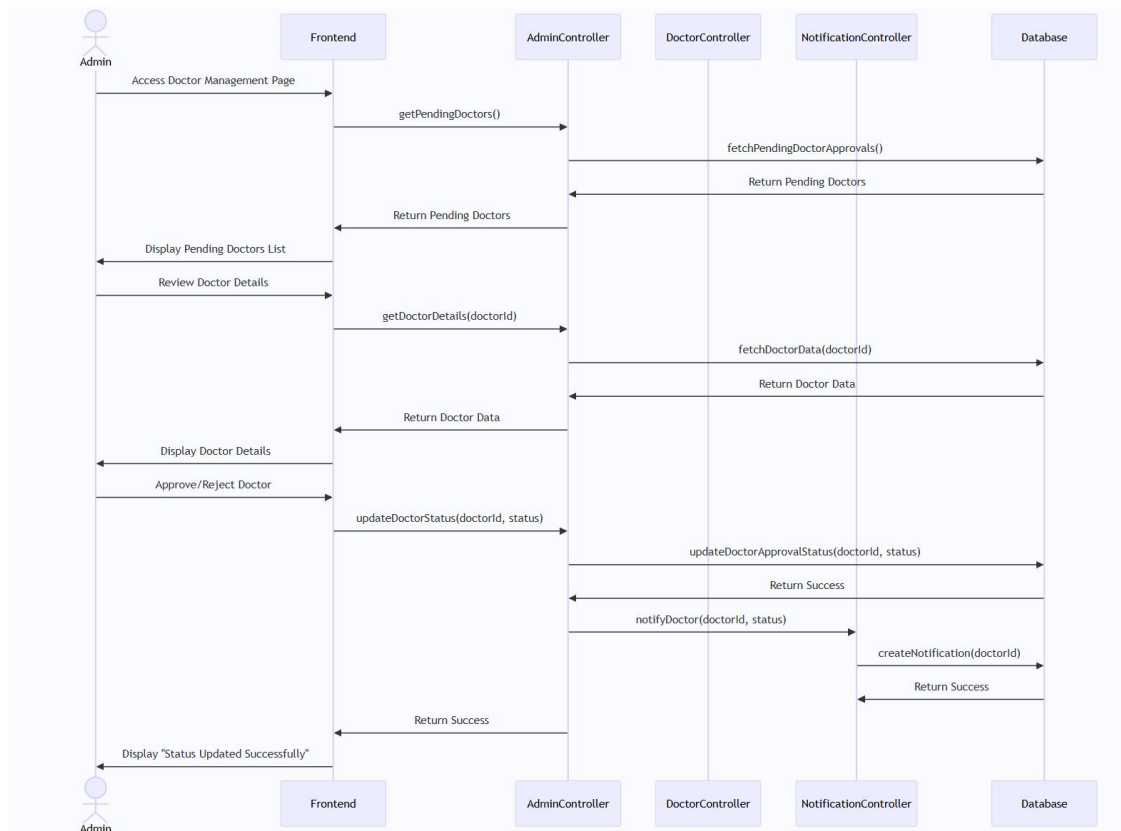


Figure 2.7.7 Admin doctor approval (Sequence diagram)

This diagram shows the process of admin approval for all doctor accounts. It illustrates how it's administrators can view pending doctor registrations, review doctor details, approve or reject them, and notify doctors of the decision from the system.

## 2.8 Gantt Chart

A Gantt chart that was developed to plan and track the project in timeline for the DIU eHealth System. The chart includes major project phases, tasks, and milestones, with estimated durations and dependencies.

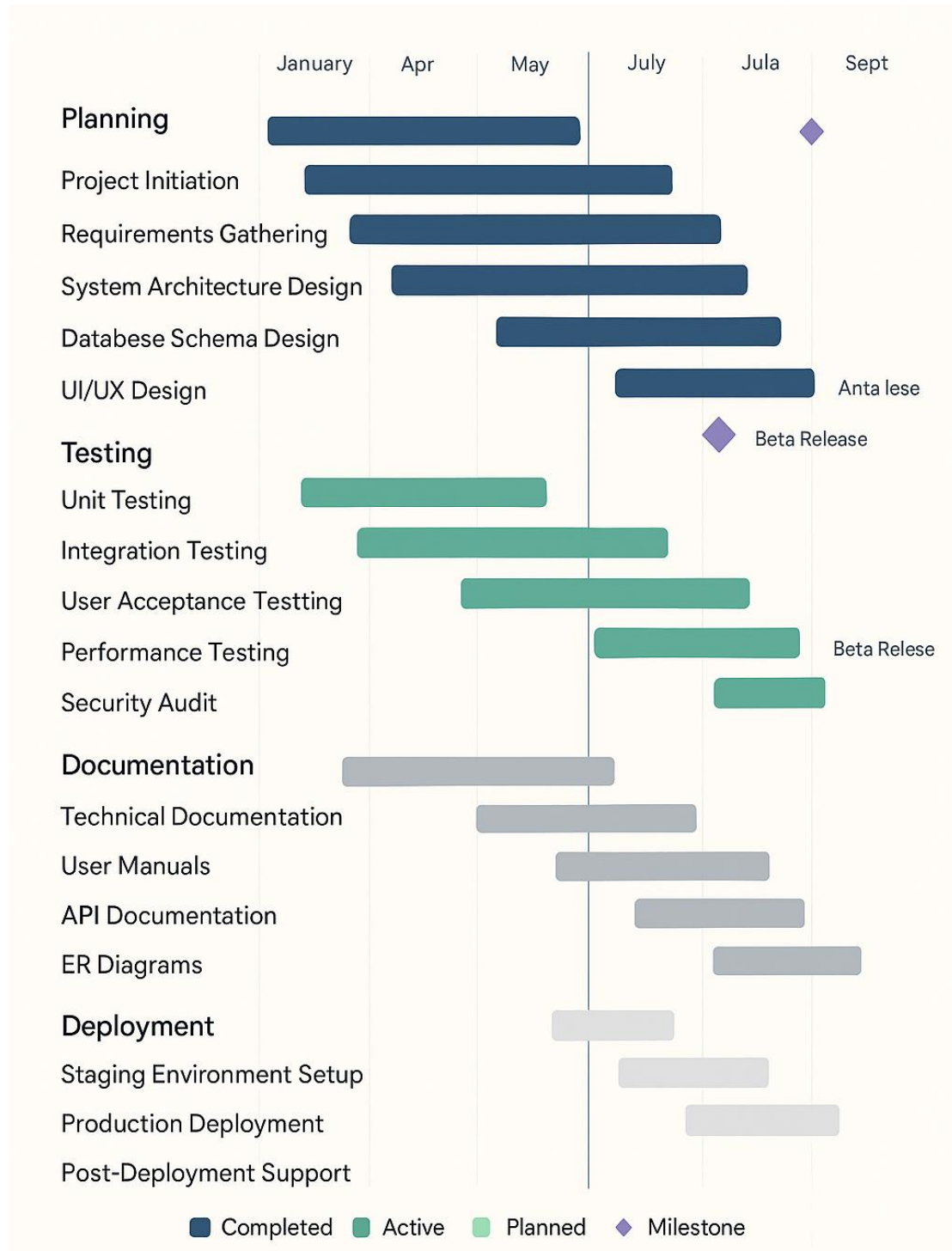


Figure 2.8 Project gantt Chart

The Gantt chart which can help in project planning, resource allocation, and progress tracking, ensuring that the project stays on schedule and all dependencies are properly managed.

## **2.9 SWOT Analysis**

A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was conducted to evaluate the DIU eHealth System:

### **Strengths**

- Comprehensive integration of various healthcare services in one platform
- Intuitive user interface with role-based access control
- Robust security measures to protect sensitive health information
- Unique features like blood donation and fundraising not commonly found in other systems
- Scalable architecture that accommodates growth in users and data

### **Weaknesses**

- Dependency on reliable internet connectivity
- Initial learning curve for users less familiar with digital systems
- Limited integration with existing healthcare systems
- Resource-intensive implementation and maintenance
- Need for continuous updates to keep pace with evolving healthcare standards

### **Opportunities**

- Growing demand for digital healthcare solutions
- Potential for expansion to include additional healthcare services
- Integration possibilities with other healthcare systems and platforms
- Opportunities to incorporate emerging technologies like AI and machine learning
- Increasing emphasis on patient engagement and accessibility in healthcare

### **Threats**

- Evolving security threats and vulnerabilities
- Changes in healthcare regulations and compliance requirements
- Competition from other healthcare platforms and systems
- Resistance to adoption from traditional healthcare providers

- Technical challenges in maintaining system performance and reliability

This SWOT analysis helps identify the strengths to leverage, weaknesses to address, opportunities to pursue, and threats to mitigate in the development and implementation of the DIU eHealth System.

## 2.10 ER Diagram

This document is an Entity Relationship Diagram of the eHealth system database. The diagram shows the various entities in the system and how they relate to each other which is a visual representation of the database schema:

### Core Entities

#### USERS

The patients or clients who can use the eHealth system. They can book appointments, have medical records, participate in blood donation, create fundraising campaigns, and communicate with doctors.

#### DOCTORS

Healthcare professionals who provide medical services. They have specializations, experience, and maintain patient records and prescriptions.

#### ADMINS

System administrators with elevated privileges to manage the overall eHealth platform.

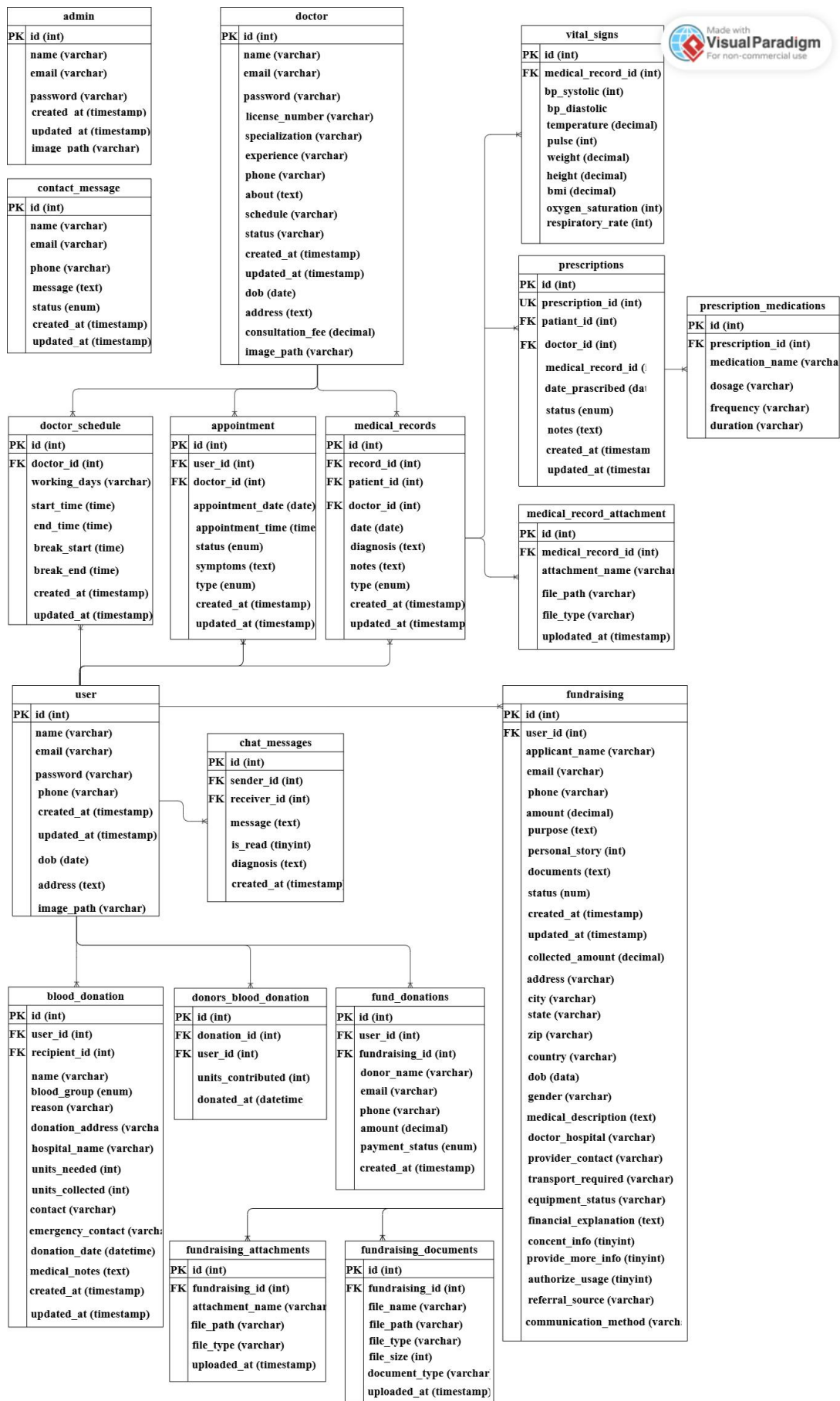


Figure 2.10 Entity-Relationship diagram for the eHealth system

## Relations of Entities

This Entity-Relationship diagram serves as a foundational framework for the eHealth system and highlights how data interconnects, ensuring seamless functionality within the platform. Each entity is essential for maintaining the integrity of the healthcare processes, from patient management to service delivery and resource tracking.

### Medical Management

#### APPOINTMENTS

Scheduling between patients and doctors, with details about the appointment type, date, time, and symptoms.

#### MEDICAL\_RECORDS

Clinical documentation for patients, including diagnosis, notes, and the type of visit.

#### VITAL\_SIGNS

Medical measurements associated with records, such as blood pressure, temperature, pulse, weight, height, BMI, oxygen saturation, and respiratory rate.

#### PRESCRIPTIONS

Medication orders for patients, created by doctors, possibly linked to a medical record.

#### PRESCRIPTION\_MEDICATIONS

Individual medications in prescriptions, with details about dosage, frequency, and duration.

### Blood Donation System

#### BLOOD\_DONATIONS

Blood donation requests/events with details about the recipient, blood group, units needed/collected, and status.

#### DONORS\_BLOOD\_DONATION

Tracks who donates to which blood donation request, including units contributed and donation date.

### Fundraising System

#### FUNDRAISING

Medical fundraising campaigns with detailed information about the applicant, purpose, medical needs, and financial situation.

## **FUNDRAISING\_DOCUMENTS**

Supporting documentation for fundraising campaigns, such as medical reports or financial statements.

## **FUNDRAISING\_ATTACHMENTS**

Additional files attached to fundraising campaigns.

## **FUND\_DONATIONS**

Financial contributions to fundraising campaigns, including donor information and payment status.

## **Communication**

### **CHAT\_MESSAGES**

Direct messages between users (patients, doctors) with read status tracking.

### **CONTACT\_MESSAGES**

Website contact form submissions that allow visitors to send messages to administrators.

## **Scheduling**

### **DOCTOR\_SCHEDULE**

Working hours for doctors, including which days they work, start/end times, and break periods.

## **Relationships**

- Users make appointments with doctors
- Doctors have schedules
- Users have medical records created by doctors
- Medical records include vital signs and may have attachments
- Users receive prescriptions written by doctors
- Medical records may have associated prescriptions
- Prescriptions contain multiple medications
- Users can request blood donations and can be recipients
- Blood donations receive contributions from users (donors)
- Users create fundraising campaigns with supporting documents
- Users make fund donations to fundraising campaigns
- Users can send and receive chat messages

# Chapter 3: Design Specification

## 3.1 Front-End Design

### 3.1.1 Frameworks and Technologies

The front-end of the DIU eHealth System is built using modern web technologies to ensure a responsive, accessible, and user-friendly experience. The key technologies and frameworks used include:

- **HTML5:** Used as the markup language for structuring the web pages.
- **CSS3:** Used for styling the web pages and implementing responsive design.
- **Tailwind CSS:** A utility-first CSS framework that facilitates rapid UI development with pre-designed components and classes.
- **JavaScript:** Used for client-side scripting to enhance interactivity and user experience.
- **Font Awesome:** Provides a comprehensive library of icons for improved visual communication.
- **Responsive Design:** Implemented to ensure compatibility with various devices and screen sizes.

### 3.1.2 Styling

The styling approach for the DIU eHealth System focuses on creating a clean, professional, and accessible interface that enhances usability while maintaining visual appeal:

- **Color Scheme:** A calming blue-based color palette is used throughout the system, reflecting trust, professionalism, and healthcare associations. The primary colors include various shades or intensity of blue complemented by white, gray, and selective accent colors.
- **Typography:** The 'Raleway' font family is used as the primary typeface there are also other fonts are used, chosen for its readability and modern appearance. Font sizes and weights are carefully selected to establish clear visual hierarchy and enhance readability.
- **Layout:** Consistent layouts are applied across the system, with clear content sections, adequate whitespace, and logical information flow.
- **Components:** UI components like buttons, forms, and cards follow a consistent design language, with visual feedback for interactive elements.

- **Responsive Design:** Styling that adapts to different screen sizes, ensuring a consistent experience across maximum type of devices devices. This includes flexible layouts, appropriate text sizing, and optimized navigation for mobile devices.

### 3.1.3 User Interface Design

The user interface design of the DIU eHealth System follows these key principles and features:

- **Role-Based Interfaces:** Different user interfaces are designed for patients, doctors, and administrators, with features and layouts tailored to their specific needs and workflows.
- **Navigation:** Intuitive navigation with clearly labeled menus, breadcrumbs, and consistent placement of navigation elements.
- **Dashboard Design:** Role-specific dashboards provide at-a-glance information and quick access to frequently used features.
- **Forms:** Streamlined forms with clear labels, validation feedback, and logical grouping of related fields.
- **Tables and Lists:** Structured presentation of data with sorting, filtering, and pagination capabilities where appropriate.
- **Modals and Dialogs:** Used for focused tasks and confirmations, with clear actions and the ability to return to the previous state.
- **Feedback Mechanisms:** Visual cues, notifications, and messages to inform users about system status and the results of their actions.

### 3.1.4 Key Pages

The DIU eHealth System includes the following key pages, each designed to serve specific user needs:

- **Landing Page:** Introduces the system and its features, with clear pathways for registration and login.
- **User Registration and Login:** Clean, simple forms for creating accounts and authenticating users.
- **User Dashboards:** Role-specific dashboards providing summary information and quick access to key features.
- **Appointment Management:** Interfaces for scheduling, viewing, and managing appointments.

- **Medical Records:** Secure pages to view and manage medical records of patients.
- **Prescription Management:** Interfaces for the creation, viewing and management of prescriptions.
- **Blood Donation:** Registration, request and management pages for blood donation.
- **Fund Donation:** Interfaces to create, view and contribute to fundraising campaigns.
- **User Profiles:** Pages used to see and update user information.
- **Admin Control Panels:** Panels of comprehensive system administration and management interfaces.
- **Help and Support:** Pages offering direction and assistance to the users.

### 3.1.5 Front-End Accessibility

The DIU eHealth System is designed with accessibility in mind, implementing the following features and practices:

- **Semantic HTML:** Using appropriate HTML elements for their intended purpose to improve screen reader compatibility.
- **Alternative Text:** Providing descriptive alt text for images and icons.
- **Keyboard Navigation:** Ensuring all interactive elements are accessible via keyboard navigation.
- **Color Contrast:** Using color combinations that meet WCAG accessibility standards for text readability.
- **Focus Indicators:** Providing clear visual indicators for keyboard focus.
- **Form Labels:** Using explicit labels for form elements to improve usability and screen reader compatibility.
- **Responsive Text:** Ensuring text remains readable at different zoom levels and screen sizes.

## 3.2 Back-End Design

### 3.2.1 Architecture

The back-end architecture of the DIU eHealth System is designed to be robust, secure, and scalable:

- **Server-Side Language:** PHP is used as the primary server-side scripting language, handling business logic, data processing, and interaction with the database.
- **Database:** MySQL is used as the relational database management system, providing robust data storage and retrieval capabilities.

- **Application Architecture:** The system follows a modular architecture, with components organized by functionality and user role.
- **Session Management:** PHP sessions are used for maintaining user state and authentication across requests.
- **File Storage:** A structured file storage system is implemented for medical records, prescriptions, and other documents.
- **Server Environment:** The system is designed to run on Apache web server with the necessary PHP extensions and configurations.

### 3.2.2 Core Functionalities

The back-end implements the following core functionalities:

- **User Authentication and Authorization:** Secure login processes with role-based access control.
- **Data Validation and Sanitization:** Input validation and sanitization to prevent security vulnerabilities like SQL injection and XSS.
- **Database Operations:** Structured database queries for data retrieval, insertion, update, and deletion.
- **File Handling:** Secure upload, storage, and retrieval of files such as medical documents and images.
- **Session Management:** Secure session handling for maintaining user state and authentication.
- **Error Handling:** Comprehensive error detection, logging, and appropriate user feedback.
- **Data Processing:** Business logic for processing user inputs, generating reports, and managing system workflows.
- **API Endpoints:** Internal API endpoints for asynchronous operations and interactions between system components.

### 3.2.3 Security Measures

Given the sensitive nature of healthcare data, the back-end implements comprehensive security measures:

- **Authentication:** Secure password hashing using modern algorithms, with protection against brute force attacks.

- **Authorization:** Role-based access control to ensure users can only access appropriate resources.
- **Input Validation:** Thorough validation of all user inputs to prevent injection attacks.
- **Prepared Statements:** Use of prepared statements for database queries to prevent SQL injection.
- **XSS Protection:** Output encoding and other measures to prevent cross-site scripting.
- **CSRF Protection:** Implementation of CSRF tokens to prevent cross-site request forgery.
- **Session Security:** Secure session handling with appropriate timeouts and protections.
- **Logging and Auditing:** Comprehensive logging of system activities for security monitoring and auditing.
- **Data Encryption:** Encryption of sensitive data in transit and at rest.

### 3.2.4 Middleware

The system employs various middleware components to handle cross-cutting concerns:

- **Authentication Middleware:** Verifies user identity and manages authentication state.
- **Authorization Middleware:** Controls access to protected resources based on user roles.
- **Session Middleware:** Manages session creation, validation, and expiration.
- **Logging Middleware:** Records system activities and user actions for auditing and troubleshooting.
- **Error Handling Middleware:** Catches and processes errors, providing appropriate responses.
- **Security Middleware:** Implements security headers, CSRF protection, and other security measures.

### 3.2.5 Scalability

The back-end architecture is designed with scalability in mind to accommodate growing user bases and data volumes:

- **Modular Design:** The system is built with modular components that can be scaled independently.
- **Database Optimization:** Efficient database schema design and query optimization to handle increasing data volumes.
- **Caching:** Strategic caching of frequently accessed data to reduce database load.

- **Stateless Architecture:** Where possible, components are designed to be stateless to facilitate horizontal scaling.
- **Resource Management:** Efficient use of server resources with appropriate connection pooling and resource allocation.

## 3.3 Interaction Design and User Experience (UX)

### 3.3.1 Navigation and User Experience

The interaction design focuses on creating intuitive navigation and a seamless user experience:

- **Consistent Navigation:** A consistent navigation structure across all pages, with clear labels and logical organization.
- **Breadcrumb Navigation:** Breadcrumbs to help users understand their location within the system and navigate backward.
- **Task-Based Design:** Interface organization based on common user tasks and workflows.
- **Progressive Disclosure:** Information is presented progressively, avoiding overwhelming users with too much information at once.
- **Consistent Interaction Patterns:** Similar actions and elements behave consistently throughout the system.
- **User-Centered Design:** Design decisions are based on understanding user needs, goals, and contexts.

### 3.3.2 Feedback and Notifications

The system provides clear feedback and notifications to keep users informed:

- **Action Confirmation:** Visual confirmations for successful actions (e.g., form submission, appointment booking).
- **Error Messages:** Clear, helpful error messages that explain the issue and suggest solutions.
- **Loading Indicators:** Visual indicators for processes that take time to complete.
- **System Notifications:** Alerts for important events which are held on (e.g., upcoming appointments, new medical records).
- **Status Indicators:** Visual indicators of system and item status how it is now (e.g., appointment status, blood donation request status).

### 3.3.3 Mobile-first Approach

The system is designed with a mobile-first approach, ensuring optimal user experience across devices:

- **Responsive Design:** All interfaces adapt fluidly to different screen sizes and orientations.
- **Touch-Friendly Interface:** Interactive elements are sized and spaced appropriately for touch interaction.
- **Prioritized Content:** Content is organized to prioritize the most important information and actions on smaller screens.
- **Simplified Navigation:** Navigation is simplified for mobile devices, often using dropdown or hamburger menus.
- **Performance Optimization:** Special attention to performance for users on mobile networks with limited bandwidth.

### 3.3.4 Testing for Usability

Usability testing was conducted throughout the design and development process:

- **User Testing:** Testing with representative users from different stakeholder groups to gather feedback on usability.
- **Heuristic Evaluation:** Expert evaluation based on established usability principles.
- **Task Analysis:** Observation of users completing common tasks to identify usability issues.
- **Accessibility Testing:** Testing with screen readers and other assistive technologies.
- **Iterative Improvement:** Continuous refinement based on testing results and user feedback.

### 3.3.5 Consistency and Accessibility

Design principles emphasizing consistency and accessibility are applied throughout the system:

- **Visual Consistency:** Consistent use of some components colors, typography, spacing, and UI.
- **Behavioral Consistency:** Similar actions and elements behave consistently across the whole system for better experience.
- **Accessibility Standards:** Compliance with WCAG guidelines for web accessibility.

- **Language Clarity:** Clear, concise, and consistent terminology throughout the interface.
- **Inclusive Design:** Design considerations for users with different abilities and needs.

## 3.4 Implementation Requirements

### 3.4.1 Front-End Tools

The following tools and technologies are required for front-end implementation:

- **HTML5/CSS3:** For page structure and styling
- **JavaScript:** For client-side interactivity and dynamic content
- **Tailwind CSS:** For utility-based styling and responsive design
- **Font Awesome:** For iconography
- **Modern Web Browser:** For testing and development (Chrome, Firefox, Safari, Edge)

### 3.4.2 Back-End Tools

The following tools and technologies are required for back-end implementation:

- **PHP:** Version 7.4 or higher for server-side scripting
- **MySQL:** Version 5.7 or higher for database management
- **Apache:** Web server with appropriate PHP modules enabled
- **PHPMyAdmin:** For database administration
- **XAMPP/WAMP:** Development environment package including PHP, MySQL, and Apache

### 3.4.3 Hosting and Deployment

The system requires the following hosting and deployment resources:

- **Web Server:** Apache or Nginx with appropriate configuration
- **Database Server:** MySQL server with adequate resources
- **Storage:** Sufficient disk space for storing files and database data
- **Bandwidth:** Adequate bandwidth for expected user load
- **SSL Certificate:** For secure HTTPS connections
- **Backup Solution:** Regular backup mechanism for data and files

### 3.4.4 Development Environment

The recommended development environment includes:

- **IDE:** Visual Studio Code, PhpStorm, or similar with appropriate plugins
- **Version Control:** Git for source code management
- **Local Server:** XAMPP, WAMP, or similar for local development
- **Browser Developer Tools:** For front-end debugging and testing
- **Database Client:** PHPMysqlAdmin or similar for database management
- **Testing Tools:** Tools for automated and manual testing

# Chapter 4: Implementation and Testing

## 4.1 Database Implementation

### 4.1.1 Database Design

The DIU eHealth System database was implemented using MySQL with the following key tables and relationships:

- **Users Table:** Stores information about patients, including personal details, contact information, and authentication credentials.
- **Doctors Table:** Contains details of healthcare providers, including specialties, qualifications, and work schedules.
- **Admins Table:** Stores information about system administrators with their access privileges.
- **Appointments Table:** Records appointment details, including patient, doctor, date, time, and status.
- **Medical Records Table:** Stores patient medical records with references to patients and doctors.
- **Medical Record Attachments Table:** Contains file attachments related to medical records.
- **Prescriptions Table:** Stores prescription information, linking patients and doctors.
- **Blood Donations Table:** Records blood donation activities and requests.
- **Fundraising Table:** Contains information about fundraising campaigns.
- **Fund Donations Table:** Records donations made to fundraising campaigns.

- **Contact Submissions Table:** Stores inquiries and messages submitted through the contact form.

The database schema includes appropriate foreign key relationships between tables to maintain data integrity and facilitate efficient querying. The structure is normalized to minimize redundancy while balancing performance considerations.

### 4.1.2 Data Security

The database implementation includes the following security measures:

- **Password Hashing:** User passwords are stored using secure hashing algorithms to protect against unauthorized access.
- **Parameterized Queries:** Prepared statements and parameterized queries are used to prevent SQL injection attacks.
- **Access Control:** Database user accounts have appropriate permissions limited to what is necessary for their function.
- **Sensitive Data Protection:** Sensitive personal and medical information is stored with additional security measures.
- **Database Auditing:** Changes to critical data are logged for security monitoring and compliance.
- **Backup Encryption:** Database backups are encrypted to protect data even in backup form.

### 4.1.3 Optimization

Several optimization techniques were applied to ensure database performance:

- **Indexing:** Strategic indexing of frequently queried columns to improve query performance.
- **Query Optimization:** Careful design of SQL queries to minimize resource usage and maximize performance.

- **Table Partitioning:** For larger tables, partitioning is implemented to improve query performance.
- **Connection Pooling:** Efficient management of database connections to reduce overhead.
- **Caching:** Implementation of caching for frequently accessed, relatively static data.
- **Database Configuration:** Optimization of MySQL configuration parameters based on server resources and usage patterns.

#### 4.1.4 Sample Data Population

To facilitate testing and demonstration, the database was populated with sample data:

- **Test Users:** A set of test user accounts with various profiles and medical histories.
- **Test Doctors:** Sample doctor accounts with different specialties and schedules.
- **Test Appointments:** Sample appointments in various states (scheduled, completed, canceled).
- **Test Medical Records:** Sample medical records with realistic but fictional medical information.
- **Test Prescriptions:** Sample prescriptions with common medications and dosages.
- **Test Blood Donations:** Sample blood donation records and requests.
- **Test Fundraising Campaigns:** Sample fundraising campaigns with various purposes and progress levels.

The sample data was designed to cover various scenarios and edge cases to ensure thorough testing of system functionality.

## 4.2 Frontend Implementation

### 4.2.1 Technology Used

The frontend of the DIU eHealth System was implemented using the following technologies:

- **HTML5:** For structuring the web pages and content.
- **CSS3:** For styling and visual presentation, including responsive design.
- **Tailwind CSS:** A utility-first CSS framework used to streamline styling and ensure consistency.
- **JavaScript:** For client-side interactivity, form validation, and dynamic content.
- **Font Awesome:** For icons and visual elements to enhance user interface.
- **Google Fonts:** For typography, specifically using the Raleway font family.

### 4.2.2 Key UI Components

Several reusable UI components were developed to maintain consistency and efficiency:

- **Navigation Components:** Consistent navigation bars for different user roles, with responsive design for various screen sizes.
- **Form Components:** Standardized form elements with built-in validation and error handling.
- **Card Components:** Reusable card layouts for displaying various types of information.
- **Table Components:** Responsive tables with sorting, filtering, and pagination capabilities.

- **Modal Components:** Reusable modal dialogs for confirmations, forms, and information display.
- **Alert Components:** Standardized alert and notification elements for user feedback.
- **Dashboard Widgets:** Customizable dashboard widgets for displaying summary information and key metrics.

### 4.2.3 Responsive Design

The frontend implementation includes comprehensive responsive design features:

- **Fluid Grid Layout:** Layout that adjusts smoothly to different screen sizes.
- **Mobile-First Approach:** Design that starts with mobile considerations and expands to larger screens.
- **Responsive Navigation:** Navigation that adapts to screen size, collapsing to a hamburger menu on smaller screens.
- **Flexible Images:** Images that scale appropriately for different display sizes.
- **Responsive Tables:** Tables that adapt to smaller screens by scrolling horizontally or reorganizing content.
- **Media Queries:** CSS media queries to apply different styles based on screen characteristics.

### 4.2.4 Interactivity and UX Features

Various interactive features were implemented to enhance the user experience:

- **Form Validation:** Real-time validation of form inputs with immediate feedback to users.

- **Interactive Calendars:** Date pickers for appointment scheduling and other date-related functions.
- **Dynamic Content Loading:** Asynchronous loading of content to improve performance and user experience.
- **Tooltips and Popovers:** Contextual information displayed on hover or click for additional guidance.
- **Animated Transitions:** Smooth transitions between states to provide visual feedback and improve perceived performance.
- **Interactive Dashboards:** Dashboards with filters, toggles, and customization options.

## 4.3 Backend Implementation

### 4.3.1 Technology Tools

The backend of the DIU eHealth System was implemented using the following technologies:

- **PHP:** Server-side scripting language used for handling business logic and data processing.
- **MySQL:** Relational database management system for data storage and retrieval.
- **Apache:** Web server for hosting the application.
- **PHP Sessions:** For maintaining user state and authentication.
- **PHP PDO/MySQLi:** For database interactions with prepared statements.
- **PHP File Handling:** For managing file uploads and downloads.

## 4.3.2 Major UI Components

The backend implementation includes several key components:

- **Authentication System:** Handles user registration, login, and session management.
- **Role-Based Access Control:** Manages permissions and access based on user roles.
- **Database Abstraction Layer:** Provides consistent interface for database operations.
- **File Management System:** Handles file uploads, storage, and retrieval.
- **Notification System:** Generates and delivers system notifications to users.
- **Error Handling System:** Manages error detection, logging, and user feedback.

## 4.3.3 Core Functionalities

The backend implementation provides the following core functionalities:

- **User Management:** Registration, authentication, and profile management for users.
- **Appointment Management:** Scheduling, updating, and tracking of appointments.
- **Medical Record Management:** Creation, updating, and retrieval of patient medical records.
- **Prescription Management:** Creation and management of medical prescriptions.
- **Blood Donation Management:** Registration, tracking, and coordination of blood donations.
- **Fund Donation Management:** Creation, approval, and tracking of fundraising campaigns and donations.

- **Administrative Functions:** System management, user oversight, and reporting capabilities.

## 4.3.4 Middleware and Error Handling

The backend implements several middleware components and error handling mechanisms:

- **Authentication Middleware:** Verifies user identity and authorization for protected resources.
- **Input Validation:** Validates and sanitizes user inputs to prevent security vulnerabilities.
- **Error Logging:** Records errors and exceptions for troubleshooting and monitoring.
- **User Feedback:** Provides appropriate error messages and guidance to users.
- **Security Middleware:** Implements security headers, CSRF protection, and other security measures.
- **Request/Response Handling:** Manages HTTP requests and generates appropriate responses.

## 4.4 Interaction Mechanisms

### 4.4.1 Role-based Interactions

The system implements distinct interaction mechanisms for different user roles:

#### 4.4.1.1 Super Admin Interactions

Super Administrators have comprehensive system management capabilities:

- **User Management:** Create, view, update, and delete all types of user accounts, including administrators.
- **System Configuration:** Configure system parameters and settings.

- **Security Management:** Monitor security logs and manage security settings.
- **Data Access:** Access all system data for auditing and monitoring purposes.
- **Backup and Restore:** Manage system backup and recovery operations.

#### 4.4.1.2 Admin Interactions

Administrators manage day-to-day system operations:

- **User Management:** Manage patient and doctor accounts, including approval of doctor registrations.
- **Blood Donation Management:** Oversee blood donation activities and requests.
- **Fund Campaign Management:** Review, approve, and monitor fundraising campaigns.
- **Report Generation:** Create reports on system activities and statistics.
- **Support Functions:** Assist users with system-related issues.

#### 4.4.1.3 Doctor Interactions

Doctors interact with the system for patient care:

- **Appointment Management:** View, accept, reject, and manage appointments.
- **Patient Management:** View patient information and medical history.
- **Medical Record Creation:** Create and update patient medical records.
- **Prescription Management:** Write and manage prescriptions for patients.

- **Schedule Management:** Set and update availability for appointments.
- **Profile Management:** Update personal and professional information.

#### 4.4.1.4 Patient/User Interactions

Patients interact with the system for healthcare services:

- **Appointment Scheduling:** Book, reschedule, or cancel appointments with doctors.
- **Medical Record Access:** View personal medical records and history.
- **Prescription Access:** View and print prescribed medications.
- **Blood Donation:** Register as a donor or request blood donations.
- **Fund Donation:** Create fundraising campaigns or donate to existing ones.
- **Profile Management:** Update personal information and preferences.

## 4.5 Integration and Deploying

### 4.5.1 Integration

The DIU eHealth System integrates various components and external services:

- **Frontend and Backend Integration:** Integration of frontend user interfaces with backend processing and data management.
- **Database Integration:** Connection and communication between application logic and database systems.
- **File Storage Integration:** Integration with file storage systems for medical records, images, and other documents.

- **Third-Party Services:** Integration with external services for specific functionality, such as notification delivery.

## 4.5.2 Deployment

The system was deployed using the following approach:

- **Server Setup:** Configuration of web server (Apache) and database server (MySQL) for optimal performance and security.
- **Code Deployment:** Transfer of application code to the production environment using secure methods.
- **Database Deployment:** Setup of database schema and initial data population.
- **Security Configuration:** Implementation of security measures including SSL certificates for HTTPS.
- **Testing and Verification:** Comprehensive testing of the deployed system to ensure functionality and performance.
- **Monitoring Setup:** Configuration of monitoring tools to track system health and performance.

## 4.6 Security Implementation

Security is a critical aspect of the DIU eHealth System, particularly given the sensitive nature of healthcare data. The following security measures were implemented:

- **Authentication:** Secure user authentication using password hashing and protection against brute force attacks.
- **Authorization:** Role-based access control to restrict access to authorized users only.
- **Input Validation:** Comprehensive validation and sanitization of all user inputs to prevent from kinds of injection attacks.

- **SQL Injection Prevention:** Use of prepared statements and parameterized queries which is used or input through vulnerable input field or URL for all database illegal interactions.
- **XSS Protection:** Output encoding and other measures to prevent cross-site scripting attacks.
- **CSRF Protection:** Implementation of CSRF tokens to prevent cross-site request forgery.
- **Session Security:** Secure session handling with proper session validation and expiration.
- **File Upload Security:** Validation of file types, sizes, and content to prevent malicious file uploads.
- **Error Handling:** Secure error handling that prevents information leakage while providing appropriate user feedback.
- **Security Headers:** Implementation of security headers to enhance browser security features.

## 4.7 Key Challenges and Solutions

During the implementation of the DIU eHealth System, several challenges were encountered and addressed:

- **Challenge:** Ensuring security of sensitive healthcare data in system.  
**Solution:** Implemented comprehensive security measures like encryption, secure coding practices, and regular security audits.
- **Challenge:** Managing complex relationships between different system components.  
**Solution:** Adopted a modular design approach with clear interfaces between components and careful database design.

- **Challenge:** Optimizing performance for a potentially large user base.  
**Solution:** Implemented database optimizations, caching strategies, and code efficiency improvements.
- **Challenge:** Creating an intuitive user experience for diverse user roles.  
**Solution:** Conducted user testing through their use with representatives from different stakeholder groups and iteratively refined the user interface.
- **Challenge:** Handling file uploads and storage for medical records.  
**Solution:** Implemented a secure file storage system with appropriate access controls and validation.
- **Challenge:** Ensuring system reliability and data integrity.  
**Solution:** Implemented comprehensive error handling, data validation, and regular backup procedures.

## 4.8 Testing Features

### 4.8.1 Testing Approach

A comprehensive testing approach was adopted for the DIU eHealth System:

- **Unit Testing:** Testing of all individual functions and components to ensure they work as expected or in planned.
- **Integration Testing:** Testing of interactions between different system components.
- **Functional Testing:** Testing of system functionality against requirements those are intended to be in system.
- **User Acceptance Testing:** Testing with representative users to validate system usability and functionality in real life conformation of system.
- **Security Testing:** Assessment of system security through various kinds of testing techniques.

- **Performance Testing:** Evaluation of system performance under various load conditions.
- **Regression Testing:** Re-testing after changes to ensure existing functionality remains intact.

## 4.8.2 Pass/Fail Criteria

The following criteria were used to determine test outcomes:

- **Functionality:** The system must correctly implement all required functions as specified in requirements.
- **Performance:** The system must respond within acceptable time limits under normal and peak loads.
- **Security:** The system must protect data confidentiality, integrity, and availability according to security requirements.
- **Usability:** Users must be able to complete key tasks efficiently and with satisfaction.
- **Reliability:** The system must function consistently without unexpected failures or data corruption.
- **Compliance:** The system must comply with relevant healthcare data protection regulations.

## 4.8.3 Suspension and Resumption

Testing activities were suspended and resumed based on the following criteria:

- **Suspension:** Testing was suspended if critical defects were found that prevented further testing, if the test environment became unavailable, or if significant changes to requirements or design were made.
- **Resumption:** Testing resumed after critical defects were fixed, the test environment was restored, or necessary changes were implemented and reviewed.

## 4.8.4 Testing Strategy

The testing strategy combined several approaches:

- **Risk-Based Testing:** Prioritizing tests based on risk assessment of system components.
- **Incremental Testing:** Testing features as they were developed and integrated.
- **Scenario-Based Testing:** Testing based on real-world usage scenarios.
- **Exploratory Testing:** Unscripted testing to discover unexpected issues.
- **Automated and Manual Testing:** Combination of automated tests for repetitive tasks and manual testing for complex scenarios.

## 4.8.5 Testing Schedule

Testing was conducted according to a defined schedule integrated with the development timeline:

- **Unit Testing:** Conducted continuously during development.
- **Integration Testing:** Conducted as components were integrated.
- **Functional Testing:** Conducted after feature completion.
- **User Acceptance Testing:** Conducted after system stabilization.
- **Security and Performance Testing:** Conducted before final deployment.

## 4.8.6 Test Cases

Test cases were developed for various system features. Representative examples include:

ID	Feature	Test Description	Expected Result	Status
TC001	User Registration	Register a new user with valid information	User account created successfully	Pass
TC002	User Registration	Attempt to register with existing email	Error message displayed	Pass
TC003	User Login	Login with valid credentials	User successfully logged in	Pass
TC004	User Login	Login with invalid credentials	Error message displayed	Pass
TC005	Appointment Booking	Book appointment with available doctor	Appointment created successfully	Pass
TC006	Medical Record	Doctor creates medical record for patient	Record created and accessible to patient	Pass
TC007	Blood Donation	Register as blood donor	Donor registration successful	Pass
TC008	Fund Donation	Create fundraising campaign	Campaign created pending approval	Pass
TC009	Admin Functions	Admin approves doctor registration	Doctor status updated to active	Pass
TC010	Security	Attempt to access restricted page without login	Redirected to login page	Pass

Table 4.8.6 Test cases of main features

These test cases represent a small subset of the comprehensive test suite developed for the system. Each test case included detailed steps, input data, and verification procedures to ensure thorough testing of system functionality.

# Chapter 5: Conclusion and Future Scope

## 5.1 Conclusion

The DIU eHealth System has been successfully developed and implemented as a comprehensive digital health system that covers various aspects of delivery and management of healthcare systems. The system incorporates a number of healthcare services such as scheduling appointments, managing medical records, prescribing and handling prescriptions, coordinating donations for blood banks and fundraising for medical needs in a consolidated platform accessible to users, doctors and administrators.

Major achievements of the DIU eHealth System include:

- **Integrated Healthcare Services:** The successful integration of various healthcare services into a single platform, reducing fragmentation and enhancing coordination.
- **Enhanced Accessibility:** Improved access to healthcare services through a digital platform that is available 24/7 and accessible from various devices.
- **Efficient Healthcare Delivery:** Streamlined processes for appointment scheduling, medical record management, and prescription handling, reducing administrative burden and improving efficiency.
- **Effective Resource Coordination:** Improved coordination of healthcare resources, particularly for blood donation and fundraising activities.
- **Robust Security:** Implementation of comprehensive security measures to protect sensitive healthcare data while ensuring availability to authorized users.
- **User-Centered Design:** Development of intuitive user interfaces tailored to the needs and workflows of different user roles.
- **Scalable Architecture:** Establishment of a technical foundation that can accommodate growth and expansion of the system in the future.

The DIU eHealth System addresses the challenges identified in the problem statement by providing a digital solution that reduces fragmentation, enhances communication, improves accessibility, and streamlines healthcare processes. The system has positive response from users during testing, also get positive feedback on its usability, functionality, and potential impact on healthcare services.

Throughout the development process, valuable lessons were learned about the complexities of healthcare systems, the importance of users involvement in design part, the critical side of nature of data security in healthcare applications, and the need for careful integration of various components in system. These study will inform for future enhancements and similar projects in the healthcare domain.

In conclusion, the DIU eHealth System represents a significant step forward in the digital transformation of healthcare services, As providing a comprehensive platform which benefits patients, healthcare providers, and administrators also groundwork for future innovations in digital health.

## Financial Statement

The development and implementation of the DIU eHealth System involved various kinds of costs and resource allocations. The following financial statement provides an overview of the project expenditure:

Category	Item	Amount (TK)
Development	UI/UX Design	25,000
	Software Development Labor	45,000
	Quality Assurance and Testing	30,000
Infrastructure	Server and Hosting	6,000
	Database Licensing	1,500

Category	Item	Amount (TK)
	SSL Certificate	1000
Training and Documentation	User Training	5,500
	Documentation Development	2,500
Miscellaneous	Project Management	5,000
	Contingency	2,500
Total Project Cost		124,000

Table 5.1 Financial statement of system development

The project was completed within the allocated budget. The largest part of budget was allocated to development costs, reflecting the complexity and scope of this system. Infrastructure costs were relatively low due to the use of cost-effective hosting solutions and open-source technologies where as much as possible. Training and documentation costs which is ensured that users would be able to effectively utilize the system.

The investment in the DIU eHealth System is expected to yield significant returns in terms of improved healthcare delivery efficiency, reduced administrative costs, and enhanced patient satisfaction. Additionally, the system's capabilities for blood donation coordination and fundraising can contribute to community health initiatives and support those in need of financial assistance for medical treatment.

## 5.2 Future Scope

While the DIU eHealth System has successfully implemented a comprehensive set of features, there are numerous opportunities for future enhancements and expansions. The modular

architecture of the system allows for the integration of additional features and capabilities to further improve healthcare delivery and management.

The following areas represent potential directions for future development:

## **Mobile Application Development**

While the current system is responsive and mobile-friendly, dedicated mobile applications for iOS and Android could provide enhanced functionality and user experience:

- Native mobile applications with offline capabilities
- Push notifications for appointment reminders and important updates
- Mobile-specific features such as biometric authentication
- Integration with device health sensors for vital sign monitoring

## **Telemedicine Integration**

Adding telemedicine capabilities would significantly enhance the system's ability to deliver healthcare services remotely:

- Video consultation functionality for remote doctor-patient interactions
- Secure messaging system for asynchronous communication
- Remote monitoring tools for chronic disease management
- Integration with telemedicine-specific diagnostic tools and devices

## **Artificial Intelligence and Machine Learning**

Incorporating AI and machine learning could provide advanced capabilities for diagnostics, personalization, and operational efficiency:

- Predictive analytics for disease management and prevention
- Intelligent appointment scheduling based on urgency and availability
- Automated triage and symptom assessment
- Natural language processing for medical records and documentation
- Image recognition for radiology and medical imaging

## **Integration with External Healthcare Systems**

Expanding the system's interoperability would facilitate seamless information exchange with other healthcare systems:

- Integration with national health information exchanges
- Connectivity with pharmacy management systems
- Interoperability with laboratory and diagnostic systems
- Compliance with international healthcare data standards (FHIR, HL7)

## **Enhanced Analytics and Reporting**

Advanced analytics capabilities would provide valuable insights for healthcare management and research:

- Comprehensive healthcare analytics dashboard
- Population health management tools
- Customizable reporting for different stakeholders

- Research data anonymization and extraction capabilities

## **Expanded Financial and Insurance Features**

Additional financial features would enhance the system's capability to handle healthcare payments and insurance:

- Integration with healthcare payment systems
- Insurance claim processing and management
- Cost estimation tools for patients
- Financial assistance program management

## **Patient Engagement and Health Education**

Features to enhance patient engagement and education would contribute to improved health outcomes:

- Personalized health education resources
- Patient support communities and forums
- Health tracking and goal setting tools
- Medication adherence reminders and support

## **Blockchain for Healthcare Records**

Implementing blockchain technology could enhance security and integrity of healthcare records:

- Immutable medical record storage and verification

- Patient-controlled access to healthcare data
- Secure sharing of medical records across providers
- Smart contracts for healthcare service agreements

These potential enhancements represent a roadmap for the continued evolution of the DIU eHealth System. The implementation of these features would be prioritized based on user feedback, healthcare needs, technological feasibility, and resource availability. The modular architecture of the current system provides a solid foundation for these future developments, ensuring that the DIU eHealth System can continue to adapt and grow to meet the evolving needs of healthcare delivery and management.

# Chapter 6: Appendix

## 6.1 System Design Details

This section provides additional details about the system design that are supplementary to the main documentation.

### 6.1.1 Database Schema

The complete database schema diagram showing all tables, relationships, and field definitions for the DIU eHealth System:

Database Schema Diagram would be placed here

Figure 6.1: Complete Database Schema of DIU eHealth System

### 6.1.2 API Documentation

The eHealth system implements several internal APIs for communication between modules.

Below is the documentation for the key API endpoints:

#### 6.1.2.1 Authentication API

Endpoint	Method	Parameters	Description	Response
/user/auth.php	POST	email, password	User authentication endpoint	User session data or error message
/doctor/login.php	POST	email, password	Doctor authentication endpoint	Doctor session data or error message
/admin/login.php	POST	username, password	Admin authentication endpoint	Admin session data or error message

Table 6.1.2.1 System authentication

### 6.1.2.2 Medical Records API

Endpoint	Method	Parameters	Description	Response
/doctor/get_record.php	GET	record_id	Retrieves a specific medical record	Medical record data
/doctor/update_record.php	POST	record_id, data fields	Updates an existing medical record	Success/failure status
/doctor/vital_signs_handler.php	POST	patient_id, vital signs data	Updates patient vital signs	Success/failure status

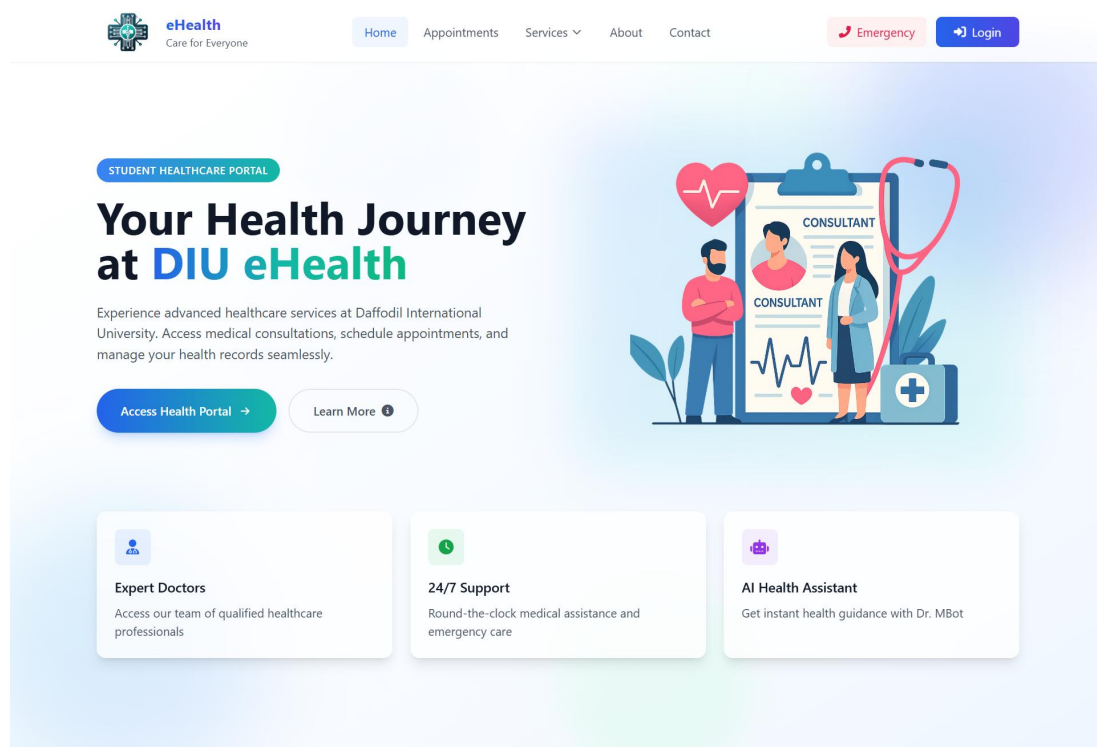
Table 6.1.2.2 System medical records API

## 6.2 User Interface Details

This section provides a comprehensive overview of the key user interfaces in the DIU eHealth System.

### 6.2.1 Landing Page

The landing page serves as the entry point for all users of the DIU eHealth System. It provides an overview of the system's services and quick access to key functionalities.



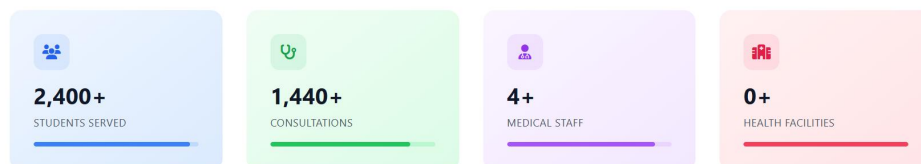
#### STUDENT HEALTH NOTICE

**Access DIU Health Services  
Anytime, Anywhere**

[Access Student Portal](#)

### Making a Difference in Campus Healthcare

Our commitment to providing quality healthcare services to the DIU community



AI-POWERED HEALTHCARE



## Meet Your 24/7 Health Companion: Dr. MBot

Get instant health guidance, symptom assessment, and personalized recommendations from our AI-powered health assistant. Dr. MBot is here to support you around the clock.

- 🔍 **Smart Analysis**  
Instant symptom assessment and health recommendations
- 🔒 **Private & Secure**  
Your health data is protected and confidential

- 🕒 **24/7 Availability**  
Access health guidance anytime, anywhere
- 💬 **Natural Interaction**  
Easy and conversational health discussions

Chat with Dr. MBot

Our Services

## Comprehensive Healthcare Services

Experience a wide range of medical services designed specifically for the DIU community

**General Consultation**

Schedule appointments with our experienced medical professionals for regular check-ups and consultations.

[Book Appointment →](#)

**24/7 Emergency Support**

🚑 Ambulance Service  
+880-1747333314

🏥 Medical Center  
+880-01747333315

[View All Emergency Contacts →](#)

**Mental Health Support**

Professional counseling and mental health services to support your emotional well-being.

[Get Support →](#)

**Blood Support**

Access our blood bank services for emergencies and participate in blood donation drives.

[Donate Blood →](#)

**Digital Health Records**

Secure access to your medical history, test results, and health documentation.

[View Records →](#)

**Health Fund Support**

Financial assistance program for students requiring medical support and treatments.

[Learn More →](#)

Our Facilities

## State-of-the-art Healthcare at DIU

Visit our modern facility with advanced diagnostics, comfortable care, and specialized medical units.







Events

## Upcoming Health Events

Stay updated with our latest health initiatives and programs

May 25, 2025

### Annual Health Check-up Drive

Free comprehensive health check-ups for all DIU students. Services include general health assessment, eye check-up, and dental screening.

[Register Now →](#)

June 5-12, 2025

### Mental Health Awareness Week

A week-long program featuring workshops, counseling sessions, and mindfulness activities to promote mental well-being.

[Learn More →](#)

June 20, 2025

### Blood Donation Camp

Join our blood donation drive and help save lives. Free health screening for all donors.

[Register as Donor →](#)

Testimonials

## What Our Students Say

Real experiences from the DIU community



**Sarah Ahmed**  
CSE Department

"The 24/7 availability of medical support through the eHealth portal gives me peace of mind. Dr. MBot has been incredibly helpful for quick health guidance!"



**Rafid Hassan**  
BBA Department

"The mental health support services have been a game-changer. The counselors are professional and the online booking system is so convenient."



**Fahmida Rashid**  
Faculty Member

"As a faculty member, I'm impressed by the comprehensive healthcare services. The digital health records system has made managing medical information so much easier."



## Your Health Journey Begins Here

Join thousands of DIU students who trust our comprehensive healthcare services. Access medical support, schedule appointments, and take control of your health journey.

[Access Health Portal →](#)

[Contact Support ↻](#)

### DIU EHEALTH

The DIU eHealth System Portal is your comprehensive healthcare solution at Daffodil International University. We're committed to providing quality healthcare services to our campus community.

Access medical services, book appointments, and manage your health records with ease through our integrated digital platform.

### Contacts

Phone: +880-2-48111639

Email: [health@diu.edu.bd](mailto:health@diu.edu.bd)

Address: 100/A, Shukrabad, Mirpur Road, Dhanmondi, Dhaka-1207, Bangladesh

### Social



Follow us on social media for health tips, event updates, and important announcements.

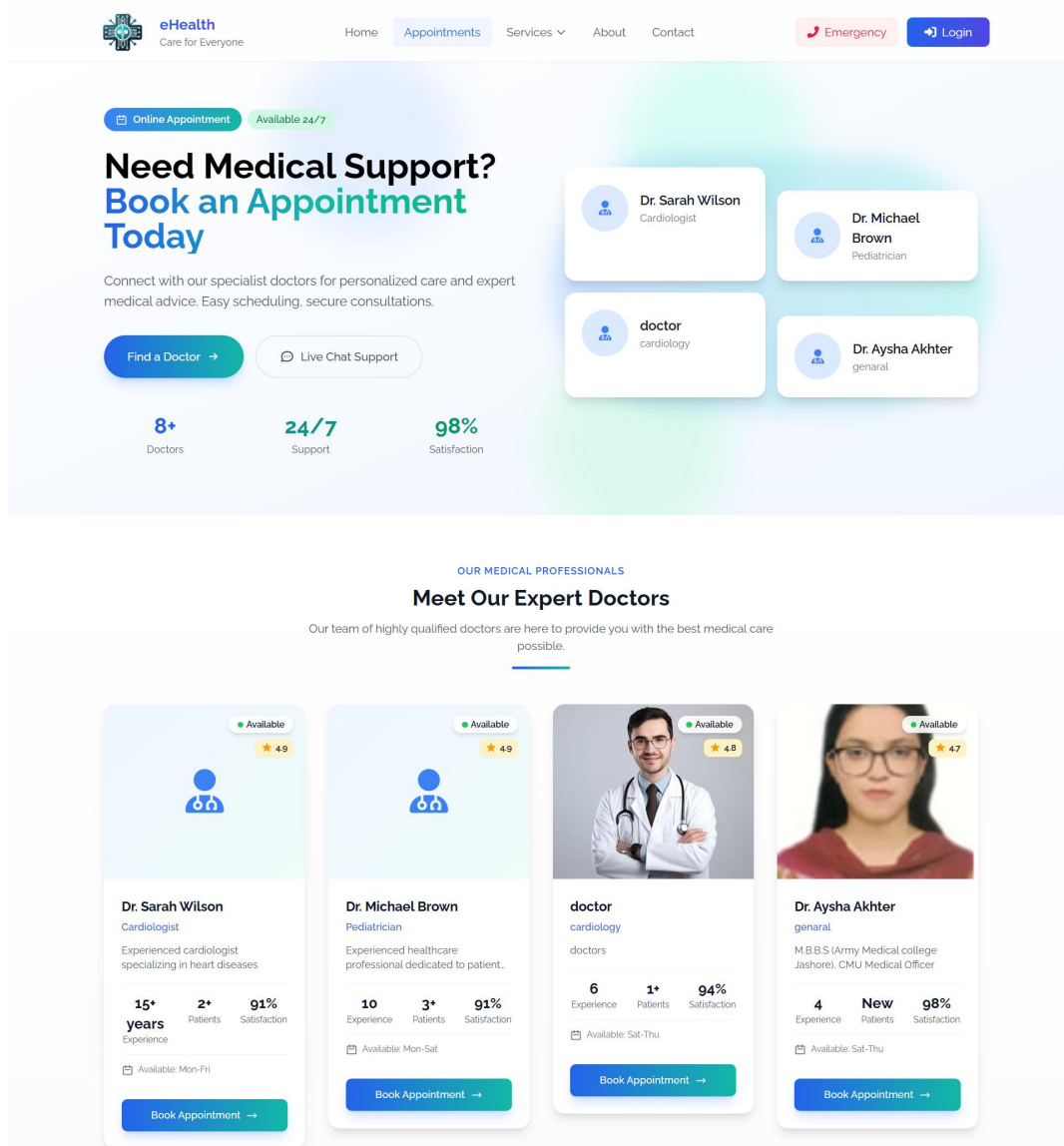
Figure 6.2.1 Landing page

Key components of the landing page include:

- Navigation menu with links to key sections
- Login/Register options for different user types
- Feature highlights showcasing primary system capabilities
- Information about healthcare services
- Contact information and FAQ links

## 6.2.2 Appointment Management

The appointment management interface facilitates scheduling and tracking of patient consultations.



HOW IT WORKS

### Easy Appointment Booking

Our streamlined appointment booking process makes it easy to get the medical care you need.

- 1 Choose a Doctor**  
 Browse our list of specialist doctors and select the one that meets your healthcare needs.
- 2 Select Date & Time**  
 Choose your preferred date and time for the appointment based on the doctor's availability.
- 3 Get Confirmation**  
 Receive instant confirmation of your appointment with all the details via email.

#### Doctor Availability

Our doctors are available for both in-person and video consultations. You can select your preferred consultation type during booking.

Thursday:	8:00 AM - 6:00 PM
Friday:	8:00 AM - 6:00 PM
Saturday:	8:00 AM - 6:00 PM
Sunday:	Closed (Emergencies only)
Monday:	8:00 AM - 6:00 PM

#### Before Your Appointment

- Have your insurance information ready
- List any current medications
- Write down questions for your doctor
- Arrive 15 minutes early for in-person visits

QUESTIONS & ANSWERS

### Frequently Asked Questions

Find answers to the most common questions about our appointment system.

**How do I book an appointment?**

Browse our doctors, select one that matches your needs, and click "Book Appointment". You'll need to be logged in, provide your symptoms, preferred date and time, and choose an appointment type (in-person or video).

**Can I change or cancel my appointment?**

Yes, you can manage appointments from your dashboard. Go to "My Appointments" in your user account to reschedule or cancel appointments. We recommend making changes at least 24 hours in advance.

**What types of appointments are available?**

We offer both in-person consultations at our facility and video consultations for remote healthcare. Video consultations are perfect for follow-ups, medication reviews, and minor health concerns.

**How do I prepare for a video consultation?**

Ensure you have a stable internet connection, a device with a camera and microphone, and a quiet, private space. You'll receive a link via email 15 minutes before your appointment time.

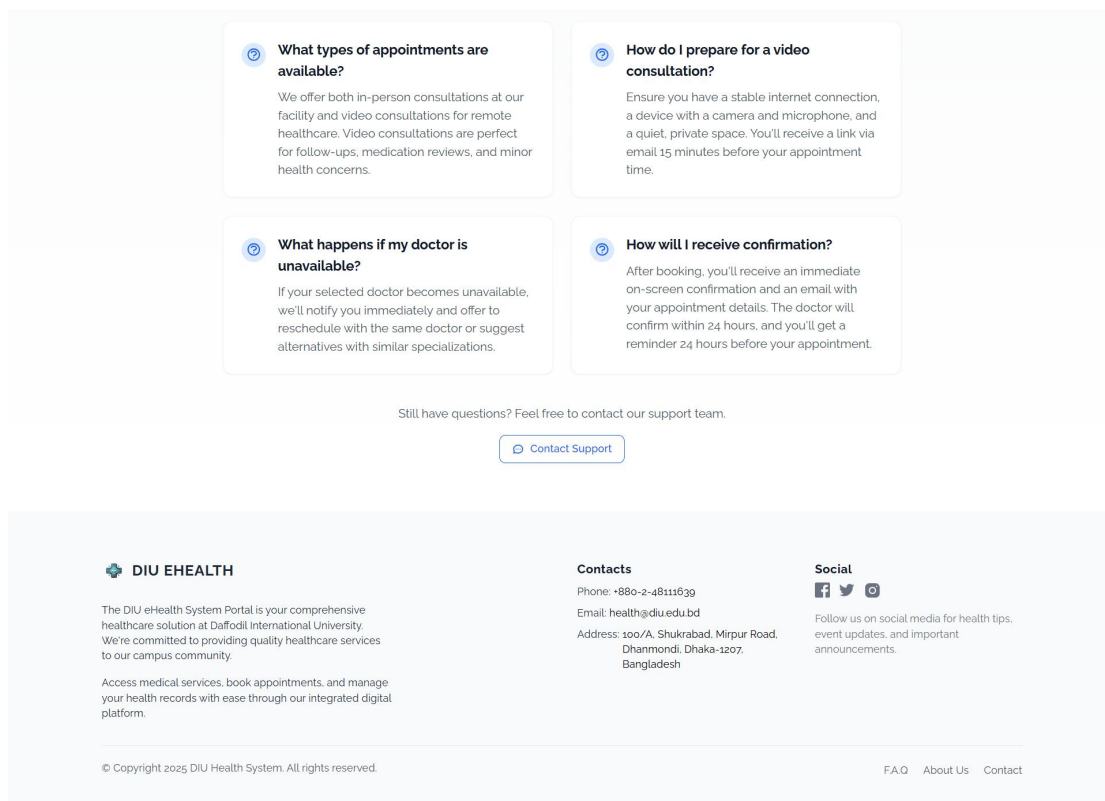


Figure 6.2.2 Appointment Management Interface

Figure 6.2.2: Appointment Management Interface

Key features include:

- Calendar view of appointments
- Appointment scheduling form
- Status tracking (pending, confirmed, completed)
- Appointment history
- Doctor availability management

## 6.2.3 Blood Donation System

The blood donation interface manages blood donation campaigns and donor records.

**BLOOD DONATION IMPACT**

### Saving Lives Together

Track our community's contribution to blood donation and emergency response.

- 10** Blood Units Donated (Total)
- 4** Blood Drives (Active)
- 8** Registered Donors (Total)
- 5** Lives Impacted

**Choose Your Blood Donation Path**

**Login Required**  
Please login to register for blood donation. Your contribution can save lives.  
[Login now →](#)

**Emergency Cases Needing Blood:**

**app - #19** hospital - sample (Active)

0 units collected / Goal: 1 units  
O+ Needed / 4 days left

**Personal Information:**

Name:  Contact Number:

[Login to Donate](#)

**NOTICE**

### Apply for Medical Fundraising

If you are facing a medical condition and need financial support for treatment, you can apply for fundraising assistance through our platform. We are here to help cover medical expenses and treatment costs.

[Apply for Fundraising →](#)

**Recent Blood Drive Performance**

Overview of our recent blood donation campaigns and emergency responses

CAMPAIGN	BLOOD TYPES	UNITS	PROGRESS	STATUS
app hospital	O+	0/1	<div style="width: 0%;"></div>	Active
Sabbir Ibn Sina Hospital	B+	1/1	<div style="width: 100%;"></div>	Urgent
Jannat Delta Hospital	A-	1/1	<div style="width: 100%;"></div>	Completed
Rahim Square Hospital	A+	2/2	<div style="width: 100%;"></div>	Active
Tanvir Square Hospital	B-	2/2	<div style="width: 100%;"></div>	Completed

**DIU EHEALTH**

The DIU eHealth System Portal is your comprehensive healthcare solution at Daffodil International University. We're committed to providing quality healthcare services to our campus community.

Access medical services, book appointments, and manage your health records with ease through our integrated digital platform.

**Contacts**

Phone: +880-2-48111639  
Email: [health@diu.edu.bd](mailto:health@diu.edu.bd)  
Address: 100A, Shukrabad, Mirpur Road, Dhanmondi, Dhaka-1207, Bangladesh

**Social**

Follow us on social media for health tips, event updates, and important announcements.

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Figure 6.2.3 Blood donation system

Figure 6.2.3: Blood Donation Management System

System components include:

- Donor registration
- Blood type tracking
- Donation history
- Blood request management
- Campaign organization tools

## 6.2.4 Fund Donation System

The fund donation portal facilitates healthcare fundraising and donation management.

The screenshot displays the eHealth Fund Donation System interface. At the top, the eHealth logo (Care for Everyone) is on the left, and navigation links (Home, Appointments, Services, About, Contact) and buttons (Emergency, Login) are on the right. The main heading is "DONATION IMPACT Making a Difference Together", with a subtext "Track our community's contribution to medical fundraising and healthcare support." Below this are four summary cards: "Total Funds Raised: \$1,500", "Active Campaigns: 1", "Total Kind Donors: 3", and "Campaign Success: 0%".

The "Choose Your Fund Donation Path" section includes a "Please login to donate" prompt with "Login" and "Register" buttons. Below is a "Select a Fundraising Campaign:" section featuring a card for "Mary Johnson's Cancer Treatment" (Approved), showing "\$510.00 gathered" out of a "\$3,000.00 Goal" and "2 donors".

The "Your Donation Details:" form includes fields for "Your Name", "Email Address", "Phone Number", and "Donation Amount (\$)". The donation amount options are \$5, \$10, \$25, and \$50, with an "Enter amount" field. A "Login to Donate" button is at the bottom.

The "Why Donate?" section lists four reasons: "Save Lives" (Your donation can directly help someone get life-saving medical treatment they couldn't otherwise afford.), "Support Families" (Help reduce the financial burden on families dealing with medical emergencies and health crises.), "Improve Healthcare Access" (Your contributions help make healthcare more accessible to those who need it most.), and "Make an Impact" (Even small donations add up to create significant positive change in our community's health.). A quote by William James is at the bottom: "The greatest use of life is to spend it for something that will outlast it."

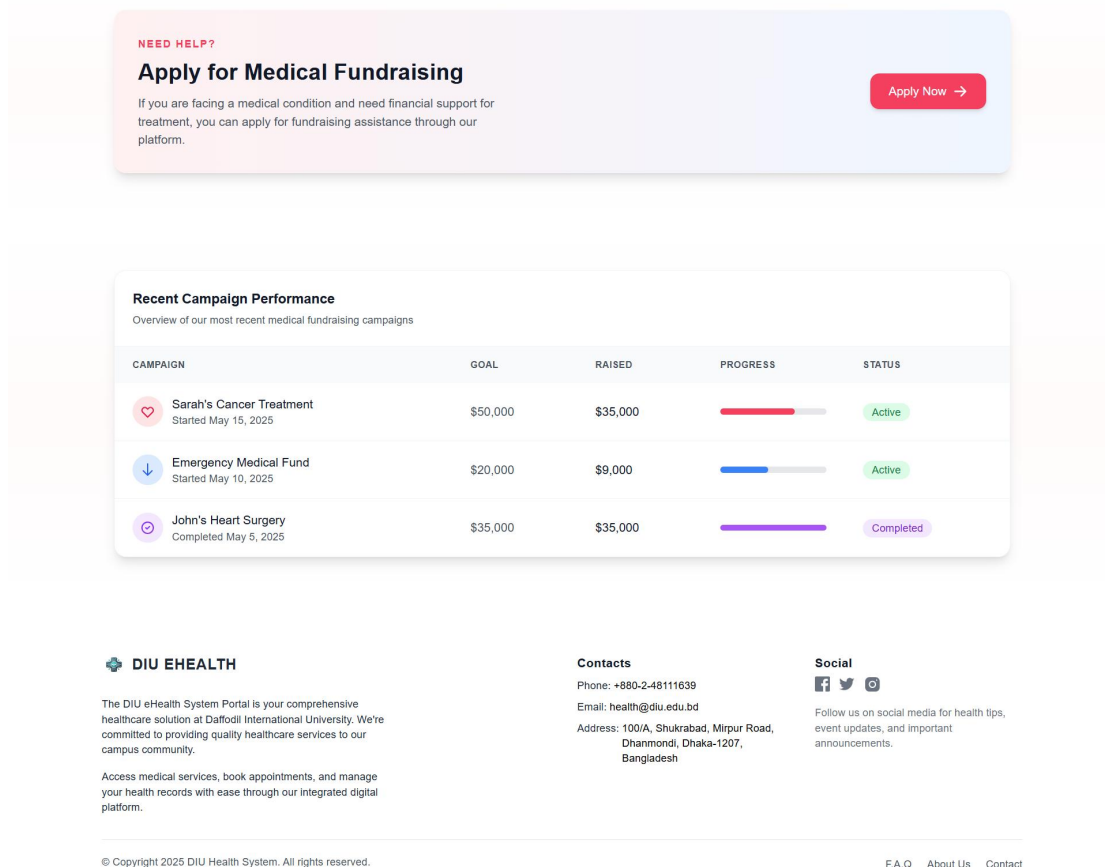


Figure 6.2.4 Fund donation system

Figure 6.2.4: Fund Donation Portal

System features include:

- Donation campaign creation
- Payment processing interface
- Donation tracking
- Fund allocation management
- Donor recognition system

## 6.2.5 AI Healthcare Assistant

The AI healthcare assistant provides automated medical guidance and support.

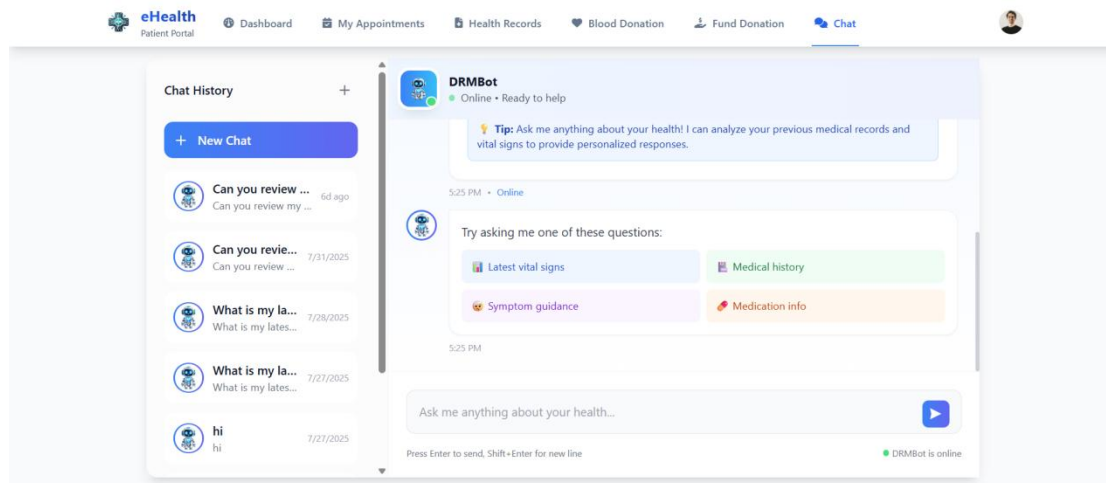


Figure 6.2.5 AI health assistant

Figure 6.2.5: Dr. MBot AI Assistant Interface

Assistant features include:

- Natural language interaction
- Symptom assessment
- Health recommendations
- Medical information lookup
- Emergency guidance

## 6.2.6 Login/Register

The login/register page is designed to login admin, doctor and user also register for user.

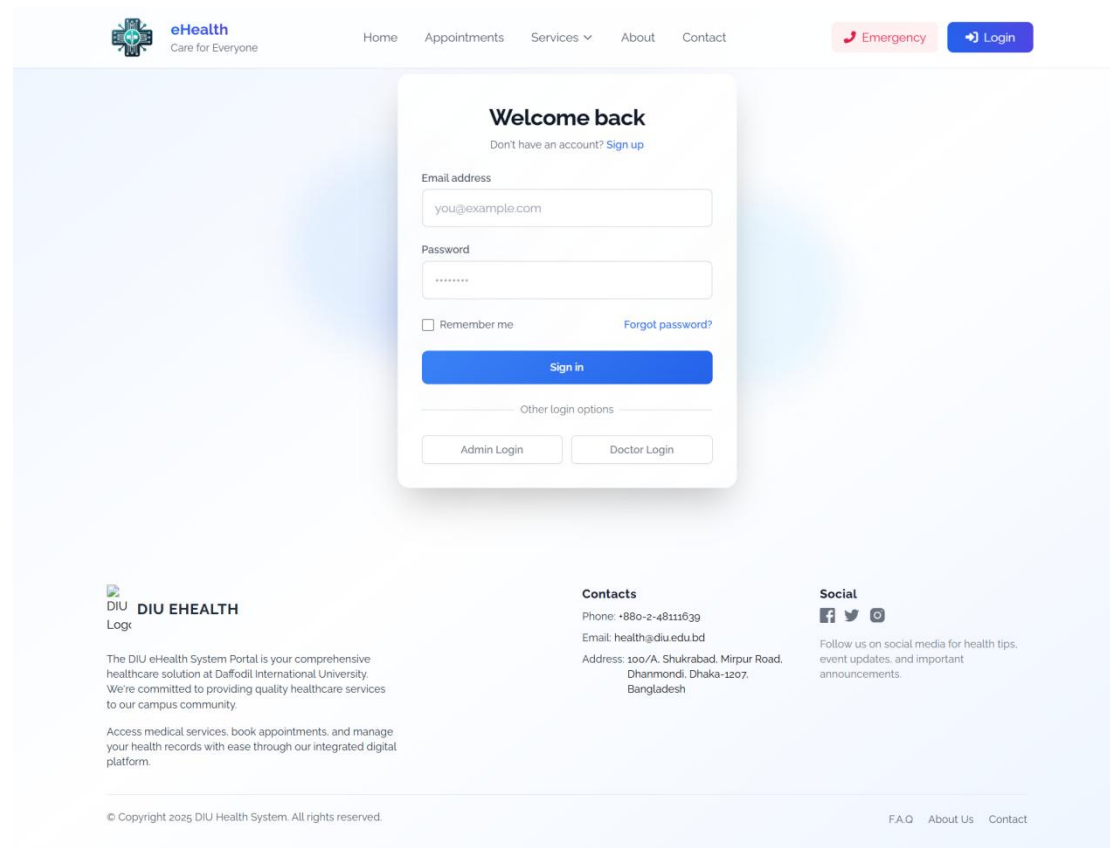


Figure 6.2.6 Authentication / Authorization

Figure 6.2.6: Login-Register Interface

Key features include:

- Admin, doctor and user can login
- User can register

## 6.2.7 Contact and Support

The contact and support interface allows users to reach out for help and provide feedback.

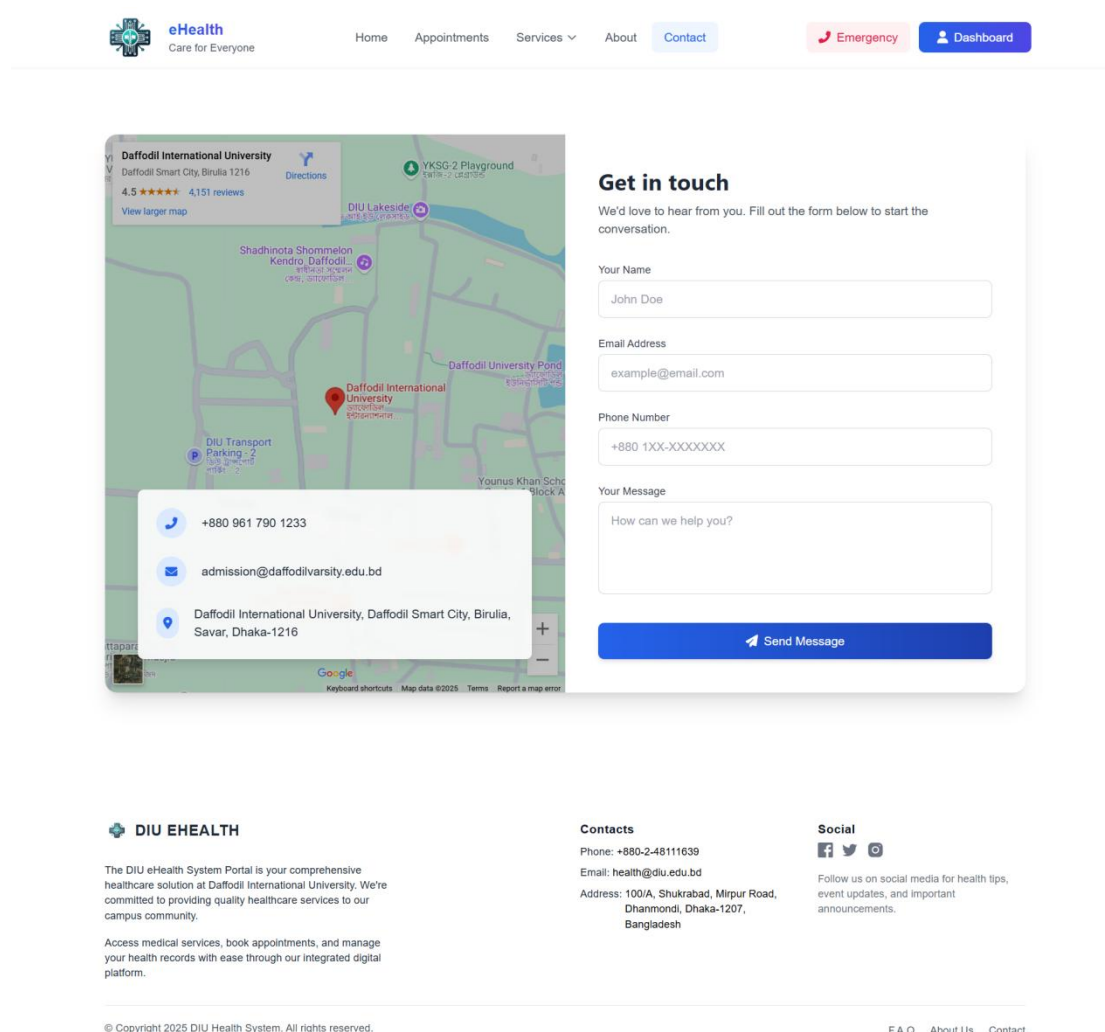


Figure 6.2.7 Contact us page

Figure 6.2.7: Contact and Support Interface  
Contact and support features include:

- Contact form for inquiries and feedback
- Live chat support
- Help center access
- System status and announcements

## 6.2.8 User Dashboard

The user dashboard provides patients with a comprehensive overview of their health information and access to various system features.

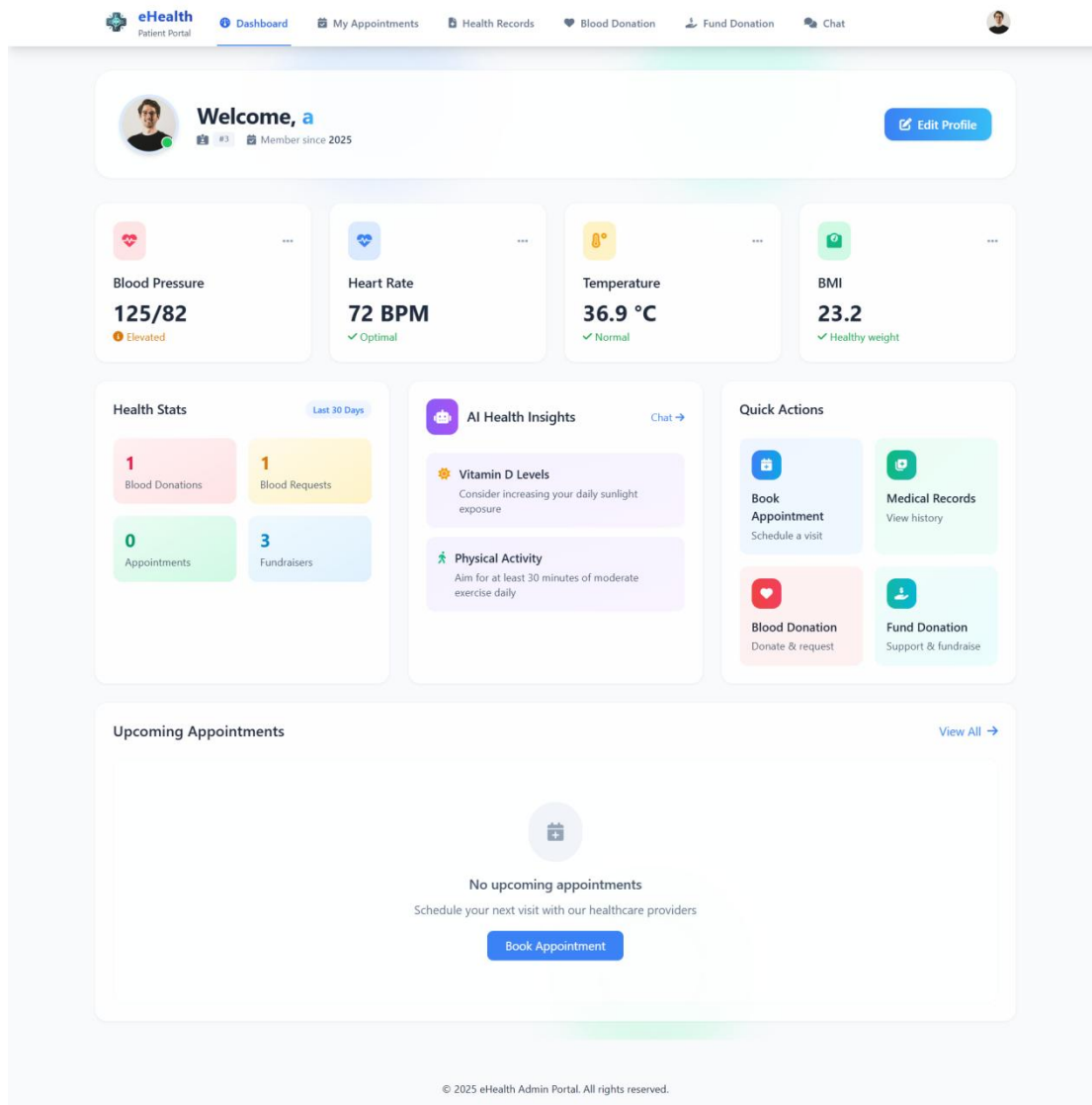


Figure 6.2.8 User dashboard page

Figure 6.2.8: Patient User Dashboard

Dashboard components include:

- Health metrics display (blood pressure, heart rate, temperature)

- Summary of upcoming appointments
- Quick access to medical records
- Prescription history
- Blood donation status and history
- Fund donation management
- Profile management options

## 6.2.9 User My Appointment

The user my appointment is designed to streamline patients daily workflows and appointment management tasks.

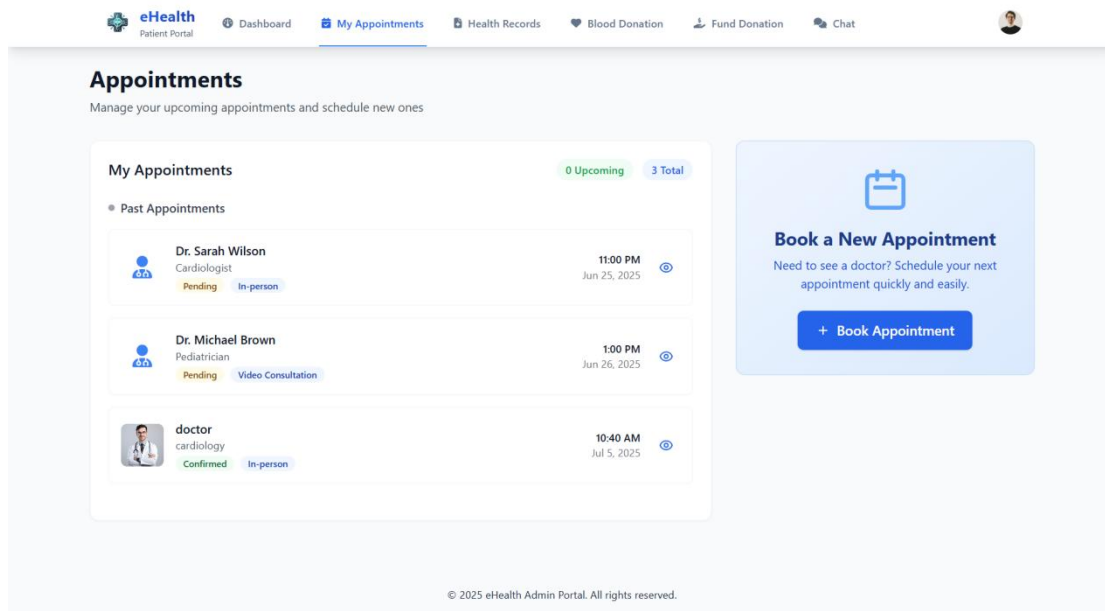


Figure 6.2.9 User appointment management page

Figure 6.2.9: User My APpointment Interface

Key features include:

- Today's appointment schedule
- Recent Appointment
- Appointment records management

## 6.2.10 User Health Record

The user health record is designed to streamline health record' daily workflows and record management tasks.

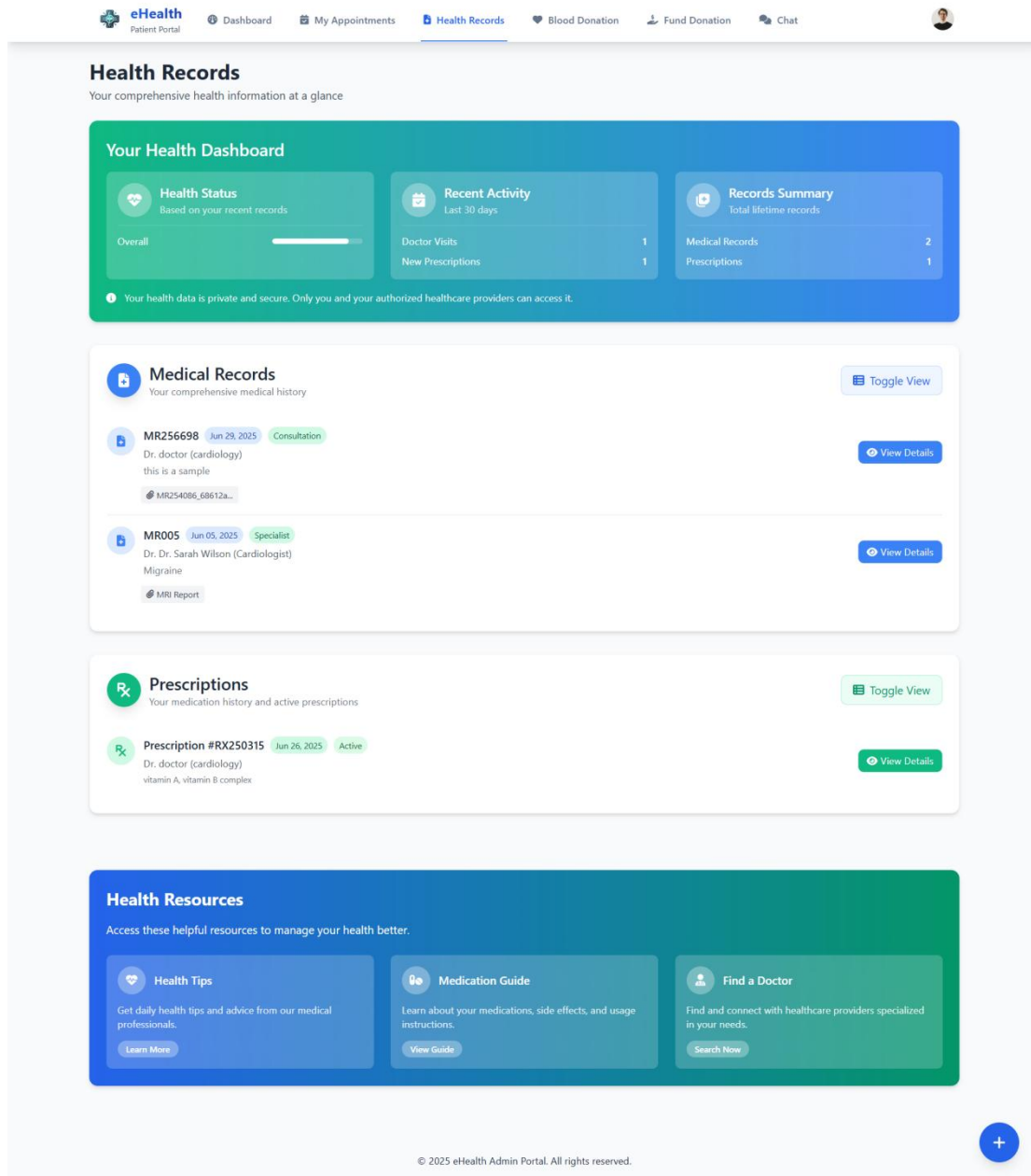


Figure 6.2.10 User health records management page

Figure 6.2.10: User health Records Interface

Key features include:

- Overview statistics (medical test, prescriptions)

- Recent medical test and prescription
- Patient see vital signs monitoring
- Medical records management

## 6.2.11 User Blood Donation

The user blood donation is designed to streamline donations and user donation management tasks.

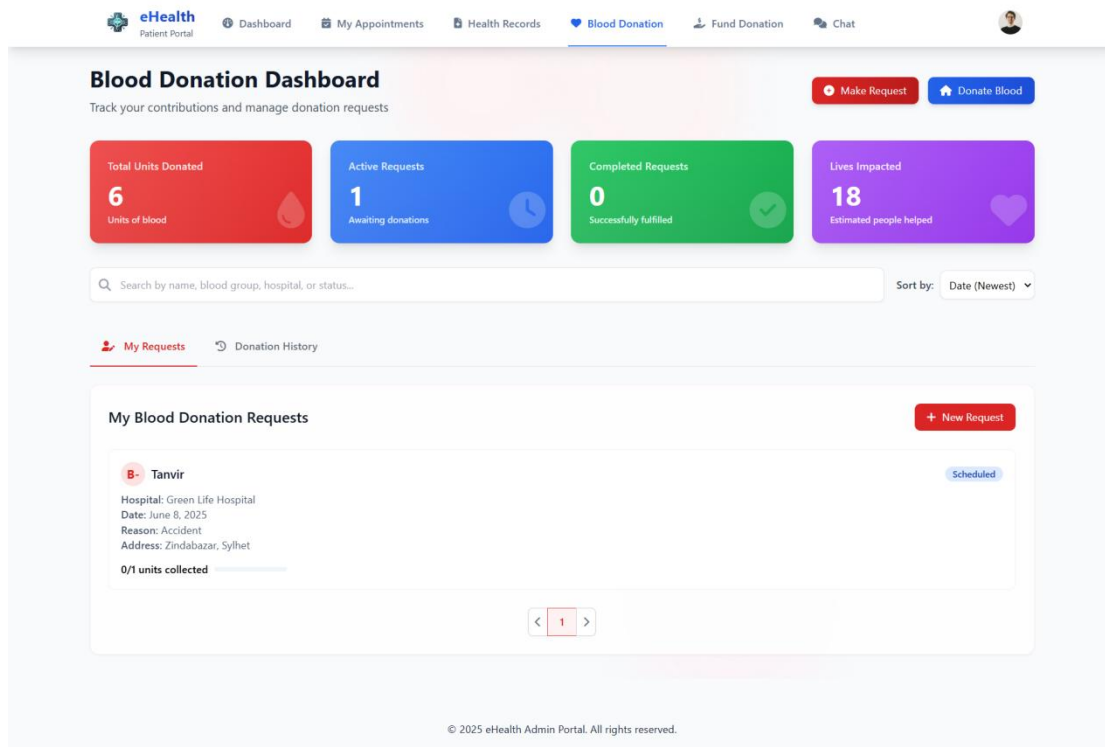


Figure 6.2.11 User Blood donation management page

Figure 6.2.11: User blood donation Interface

Key features include:

- Overview statistics (donations,request)
- Manage donation
- User see recent and historical donation

## 6.2.12 User Fund Donation

The user fund donation is designed to streamline donations and user donation management tasks.

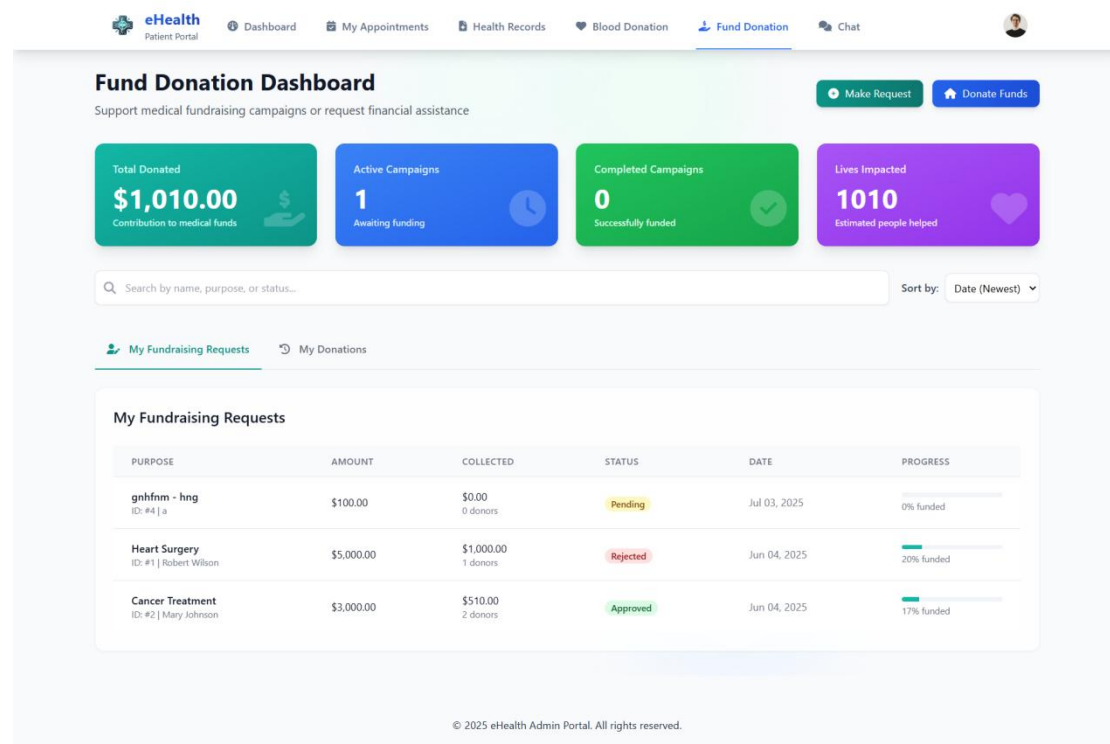


Figure 6.2.12 User fund donation management page

Figure 6.2.12: User Fund Donation Interface

Key features include:

- Overview statistics (donations,request)
- Manage donation
- User see recent and historical donation

## 6.2.13 User Profile

The user fund profile is designed to streamline profile details and user profile management tasks.

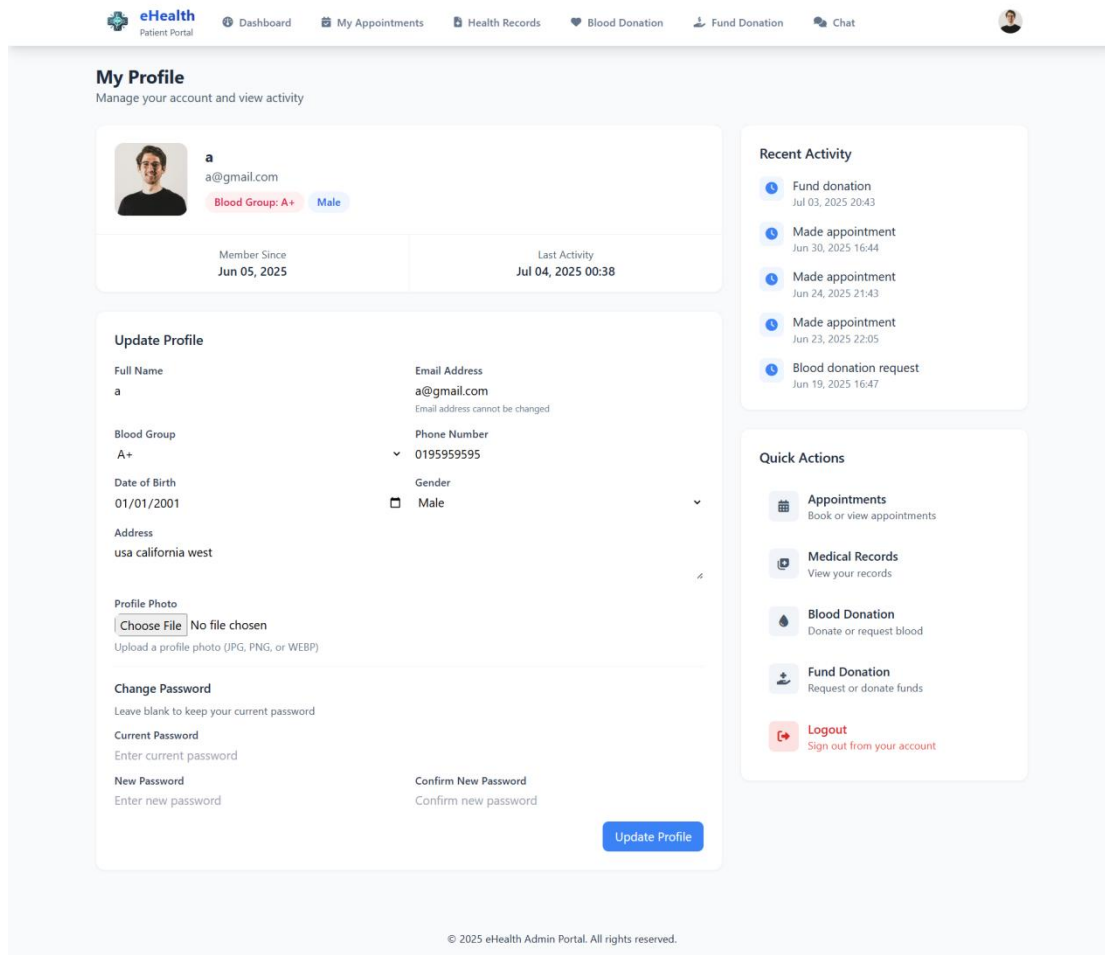


Figure 6.2.13 User Profile page

Figure 6.2.13: User Profile Interface

Key features include:

- Manage profile

## 6.2.14 Doctor Dashboard

The doctor dashboard is designed to streamline healthcare providers' daily workflows and patient management tasks.

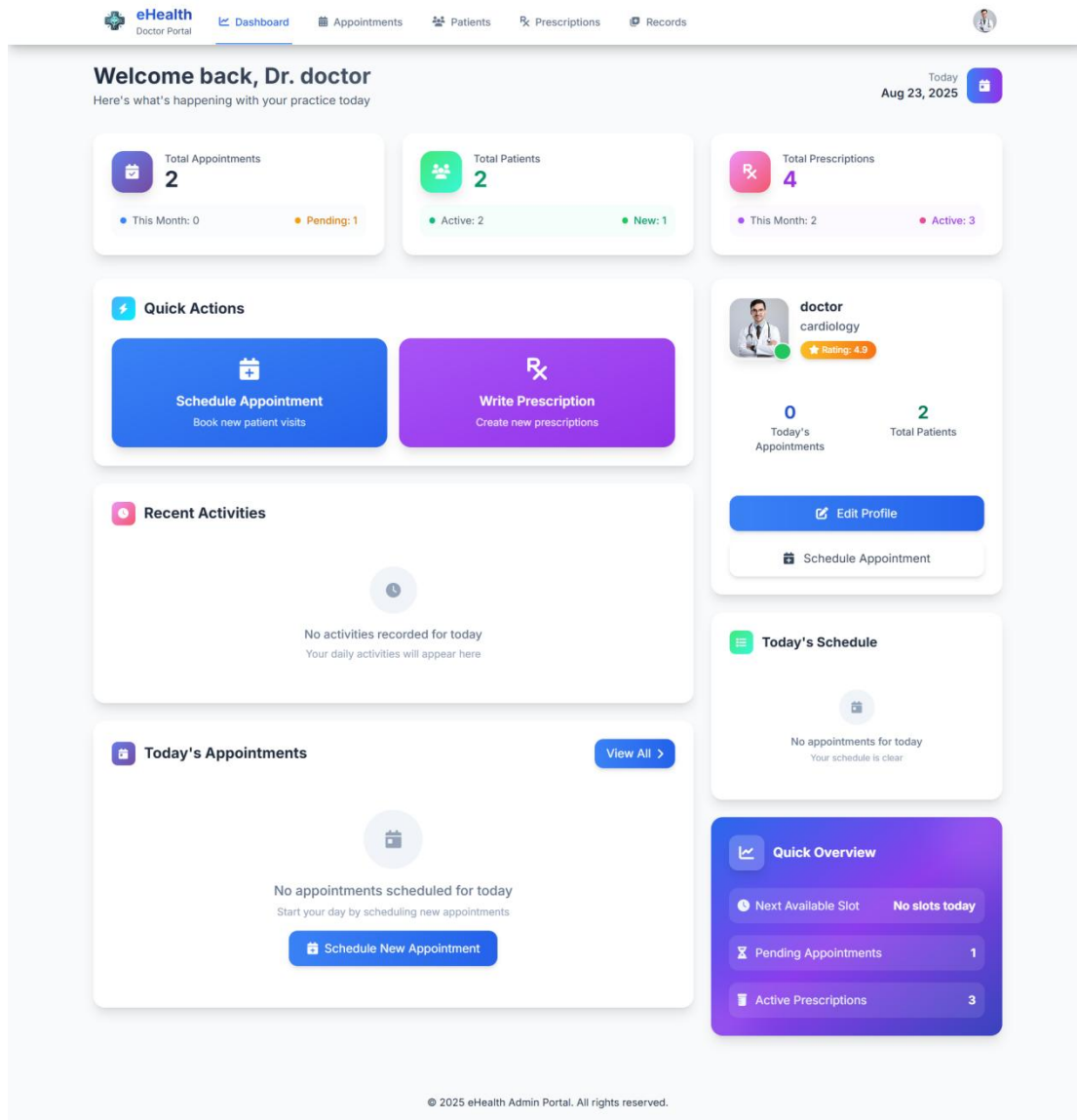


Figure 6.2.14 Doctor dashboard

Figure 6.2.14: Doctor Dashboard Interface

Key features of the doctor dashboard include:

- Overview statistics (total patients, appointments, prescriptions)
- Today's appointment schedule

- Quick actions menu (schedule appointment, write prescription)
- Recent patient activities
- Patient vital signs monitoring
- Medical records management

## 6.2.15 Doctor Appointment

The doctor appointment is designed to streamline healthcare providers' daily workflows and patient appointment management tasks.

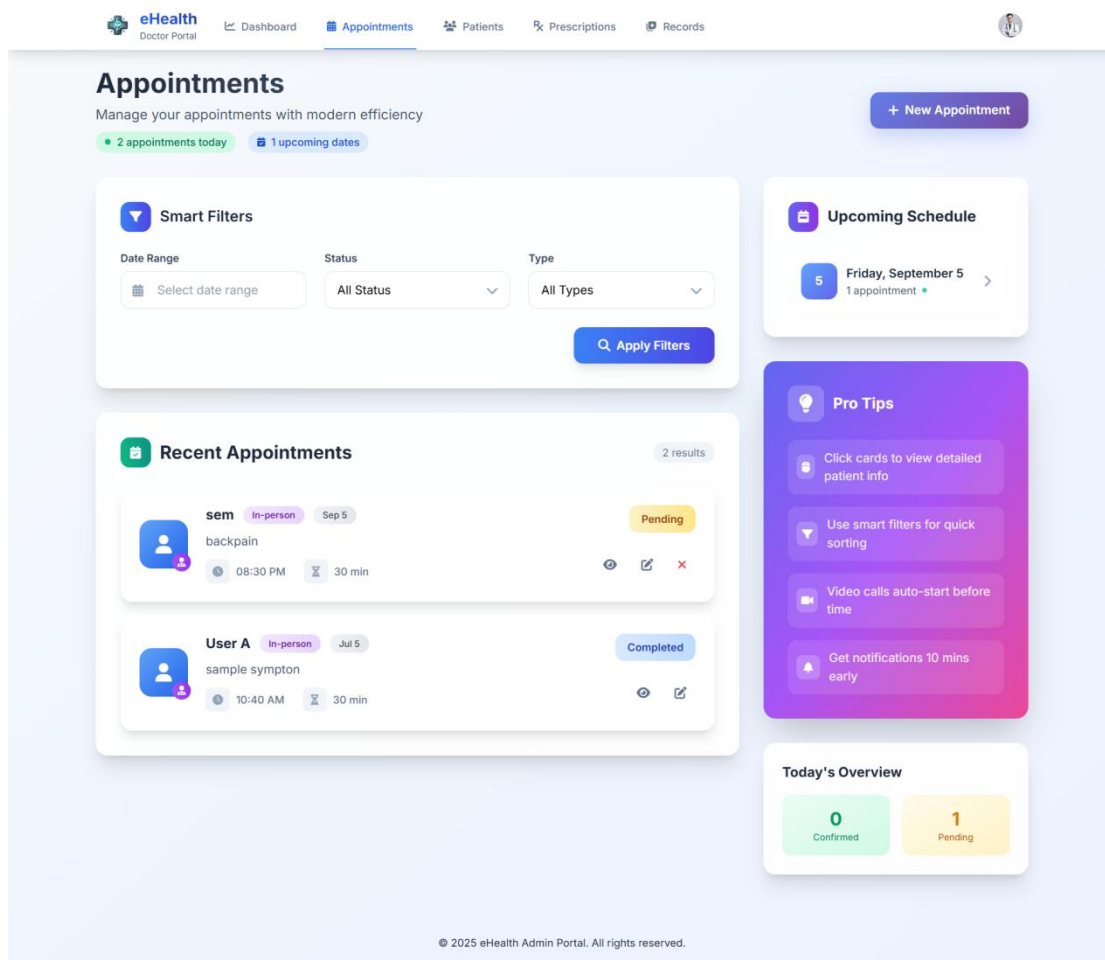


Figure 6.2.15 Doctor appointment

Figure 6.2.15: Doctor Appointment Interface

Key features of the doctor dashboard include:

- Today's appointment schedule
- Quick actions menu (schedule appointment)
- Appointment management

## 6.2.16 Doctor Patient's

The doctor patient's is designed to streamline healthcare providers' daily workflows and patient management tasks.

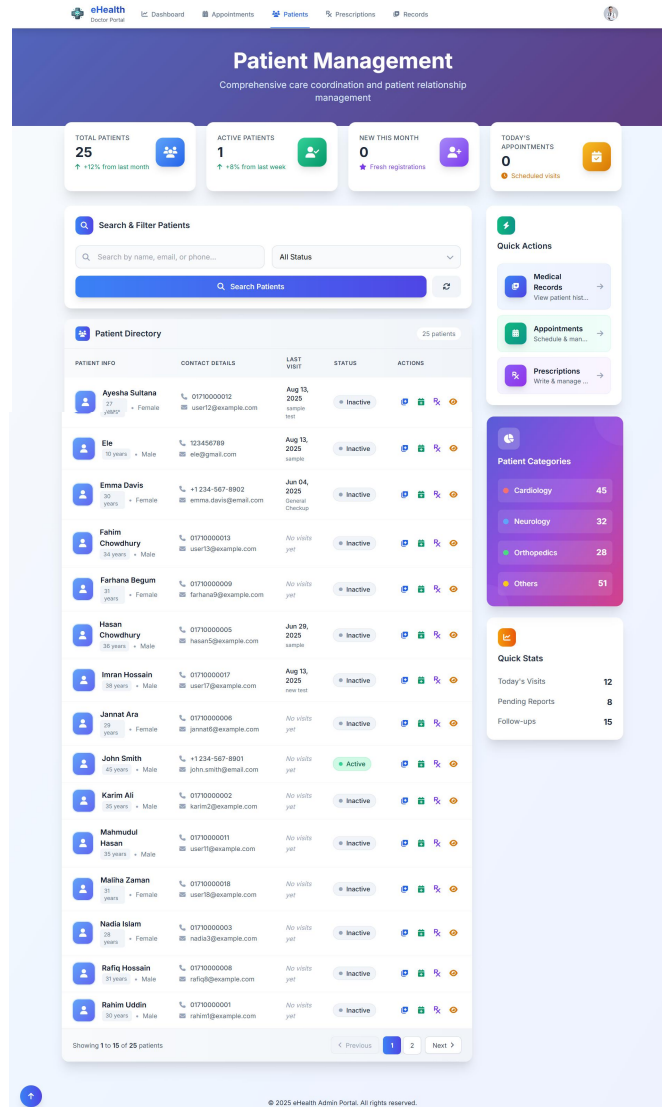


Figure 6.2.16 Doctor patients management page

### Figure 6.2.16: Doctor Patients Interface

Key features of the doctor dashboard include:

- Patients list
- Quick actions (make prescription, view details recods)
- Patients management

## 6.2.17 Doctor Prescription

The doctor Prescription is designed to streamline healthcare providers' daily workflows and patient prescription management tasks.

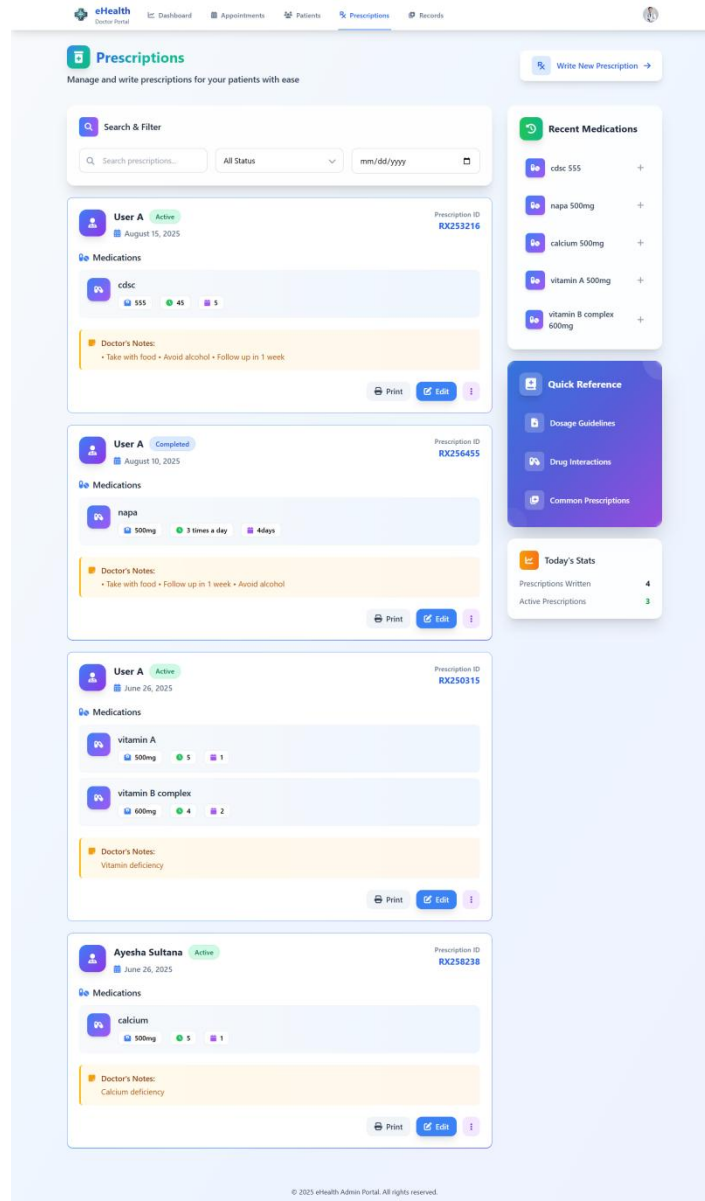


Figure 6.2.17 Doctor prescription management page

Figure 6.2.17: Doctor Prescription Interface

Key features of the doctor dashboard include:

- Quick actions (prescription create, view, edit)
- Patients prescription management

## 6.2.18 Doctor Medical Record

The doctor medical record is designed to streamline healthcare providers' daily workflows and patient medical record management tasks.

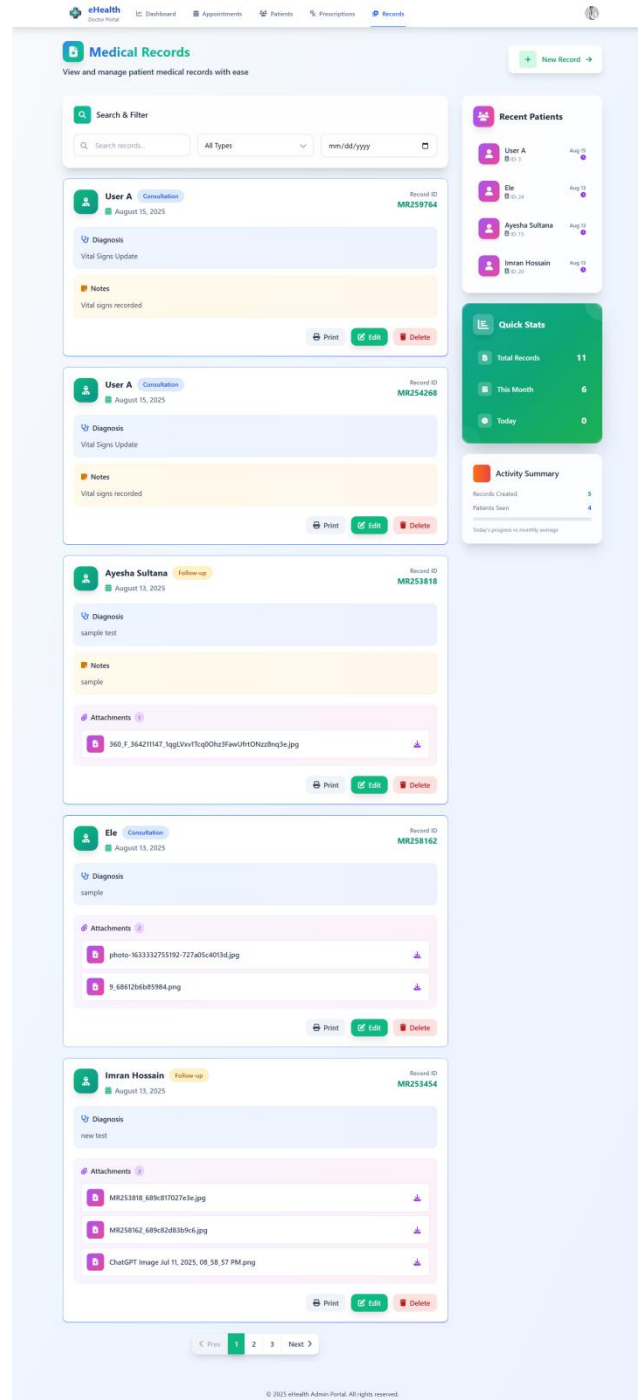


Figure 6.2.18 Doctor user medical record management page

Figure 6.2.18: Doctor Medical Record Interface  
Key features of the doctor dashboard include:

- Quick actions (medical record create, view, edit)
- Patients medical record management

## 6.2.19 Doctor Profile

The Doctor profile is designed to streamline profile details and doctor profile management tasks.

The screenshot displays the 'My Profile' page in the eHealth Doctor Portal. The page is organized into several sections:

- Header:** Includes the eHealth logo, navigation links for Dashboard, Appointments, Patients, Prescriptions, and Records, and a user profile icon.
- My Profile:** A summary section with a profile picture, name 'doctor', email 'doctor@example.com', specialization 'Cardiology', and license number 'MED123456'. Below this, it shows 'Experience: 6', 'Member Since: Jun 25, 2025', and 'Schedule: Mon, Tue, Wed, Thu, Sat, Sun (08:14 PM - 04:14 PM)'.
- Update Profile:** A form section with a note: 'Note: Only contact info, experience, about, and photo are editable. Name, email, specialization, and license are admin-only.' It contains fields for:
  - Full Name (non-editable): doctor
  - Email Address (non-editable): doctor@example.com
  - Specialization (non-editable): cardiology
  - License Number (non-editable): MED123456
  - Phone Number (editable): 0123456789
  - Experience (years) (editable): 6
  - About Me (editable): doctors
- Profile Photo:** A section with a 'Choose File' button and 'No file chosen' status.
- Change Password (editable, optional):** A section with fields for 'Current Password', 'New Password', and 'Confirm New Password'.
- Recent Activity:** A list of recent actions:
  - Updated appointment (Jul 01, 2025 00:34)
  - Added medical record (Jun 29, 2025 18:39)
  - Added medical record (Jun 29, 2025 17:57)
  - Created prescription (Jun 26, 2025 00:00)
- Quick Actions:** A list of shortcuts:
  - Settings (Account preferences)
  - Schedule (View appointments)
  - Records (Patient records)
  - Logout (End session)

At the bottom of the page, there is a copyright notice: '© 2025 eHealth Admin Portal. All rights reserved.'

Figure 6.2.19 Doctor profile

Figure 6.2.19: doctor Profile Interface  
Key features of the doctor dashboard include:

- Manage profile

## 6.2.20 Admin Dashboard

The admin dashboard provides system administrators with comprehensive control and monitoring capabilities.

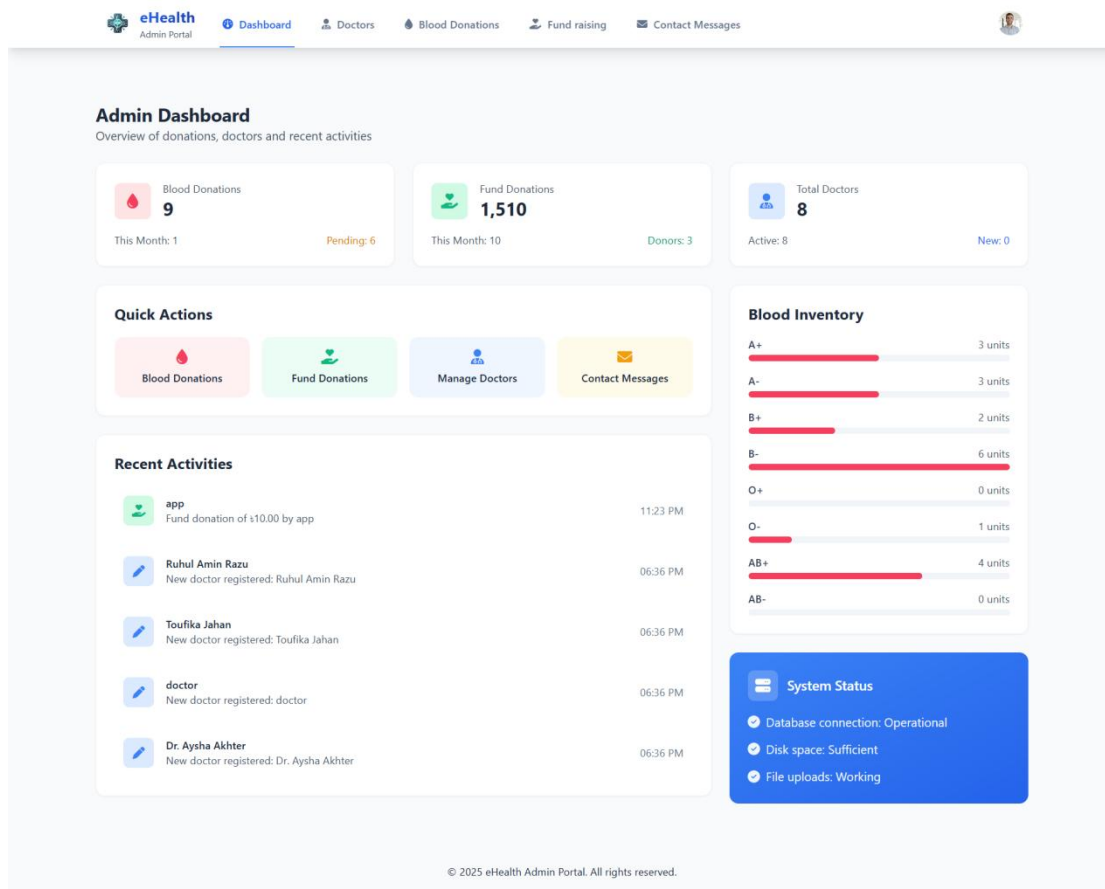


Figure 6.2.20 Admin dashboard

Figure 6.2.20: Administrator Dashboard

Admin dashboard features include:

- System statistics overview
- Doctor management tools
- Blood donation tracking
- Fund donation monitoring

- Contact form submissions
- System user management

## 6.2.21 Admin Doctors

The admin doctors provides system administrators with comprehensive control and monitoring capabilities.

**Doctor Management**  
Manage and monitor hospital doctors

[Add New Doctor](#)

Total Doctors: 8 | Active Doctors: 8 | Specialties: 5 | Avg. Rating: 0

Specialty: All Specialties | Status: All Status | Experience: Any Experience | Search: Search doctors...

DOCTOR	CONTACT	SPECIALTY	STATUS	RATING	ACTIONS
<b>Dr. Sarah Wilson</b> Experience: 15+ years	dr.sarah@ehealth.edu License: MED123455	Cardiologist	Active	Not set	<a href="#">Edit</a> <a href="#">View</a>
<b>Dr. Michael Brown</b> Experience: 10	dr.michael@ehealth.edu License: MED123457	Pediatrician	Active	\$0.00	<a href="#">Edit</a> <a href="#">View</a>
<b>doctor</b> Experience: 6	doctor@example.com License: MED123456	cardiology	Active	\$500.00	<a href="#">Edit</a> <a href="#">View</a>
<b>Dr. Aysa Akhter</b> Experience: 4	License: MED1234561	general	Active	\$500.00	<a href="#">Edit</a> <a href="#">View</a>
<b>Sushanta Kumar Ghose</b> Experience: 4	physiotherapist@daffodilvarsity.edu.bd License: MED1234562	Physiotherapist	Active	\$500.00	<a href="#">Edit</a> <a href="#">View</a>
<b>Dr. Md. Fazlay Rabbi Rakib</b> Experience: 4	rakib@example.com License: MED1234563	general	Active	\$500.00	<a href="#">Edit</a> <a href="#">View</a>
<b>Ruhul Amin Razu</b> Experience: 4	ruhul.mc@daffodilvarsity.edu.bd License: MED1234564	general	Active	\$500.00	<a href="#">Edit</a> <a href="#">View</a>
<b>Toufika Jahan</b> Experience: 4	toufia.mc@daffodil.hospital License: MED1234565	general	Active	\$500.00	<a href="#">Edit</a> <a href="#">View</a>

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Figure 6.2.21 Admin doctors management page

Figure 6.2.21: Administrator Doctors  
Key features include:

- System statistics overview
- Doctor management tools

## 6.2.22 Admin Blood Donation

The admin blood donation provides system administrators with comprehensive control and monitoring capabilities.

**Blood Donations Management** + New Campaign

Total Units

**10**

Active Drives

**4**

Total Donors

**8**

Success Rate

**100%**




**Active Blood Donation Campaigns**  
Manage ongoing and upcoming blood donation drives

CAMPAIGN	BLOOD TYPES	PROGRESS	STATUS	ACTIONS
<b>app</b> hospital	O+	<div style="width: 0%;"></div> 0/1	Active	
<b>Rahim</b> Square Hospital	A+	<div style="width: 100%;"></div> 2/2	Active	
<b>Jannat</b> Delta Hospital	A-	<div style="width: 100%;"></div> 1/1	Completed	
<b>Tanvir</b> Square Hospital	B-	<div style="width: 100%;"></div> 2/2	Completed	
<b>Sabbir</b> Ibn Sina Hospital	B+	<div style="width: 100%;"></div> 1/1	Urgent	
<b>Hasan</b> Square Hospital	O-	<div style="width: 100%;"></div> 1/1	Completed	
<b>Jannat</b> Delta Hospital	A-	<div style="width: 0%;"></div> 0/2	Upcoming	
<b>Tanvir</b> Green Life Hospital	B-	<div style="width: 0%;"></div> 0/1	Scheduled	
<b>Nadia</b> Popular Diagnostic	AB+	<div style="width: 100%;"></div> 3/3	Active	

< 1 >

**Recent Donors**  
Latest blood donations and donor information

DONOR	BLOOD TYPE	EMAIL	CONTACT	LAST DONATION	TOTAL DONATIONS
<b>a</b> ID: 3	A+	a@gmail.com	0195959595	2025-07-01	6
<b>John Smith</b> ID: 1	O+	john.smith@email.com	+1 234-567-8901	2025-06-18	1
<b>Nadia Islam</b> ID: 6	O-	nadia3@example.com	0171000003	2025-06-15	3
<b>Sumaiya Akter</b> ID: 7	AB+	sumaiya4@example.com	0171000004	2025-06-14	3
<b>Hasan Chowdhury</b> ID: 8	O+	hasan5@example.com	0171000005	2025-06-13	1

 Karim Ali ID: 5	B+	karim2@example.com	0171000002	2025-06-08	1
 Rahim Uddin ID: 4	A+	rahim1@example.com	0171000001	2025-06-08	1
 Emma Davis ID: 2	O+	emma.davis@email.com	+1 234-567-8902	2025-06-07	1

< 1 >

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Figure 6.2.22 Admin users blood donations management page

Figure 6.2.22: Administrator Blood Donation  
Key features include:

- System statistics overview
- Blood donation tracking
- Blood donation management tools

## 6.2.23 Admin Fund Donation

The admin Fund donation provides system administrators with comprehensive control and monitoring capabilities.

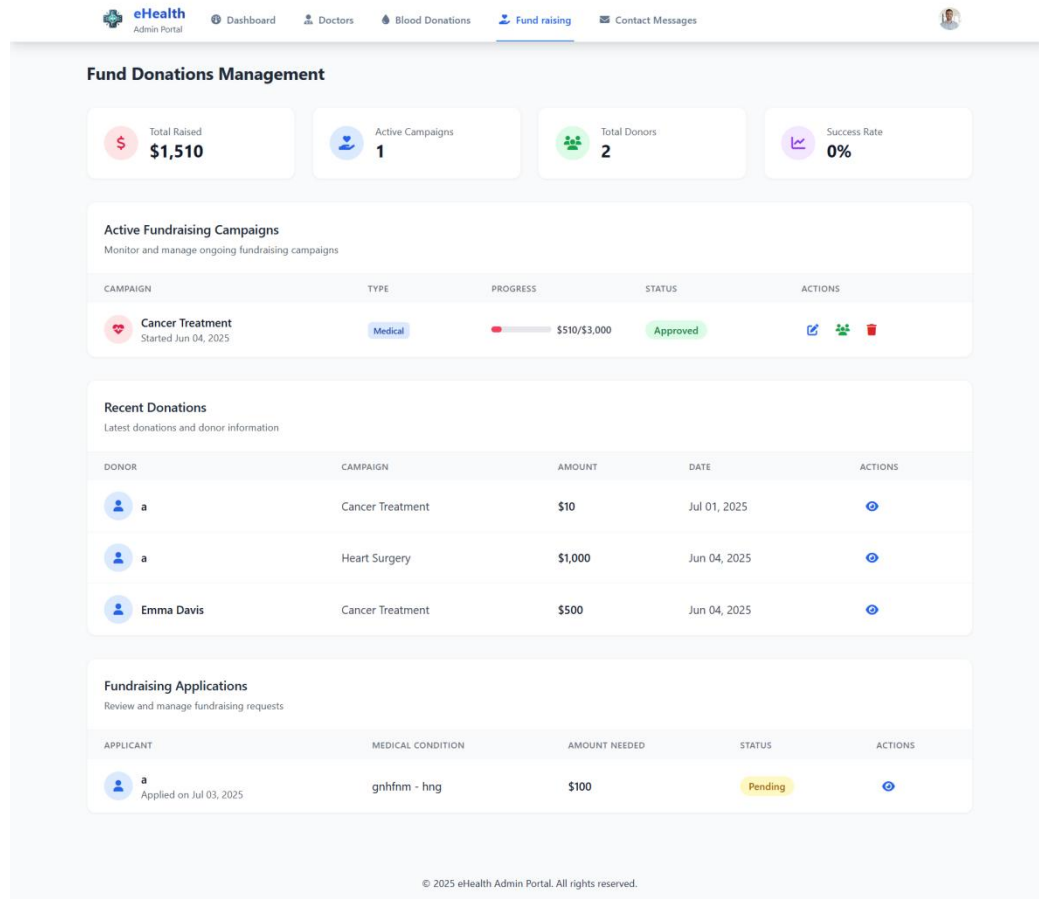


Figure 6.2.23 Admin user fund donations management page

Figure 6.2.23: Administrator Fund Donation

Key features include:

- System statistics overview
- Fund donation tracking
- Fund donation management tools

## 6.2.24 Admin Profile

The Admin profile is designed to streamline profile details and admin profile management tasks.

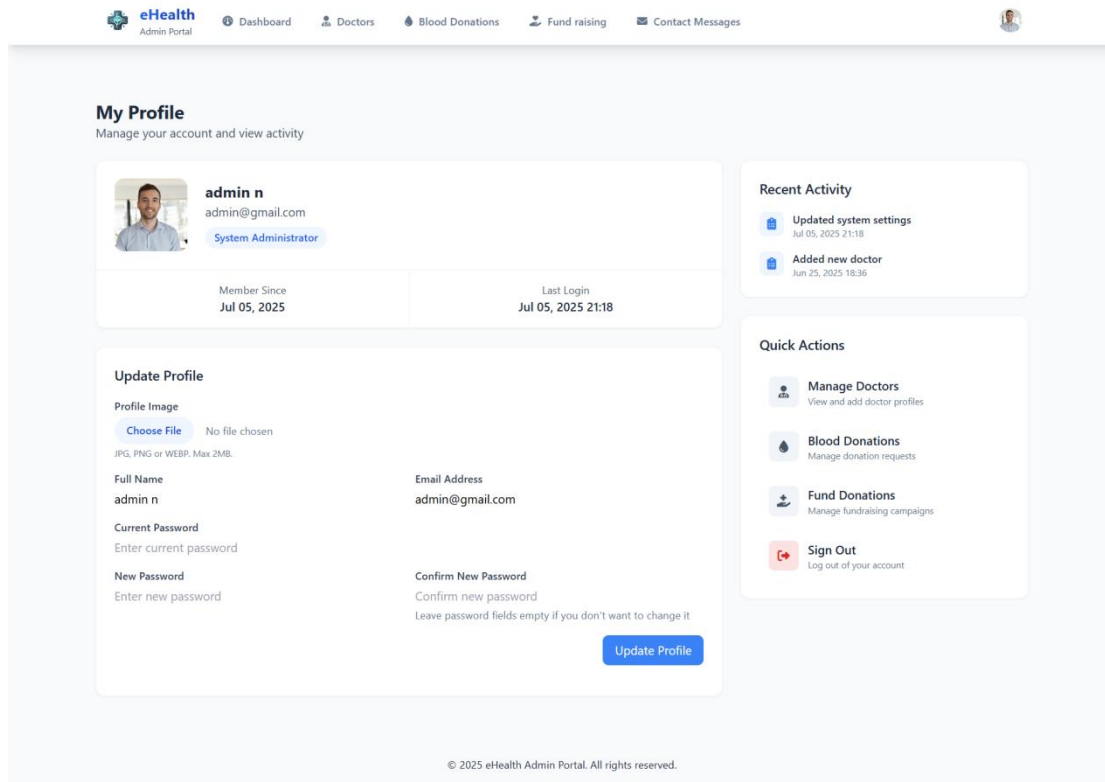


Figure 6.2.24 Admin profile

Figure 6.2.24: Admin Profile Interface

Key features include:

- Manage profile

## 6.3 Database System Details

### 6.3.1 Table Structures

Detailed description of the key database tables used in the system:

#### Users Table

```
CREATE TABLE `users` (  
  `id` int(11) NOT NULL AUTO_INCREMENT,  
  `name` varchar(100) NOT NULL,  
  `email` varchar(100) NOT NULL,  
  `password` varchar(255) NOT NULL,  
  `phone` varchar(20) DEFAULT NULL,  
  `address` text DEFAULT NULL,  
  `dob` date DEFAULT NULL,  
  `gender` enum('Male','Female','Other') DEFAULT NULL,  
  `blood_group` enum('A+','A-','B+','B-','AB+','AB-','O+','O-') DEFAULT NULL,  
  `profile_image` varchar(255) DEFAULT NULL,  
  `created_at` timestamp NOT NULL DEFAULT current_timestamp(),  
  PRIMARY KEY (`id`),  
  UNIQUE KEY `email` (`email`)  
)
```

#### Doctors Table

```
CREATE TABLE `doctors` (  
  `id` int(11) NOT NULL AUTO_INCREMENT,  
  `name` varchar(100) NOT NULL,  
  `email` varchar(100) NOT NULL,
```

```

`password` varchar(255) NOT NULL,
`specialization` varchar(100) NOT NULL,
`qualification` varchar(255) NOT NULL,
`experience` int(11) DEFAULT NULL,
`phone` varchar(20) DEFAULT NULL,
`address` text DEFAULT NULL,
`profile_image` varchar(255) DEFAULT NULL,
`status` enum('Active','Inactive','Pending') DEFAULT 'Pending',
`created_at` timestamp NOT NULL DEFAULT current_timestamp(),
PRIMARY KEY (`id`),
UNIQUE KEY `email` (`email`)
)

```

## Appointments Table

```

CREATE TABLE `appointments` (
  `id` int(11) NOT NULL AUTO_INCREMENT,
  `user_id` int(11) NOT NULL,
  `doctor_id` int(11) NOT NULL,
  `appointment_date` date NOT NULL,
  `appointment_time` time NOT NULL,
  `reason` text NOT NULL,
  `status` enum('Pending','Confirmed','Completed','Cancelled') DEFAULT 'Pending',
  `created_at` timestamp NOT NULL DEFAULT current_timestamp(),
  PRIMARY KEY (`id`),

```

```

KEY `user_id` (`user_id`),

KEY `doctor_id` (`doctor_id`),

CONSTRAINT `appointments_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users`
(`id`),

CONSTRAINT `appointments_ibfk_2` FOREIGN KEY (`doctor_id`) REFERENCES
`doctors` (`id`)

)

```

## Medical Records Table

```

CREATE TABLE `medical_records` (

`id` int(11) NOT NULL AUTO_INCREMENT,

`record_id` varchar(20) NOT NULL,

`user_id` int(11) NOT NULL,

`doctor_id` int(11) NOT NULL,

`diagnosis` text NOT NULL,

`treatment` text NOT NULL,

`notes` text DEFAULT NULL,

`attachment` varchar(255) DEFAULT NULL,

`created_at` timestamp NOT NULL DEFAULT current_timestamp(),

PRIMARY KEY (`id`),

UNIQUE KEY `record_id` (`record_id`),

KEY `user_id` (`user_id`),

KEY `doctor_id` (`doctor_id`),

CONSTRAINT `medical_records_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES
`users` (`id`),

CONSTRAINT `medical_records_ibfk_2` FOREIGN KEY (`doctor_id`) REFERENCES
`doctors` (`id`)

)

```

## Blood Donations Table

```
CREATE TABLE `blood_donations` (  
  `id` int(11) NOT NULL AUTO_INCREMENT,  
  `user_id` int(11) NOT NULL,  
  `blood_group` enum('A+', 'A-', 'B+', 'B-', 'AB+', 'AB-', 'O+', 'O-') NOT NULL,  
  `units` int(11) NOT NULL DEFAULT 1,  
  `donation_date` date NOT NULL,  
  `status` enum('Available', 'Used', 'Expired') DEFAULT 'Available',  
  `created_at` timestamp NOT NULL DEFAULT current_timestamp(),  
  PRIMARY KEY (`id`),  
  KEY `user_id` (`user_id`),  
  CONSTRAINT `blood_donations_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES  
  `users` (`id`)  
)
```

## Fund Donations Table

```
CREATE TABLE `fund_donations` (  
  `id` int(11) NOT NULL AUTO_INCREMENT,  
  `donor_name` varchar(100) NOT NULL,  
  `donor_email` varchar(100) NOT NULL,  
  `donor_phone` varchar(20) DEFAULT NULL,  
  `amount` decimal(10,2) NOT NULL,  
  `transaction_id` varchar(100) DEFAULT NULL,  
  `payment_method` varchar(50) DEFAULT NULL,  
  `purpose` text DEFAULT NULL,  
  `document` varchar(255) DEFAULT NULL,
```

```

`status` enum('Pending','Approved','Rejected') DEFAULT 'Pending',
`created_at` timestamp NOT NULL DEFAULT current_timestamp(),
PRIMARY KEY (`id`)
)

```

## 6.3.2 Relationships and Constraints

The DIU eHealth System database implements several foreign key constraints to maintain data integrity:

- Appointments table links to both users and doctors tables
- Medical records table links to both users and doctors tables
- Blood donations table links to the users table
- Prescriptions table links to appointments, users, and doctors tables

These relationships ensure that:

- Appointments can only be made with valid user and doctor IDs
- Medical records can only be created for valid patients by valid doctors
- Blood donations can only be recorded for registered users
- Prescriptions are always associated with valid appointments, patients, and doctors

## 6.3.3 Stored Procedures and Functions

Several stored procedures are implemented to handle complex operations:

### Get Available Blood Units

```

DELIMITER //

CREATE PROCEDURE GetAvailableBloodUnits()

BEGIN

    SELECT blood_group, SUM(units) as available_units

    FROM blood_donations

    WHERE status = 'Available'

    GROUP BY blood_group

    ORDER BY blood_group;

END //

DELIMITER ;

```

## Get Doctor Appointment Count

```
DELIMITER //

CREATE PROCEDURE GetDoctorAppointmentCount(IN doctor_id INT)

BEGIN

    SELECT status, COUNT(*) as count

    FROM appointments

    WHERE doctor_id = doctor_id

    GROUP BY status;

END //

DELIMITER ;
```

# Chapter 7: References

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