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**DiagnoTopia: Developing a Comprehensive
Hospital Management System for Patient Care**

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Dedications

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General Introduction

In recent years, the healthcare industry has undergone significant transformations driven by technological advancements and evolving patient needs. The development and implementation of hospital-patient management systems in Algeria have become essential in streamlining healthcare processes, improving patient care, and enhancing overall efficiency.

At the core of this innovation, hospital-patient management systems play a pivotal role in facilitating seamless communication and coordination among healthcare providers, patients, and administrative staff. These systems integrate various functionalities, including patient registration, appointment scheduling, electronic medical records (EMRs) management, billing and payment processing, and inventory management. By digitizing and automating these tasks, hospital-patient management systems enable healthcare facilities to optimize resource utilization, reduce administrative burdens, and enhance the quality of care delivery.

In today's healthcare landscape, patients expect convenient access to healthcare services, personalized care experiences, and timely communication with healthcare providers. Hospital-patient management systems empower patients with online appointment scheduling, secure access to their medical records, and real-time communication channels with healthcare professionals. These systems also support healthcare providers in delivering patient-centric care by providing comprehensive patient profiles, clinical decision support tools, and data analytics capabilities to inform evidence-based treatment decisions.

Despite the benefits offered by hospital-patient management systems, challenges persist in their implementation and adoption. Healthcare organizations must navigate complex regulatory requirements, interoperability issues, and data security concerns to successfully integrate these systems into their workflows. Additionally, ongoing training and support are crucial to ensuring that healthcare professionals and administrative staff effectively utilize these technologies to improve patient outcomes and operational efficiency.

In conclusion, hospital-patient management systems represent a significant advancement in modern healthcare delivery, offering unprecedented opportunities to enhance patient care, streamline operations, and drive organizational success. However, their successful implementation requires careful planning, robust infrastructure, and continuous innovation to meet the evolving needs of patients and healthcare providers in an increasingly digital healthcare ecosystem.

Problem Statement

In Algeria, patients face prolonged waiting times for medical appointments, particularly when they urgently need medical attention. This extended wait exacerbates their condition, causing distress and discomfort. Additionally, these delays lead to patient dissatisfaction and compromise the quality of healthcare delivery. Simultaneously, healthcare facilities struggle with managing appointments, medical records, documents, and invoicing processes due to increasing demands and complexities.

Traditional methods result in inefficiencies, hindering seamless patient care. Hence, there's an urgent need for an integrated IT solution to address long waiting times, streamline hospital management processes, and enhance overall operational efficiency in the Algerian healthcare system.

Objectives

The goal of our hospital management system is to provide a user-friendly and accessible platform called "**DiagnoTopia**." This system caters to various stakeholders (administrators, healthcare providers, patients, visitors) and is designed for healthcare facilities lacking IT support, seeking to enhance their management systems.

The primary objectives of this system are:

- Offer an intuitive and user-friendly interface, enabling easy navigation for users to manage appointments, access medical records, and handle administrative tasks efficiently.
- Provide a comprehensive range of features to support healthcare providers in managing patient care, including scheduling appointments, updating medical records, and generating invoices.
- Introduce personalized patient experiences by offering features such as appointment reminders, access to medical information, and feedback(Report) mechanisms.
- Implement data analytics capabilities to track patient outcomes, monitor resource utilization, and identify areas for improvement in hospital operations.

Thesis Outline

This thesis is structured into three chapters as follows:

- **Chapter 1:** Conducts a comparative study on various Hospital Management Systems.
- **Chapter 2:** Presents the analysis and detailed design of the hospital management system, constructing associated diagrams.
- **Chapter 3:** Introduces the development environment and the various tools used for implementing the web platform “DiagnoTopia” for hospital management.

We end our work with a general conclusion and some perspectives that could lead to future extensions of our system.

Chapter I :
Existing Systems Exploration

I.1 Introduction

Web applications have seen widespread adoption due to their accessibility across various devices and user-friendly interfaces. In recent years, hospital management systems have gained significant traction globally, with large hospitals utilizing comprehensive web applications for streamlined healthcare administration.

These systems facilitate various hospital functions, including patient appointments, medical records management, and administrative tasks.

Our study aims to conduct a detailed comparative analysis of existing hospital management systems, particularly focusing on a prominent web application used by large hospitals **outside Algeria**. By examining the features and functionalities of this system, we seek to gain valuable insights into best practices and identify potential enhancements for our healthcare facility.

I.2 Similar Systems

I.2.1 Sign In Scheduling: An Online Appointment Booking System

Year Established: 2021

Starting Price: \$38/Month

Pricing Model: Per User, Free Trial

Best For: Health sector

Uses: Wordpress

What is Sign In Scheduling ?

Sign In Scheduling is a versatile tool designed for appointment scheduling and online booking, compatible with WordPress through a user-friendly plugin.

It allows clients to independently schedule and manage appointments, reducing the need for manual booking and phone interruptions, thereby optimizing business operations.

The system significantly reduces no-shows with automated reminders sent via SMS and email, ensuring clients and staff stay informed about upcoming appointments, leading to smoother scheduling and improved customer service.

Additional features include a two-way client chat, seamless calendar synchronization with iCal, Google, and Outlook, and compatibility with over 500 other applications [1].

I.2.2 athenaOne:

Year Established: 2022

Pricing: Not Available

Best For: Health sector

What is athenaOne ?

athenaOne is a cloud-based medical software suite owned by an American healthcare company called AthenaHealth which integrates electronic health records (EHR), medical billing tools, revenue cycle management (RCM), and medical practice management.

athenaOne organizes the moment of care, performs administrative and quality services to ensure full payment, and tracks all physician orders so doctors can focus on what they do best. It helps doctors benefit from continuous access to the best practices of the nation's largest clinical network, the most up-to-date and extensive quality rules and industry guidelines, and 24/7 support [2].

I.2.3 Net Health:

Year Established: 2021

Pricing: Not Available

Best For: Health sector (physical therapy)

What is Net Health ?

Net Health is a comprehensive, cloud-based, all-in-one EMR solution for Rehab Therapists.

Net Health's suite of products provides physical therapy clinics with patient scheduling, billing, clinical documentation, analytics, reporting, patient engagement, and communication. Improve the patient experience, ensure therapists can efficiently create compliant documentation, and establish an important revenue stream for your clinic [3].

I.3 Comparative Table

The following table provides a comparison between the aforementioned systems and our "DiagnoTopia" system.




Feature	DiagnoTopia	Sign In Scheduling [2]	athenaOne [3]	Net Health [4]
Year Established	2024	2021 	2022 	2021 
Starting Price	Free	\$38/Month	Not Available	\$0/Month
Pricing Model	Free	Free Trial	Not Available	Not Available
Best For	Health sector	Health sector	Health sector	Physical Therapy
Appointment Scheduling	yes	yes	yes	yes
Medical Billing	yes	yes	yes	no
Medical Documentation	yes	no	yes	yes
Charts and Graphs	yes	yes	yes	yes
Communication Tool	yes	yes	no	no
Patient Engagement	yes	yes	yes	yes
Calendar Management	yes	yes	yes	yes

Table 1: Comparison of Hospital Management Systems.

The table above presents an analysis of various hospital management platforms based on several important criteria. In comparing these platforms, we examined the following elements:

- **Appointment Scheduling:** This feature allows patients to search for available appointment slots for a specific period. Patients can select a date for their appointment, and the platform will show the available slots during that period, making it easier to plan and book appointments according to their specific needs.
- **Medical Billing:** Detailed billing options that provide cost information. Clear billing procedures are essential to ensure a transparent and unambiguous patient experience. And in addition to make the process easier for healthcare providers.
- **Medical Documentation:** Comprehensive medical records and documentation are crucial. This data helps in making informed decisions during medical consultations and treatments.
- **Charts and Graphs:** Visualization tools such as charts and graphs help in the analysis and interpretation of medical data. These tools are essential for administrators to monitor hospital performance.
- **Communication Tools:** Tools that facilitate communication between patients and healthcare providers. These tools are essential for providing timely information and support to patients.
- **Patient Engagement:** Features that involve patients in their care process. Engaging patients can lead to better health outcomes and higher patient satisfaction.
- **Calendar Management:** Effective calendar management tools help in scheduling and managing appointments and other hospital activities efficiently.

Among the hospital management systems studied, it is noteworthy that all of them offer appointment scheduling options. Additionally, the majority provide medical billing, detailed medical documentation, and calendar management.

However, only a few systems offer communication tool feature. Moreover, not all systems allow for the patient engagement feature.

It is also observed that some international systems meet almost all needs except for patient engagement features. Our system, "**DiagnoTopia**," aims to complement these features by providing a comprehensive solution that includes all the essential functionalities and benefits for patients.

I.4 Conclusion

Thanks to this thorough comparative analysis, we have identified the gaps in existing hospital management systems. Armed with this understanding, we have embarked on developing a new, innovative system that comprehensively addresses several critical needs of this industry. Our goal was to bridge the observed gaps and provide a complete and enhanced solution for healthcare providers and patients.

Chapter II :

Analysis and Design

II.1 Introduction

In order to establish an effective, high-performance, and dependable hospital management system, it is imperative to adhere to a clearly outlined process. The journey commences with the identification and clarification of requirements, targeting both functional and non-functional aspects. These identified needs serve as the cornerstone for crafting the system in alignment with predetermined objectives.

By steadfastly following this methodical approach, we guarantee the creation of a hospital management system that meets operational efficiency and reliability expectations.

II.2 Needs Specification

In the world of software development, the success of a project relies heavily on a crucial yet often overlooked phase: Requirement Gathering. This initial stage acts as the foundation for the entire development life cycle, steering the course of the software and ultimately determining its success [4].

Once the preliminary study of the requirements is completed, it is necessary to determine the functionalities to be implemented in the new system. Here is an overview of the main functionalities that will be developed :

- **User Management** : This functionality allows managing user accounts, including doctors, nurses, receptionists, and patients. It includes user authentication, profile creation, management of personal information.

- **Appointment Management** : This functionality allows users to schedule appointments according to their medical needs. It includes real-time appointment availability, selection of dates and times, and appointment confirmation.

- **Medical Record Management** : This functionality manages information related to patients' medical records. It includes recording patient details, medical history, diagnoses, and treatments.

➤ **Medical Documents Management** : This functionality oversees the storage and management of various medical documents, including prescriptions, medical analyses, and medical imaging (such as X-rays and MRIs). It ensures secure access and retrieval of these documents as needed for patient care.

➤ **Department Management** : This functionality handles the organization and administration of hospital departments. It includes managing departmental staff, and coordination of patient care within each department.

➤ **Billing Management** : This functionality manages the creation, processing, and tracking of patient invoices for medical services rendered. It includes generating invoices, recording payments, and maintaining billing records for accurate financial management.

II.3 Requirements Specification

II.3.1 Functional Requirements

In a hospital management system, there are various stakeholders who interact with the system to carry out their specific tasks. Each stakeholder has distinct roles and functionalities allocated to them to ensure the seamless operation of the hospital management system and to provide an excellent user experience.

Detailed functions for each ‘Actor’ in the system :

1. Patient :

A. Account Creation :

The system will provide a filling form for patients to register.

B. Personal Information Update:

After the Login the patient can edit personal or password information as needed.

C. Book and Cancel Appointment :

The Patient can book one appointment per day and must wait for receptionist approval.

The Patient can cancel the appointment as needed.

D. Notification:

The patient will be notified in case the appointment changed (to reduce missed appointments) or in case of responding to his reports.

E. Provide Feedback(Report a problem):

The system will provide a report messages side for patient about a problem that he/she faced during the service.

2. Doctor :

A. Account Creation : (This process is carried out by the admin):

The Admin is responsible for entering the Doctor's Personal Information (The responsibility of registration for current actor).

The Admin is responsible for Setting up the identifier and password for secure access.

B. Personal Information Update:

After the Login the doctor can edit personal or password information as needed.

- *Doctors are aligned with the departments they are responsible for.*
- *Doctors of the same department can manage patients they are responsible for.*
- *The Doctor logs into the hospital management system using their credentials.*

C. Manage Medical Record:

The doctor can create new Medical Records.

The doctor can create view existing patient information and Old Medical Records.

-In case of patient not found, the doctor can Create new patient account (non user account, means that the patient can't access with this account, because it doesn't have the credential information).

D. Generate Medical Documents such as (Prescription, Imaging, Analysis):

Doctor can create Medical Document for Patient :

Doctor can view and update Old Patient Medical Document.

E. Schedule:

Doctors can view their Appointments Schedule (as : List view and Calender view).

3. Receptionist :

A. Account Creation : (This process is carried out by the admin)

The Admin is responsible for entering the Receptionist's Personal Information (The responsibility of registration for current actor).

The Admin is responsible for Setting up the identifier and password for secure access.

B. Personal Information Update:

After the Login the receptionist can edit personal or password information as needed.

C. Manage Appointments Schedule:

The receptionist can create(book) Appointments for a specific doctor and patients.

The receptionist can view Appointments Schedule for a specific doctor.

The receptionist can update doctor's Schedule.

The receptionist can cancel Appointment for patients.

The receptionist has the ability to Approved/Rejected/Pending Appointments.

The receptionist can print appointment for patients.

D. Generate Invoices:

The receptionist can generate patient Invoices.

The receptionist can view all patient Invoices.

In case of patient not found , the receptionist can Create new patient account (non user account, means that the patient can't access with this account, because it doesn't have the credential information).

4. Nurse:

A. Account Creation : (This process is carried out by the admin)

The Admin is responsible for entering the Nurse's Personal Information (The responsibility of registration for current actor).

The Admin is responsible for Setting up the identifier and password for secure access.

B. Personal Information Update:

After the Login the receptionist can edit personal or password information as needed.

C. Nurse can View and Print appointment schedule of the responsible doctor.

E. Nurse can View and Print Medical Record.

F. Nurse can View and Print Medical Document.

5. Administrator : (the system owner or an appointed individual)

A. Account Creation : (The Initial Setup by Developer)

The system developer is responsible for the initial setup of the system, including the creation of a default administrator account.

A unique identity and password for secure access will be set up by the developer.

B. Personal Information Update:

The Admin can update all his personal information .

C. Manage Department:

The Admin can Create, View, Update or Drop any department.

D. Manage Users(Roles) Accounts:

The Admin can Create, View, Update or Drop any user account.

E. Manage Appointment:

The Admin can Create, View, Update or Drop any appointment.

F. Manage Medical Record:

The Admin can Create, View, Update or Drop any medical record.

G. Manage Medical documents:

The Admin can Create, View, Update or Drop any type of medical document.

H. View statistics:

The Admin can view statistics in the hospital management system:

This includes accessing key data and information on the overall performance of the system, such as the number of appointments, revenue generated, number of patients, and available medical staff, etc.

II.3.2 Non-Functional Requirements

- **Security:** The system must ensure the confidentiality of patient information and prevent unauthorized access to sensitive data. It should implement robust protective measures to secure users' data and prevent all privacy breaches.
- **Simplicity(user-friendly):** The system's interfaces should be designed to be simple, readable, and easy to use.
- **Compatibility:** The system must be compatible with all web browsers available.

II.4 Design

System design is the process of developing an abstract model of a system to represent different perspectives of the system. This is done through UML diagrams. UML means Uniform Modelling Language and is a method of software program visualization through some graphical notation using specific shapes and diagrams in an orderly manner [5].

II.4.1 Identification of Actors

An actor represents an abstraction of a role played by external entities. The various actors in our hospital management system are : Patient, Doctor, Receptionist, Nurse, and Administrator and they are distinguished by the context diagram on the *Figure 1*.

A static context diagram provides a high-level overview of the system's boundaries and relationships without detailing internal processes.

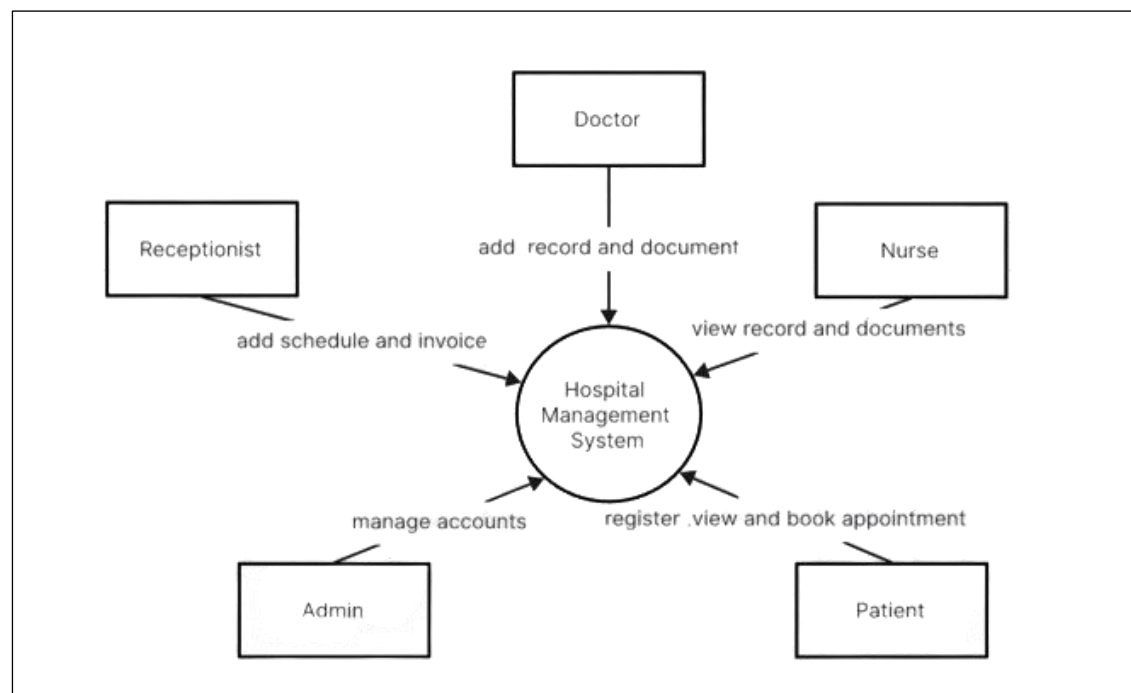


Figure 1 "Static Context Diagram"

II.4.2 Use Case Diagrams

A Use Case Diagram is a type of Unified Modeling Language (UML) diagram that represents the interaction between actors (users or external systems) and a system under consideration to accomplish specific goals. It provides a high-level view of the system's functionality by illustrating the various ways users can interact with it.[6].

➤ Patient :

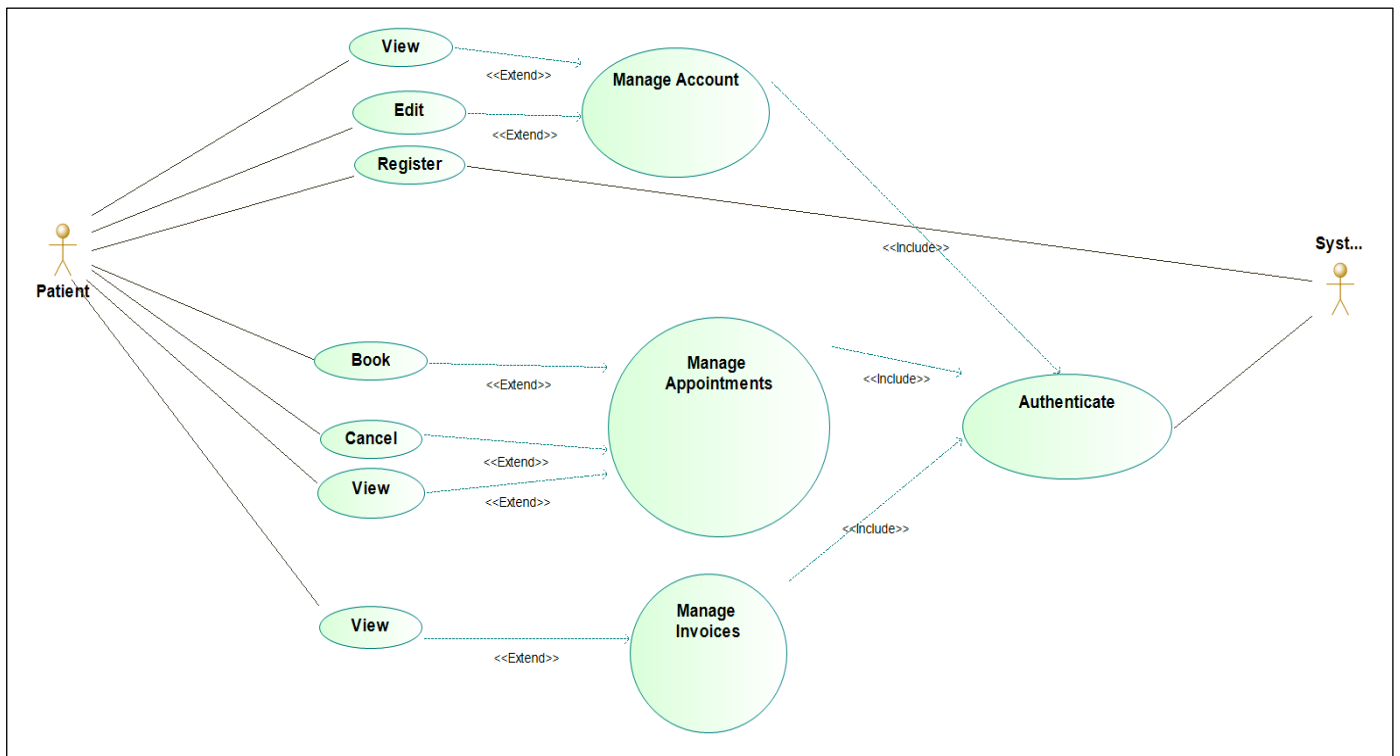


Figure 2 "Patient Use Case Diagram"

In Figure 2 the actor patient represents an entity that interacts with the system as a registered user and performs appointment booking. The patient represents individuals who regularly use the appointment booking service to meet their medical needs.

➤ Doctor :

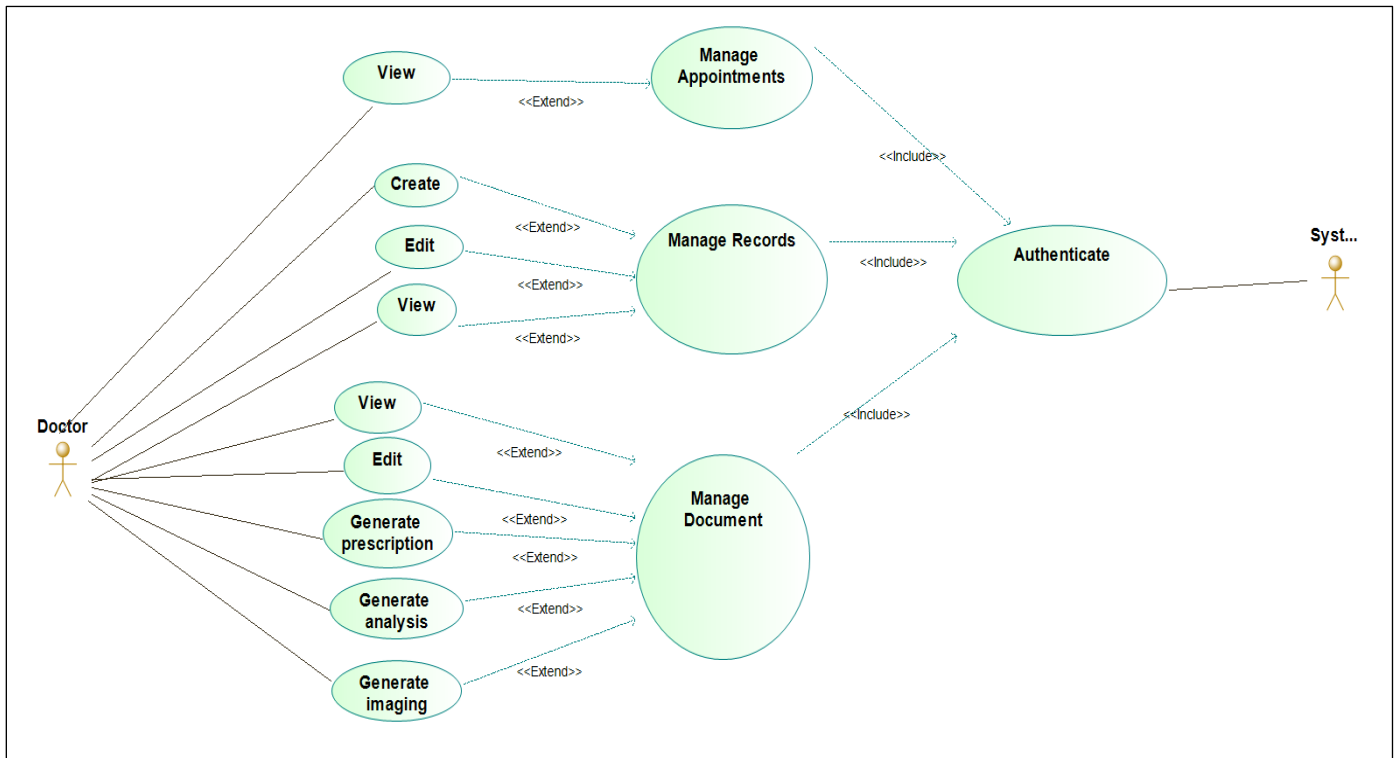


Figure 3 "Doctor Use Case Diagram"

In *Figure 3* the actor doctor is a staff member who works within the hospital. The doctor's role is to manage the daily medical operations, such as medical records, and medical documents, and view his schedule.

➤ Receptionist :

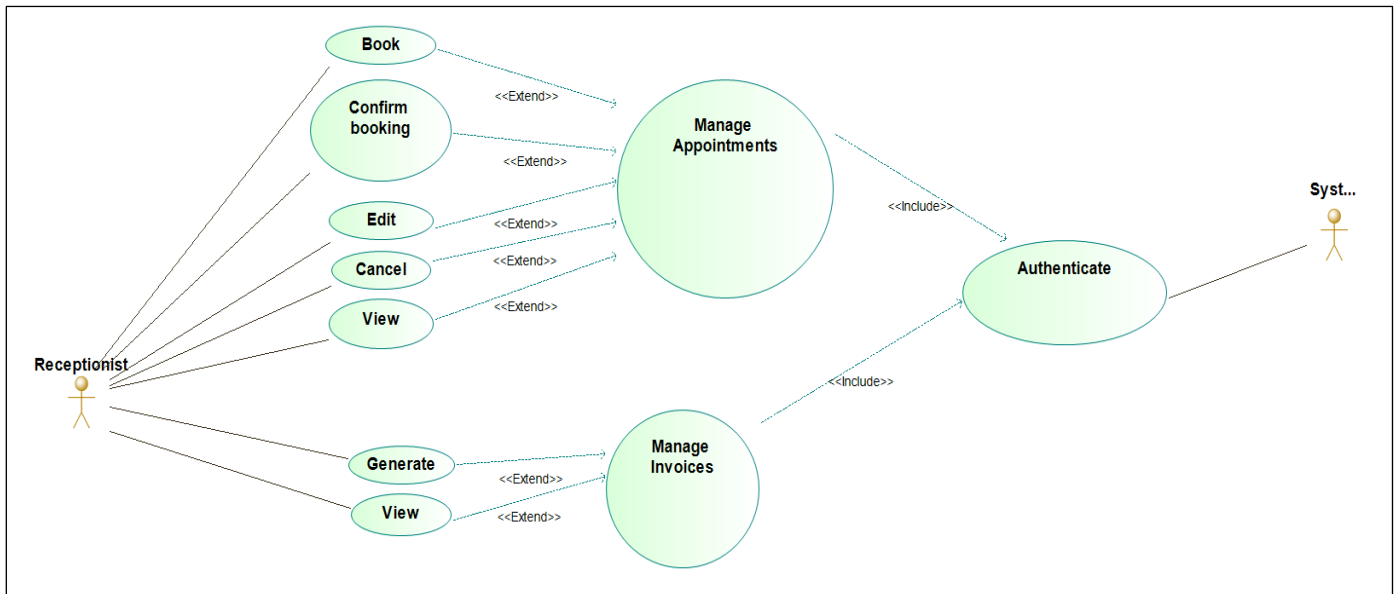


Figure 4 "Receptionist Use Case Diagram"

In *Figure 4* the actor receptionist is a staff member who works within the hospital. The receptionist's role is to manage the daily appointment and invoice operations.

➤ Nurse :

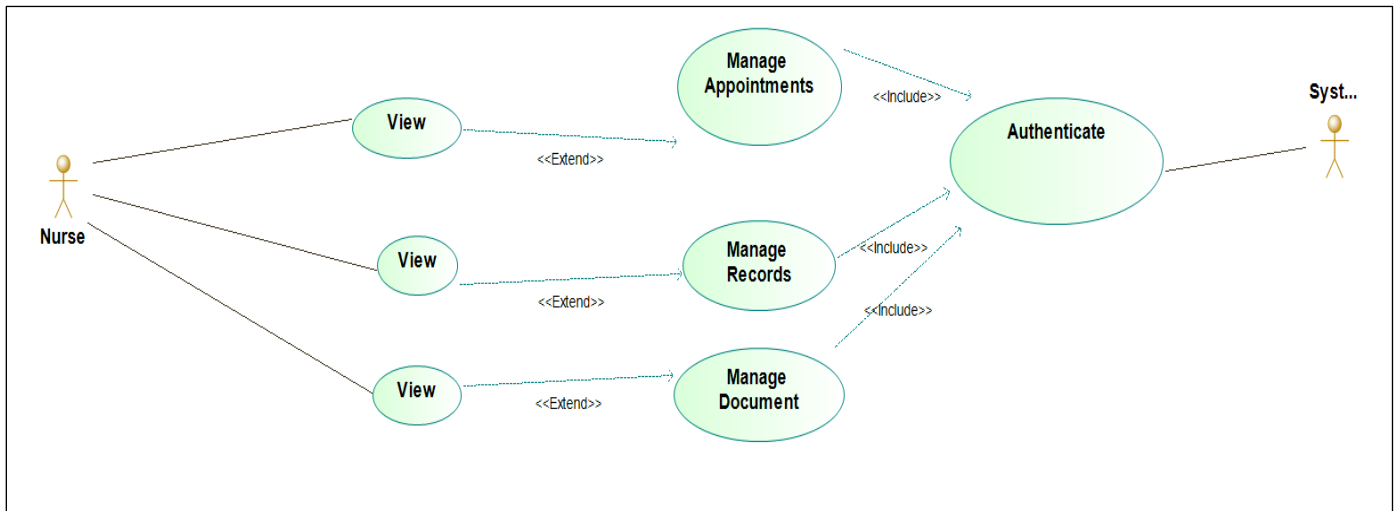


Figure 5 "Nurse Use Case Diagram"

In *Figure 5* the actor nurse is a staff member who works within the hospital. The Nurse's role is to view and inform the daily doctor's appointments and view medical records and medical documents.

➤ Admin :

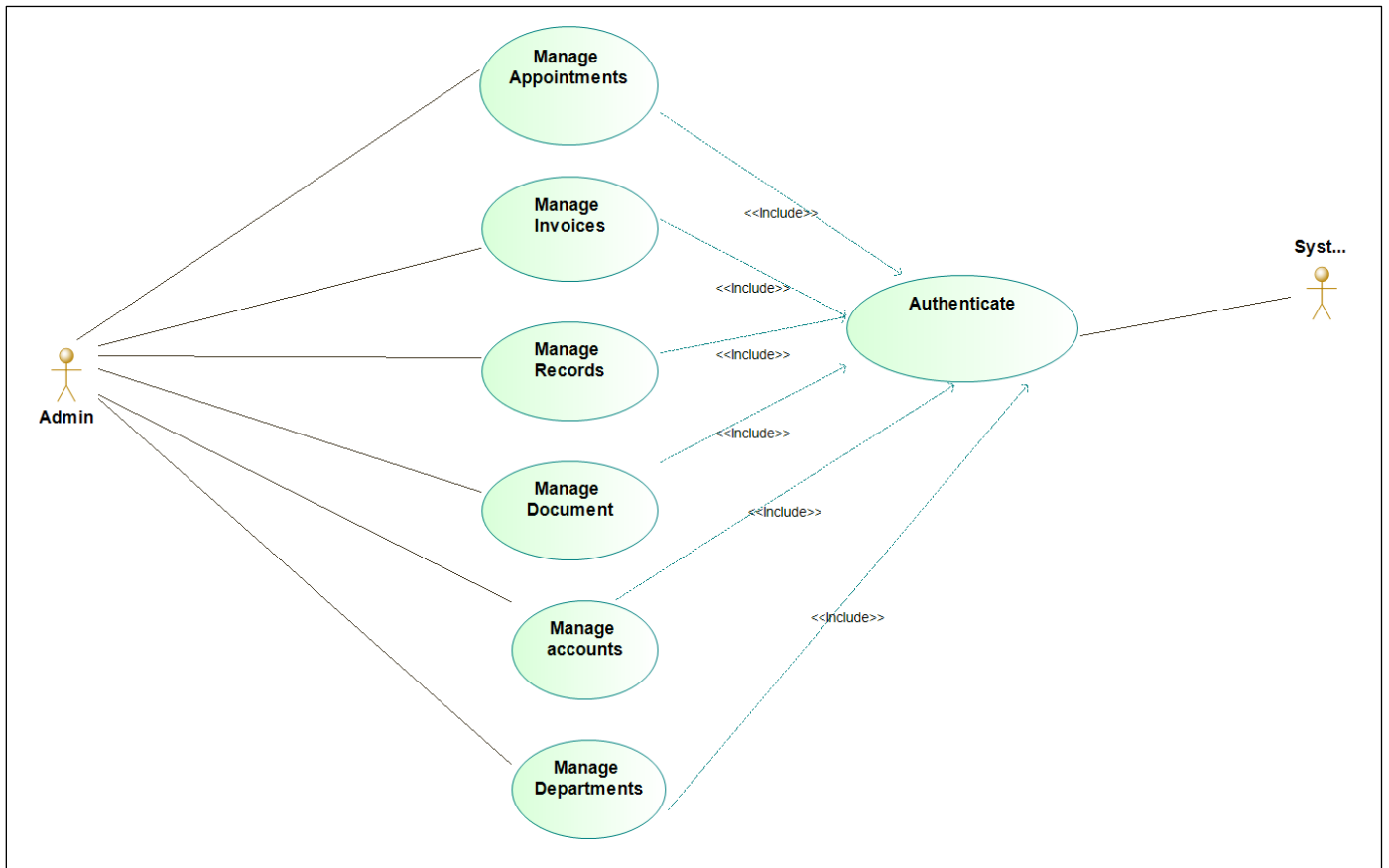


Figure 6 "Admin Use Case Diagram"

In *Figure 6* the actor administrator occupies the role of the manager for overseeing the entire system. The administrator can manage the departments, doctors, receptionists, nurses, and patients within the hospital management system. The administrator supervise the system's daily operations, ensuring that the rental processes run smoothly and efficiently.

➤ **Global Use Case :**

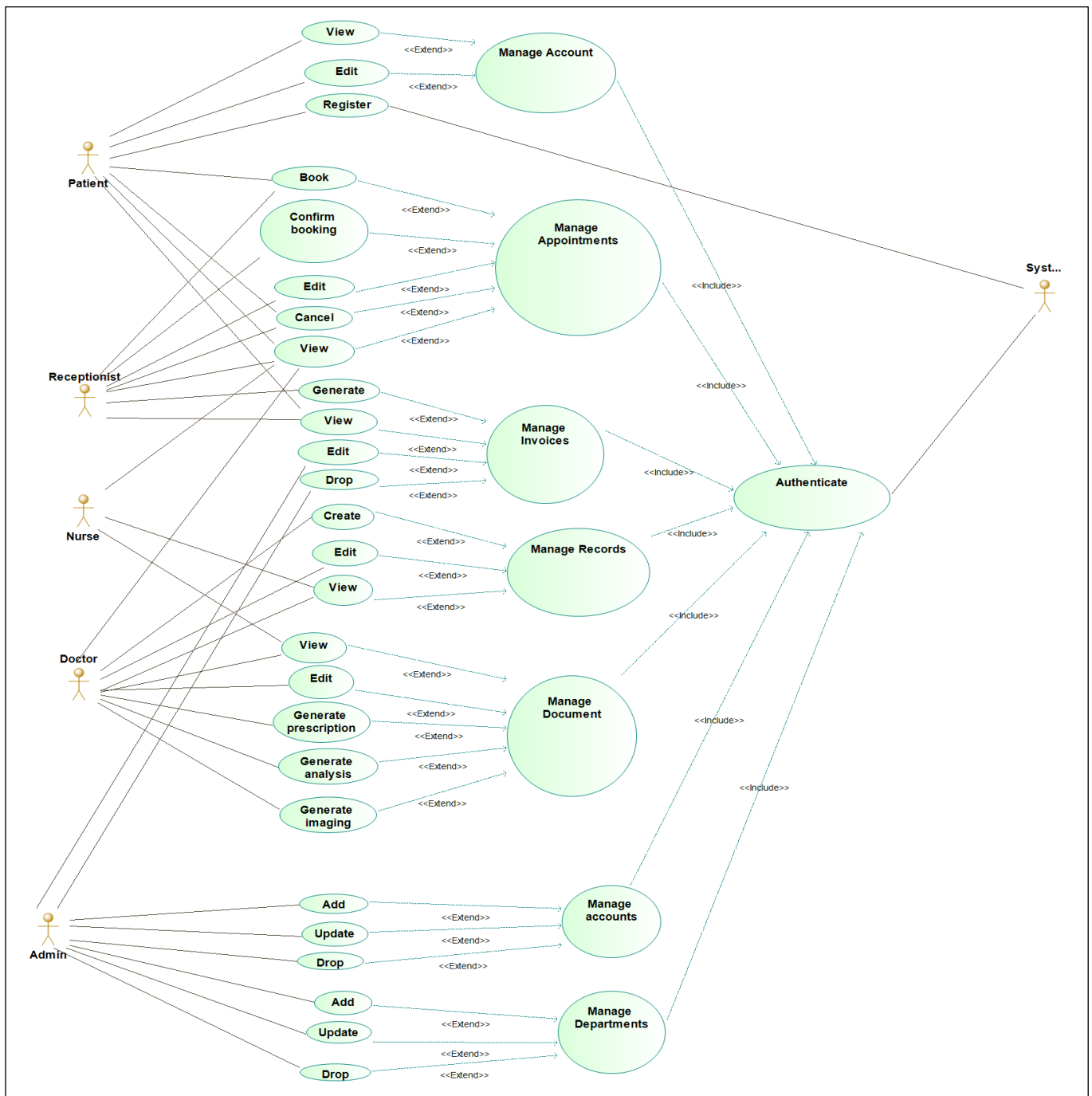


Figure 7 "Global Use Case Diagram"

In *Figure 7* the global use case diagram is an additional diagram that represents the overview of all interactions between all actors and the system.

II.4.3 Sequence Diagrams

In this section, we will present four detailed examples of sequence diagrams to illustrate the operation of our system. An interaction diagram is used to show the interactive behavior of a system. Since visualizing the interactions in a system can be difficult, we use different types of interaction diagrams to capture various features and aspects of interaction in a system [7].

II.4.3.1 Sequence Diagram for 'Authenticate'

This sequence diagram visualizes the chronological flow of actions and information exchanges between the user and the system during Authentication(Login). It highlights the various steps of the process, from the user inputting information to redirecting to the home page.

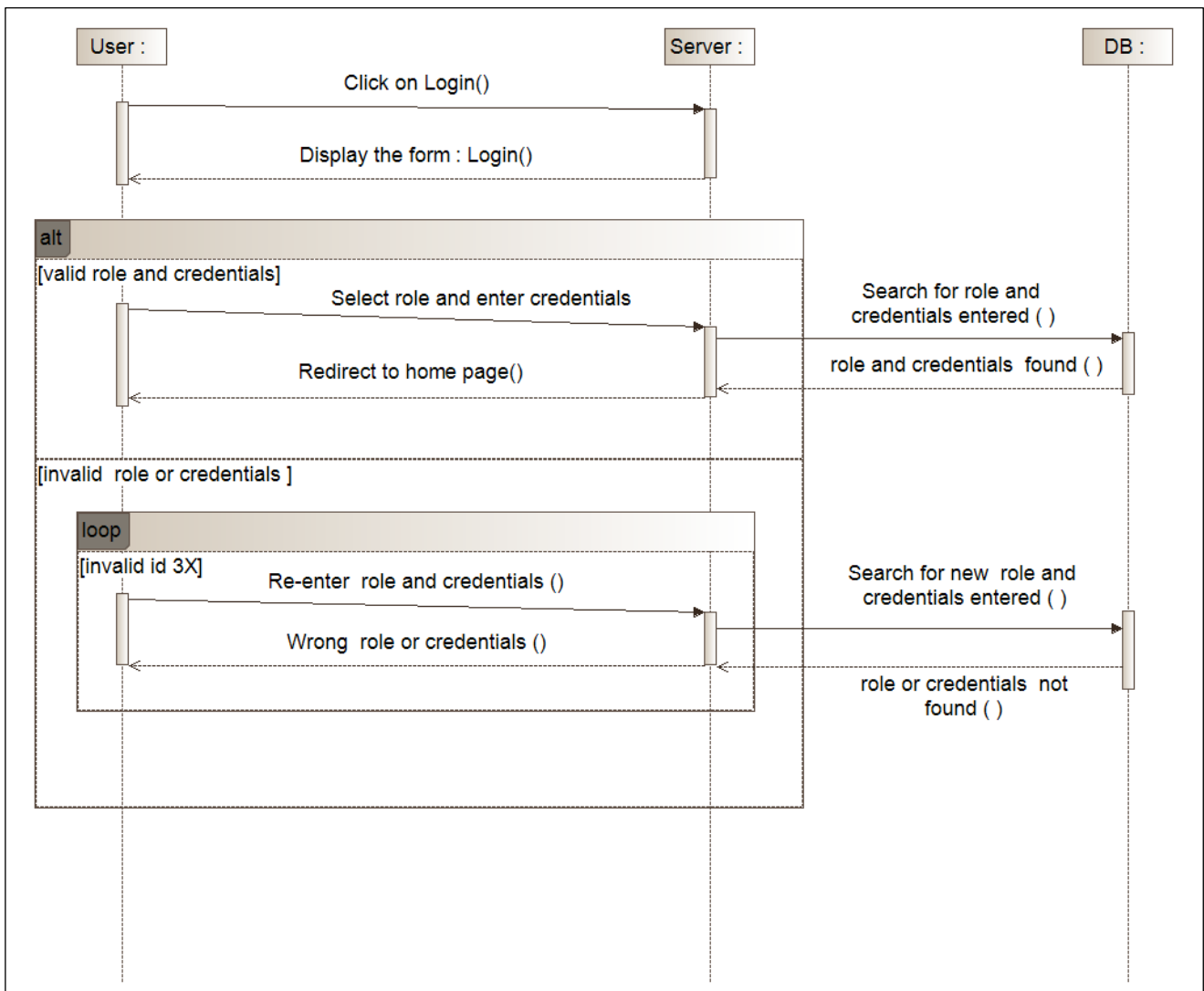


Figure 8 "Authenticate Sequence Diagram"

In *Figure 8* the 'Authenticate' sequence diagram depicts the process of a user, such as a patient, doctor, receptionist, nurse, or admin, logging into a system. The sequence begins with the user selecting their role, such as admin or general user (patient, doctor, receptionist, or nurse). Following the role selection, the system prompts the user to enter their username. The user then inputs their username, and the system subsequently prompts them to enter their password. After the user enters their password, the system authenticates the provided credentials. If the credentials are correct, the system grants the user access.

If the credentials are incorrect, the system redirects the user back to the login page and displays a message indicating 'wrong password or username.' This diagram highlights the step-by-step interaction between the user and the system during the login process, including the handling of incorrect login attempts.

II.4.3.2 Sequence Diagram for 'Appointment Booking'

The *Figure 9* represents the sequence diagram that visualizes the chronological flow of actions and information exchanges between the receptionist and the system during appointment booking. It highlights the various steps of the process, from the receptionist inputting appointment information to redirecting to the appointments list page.

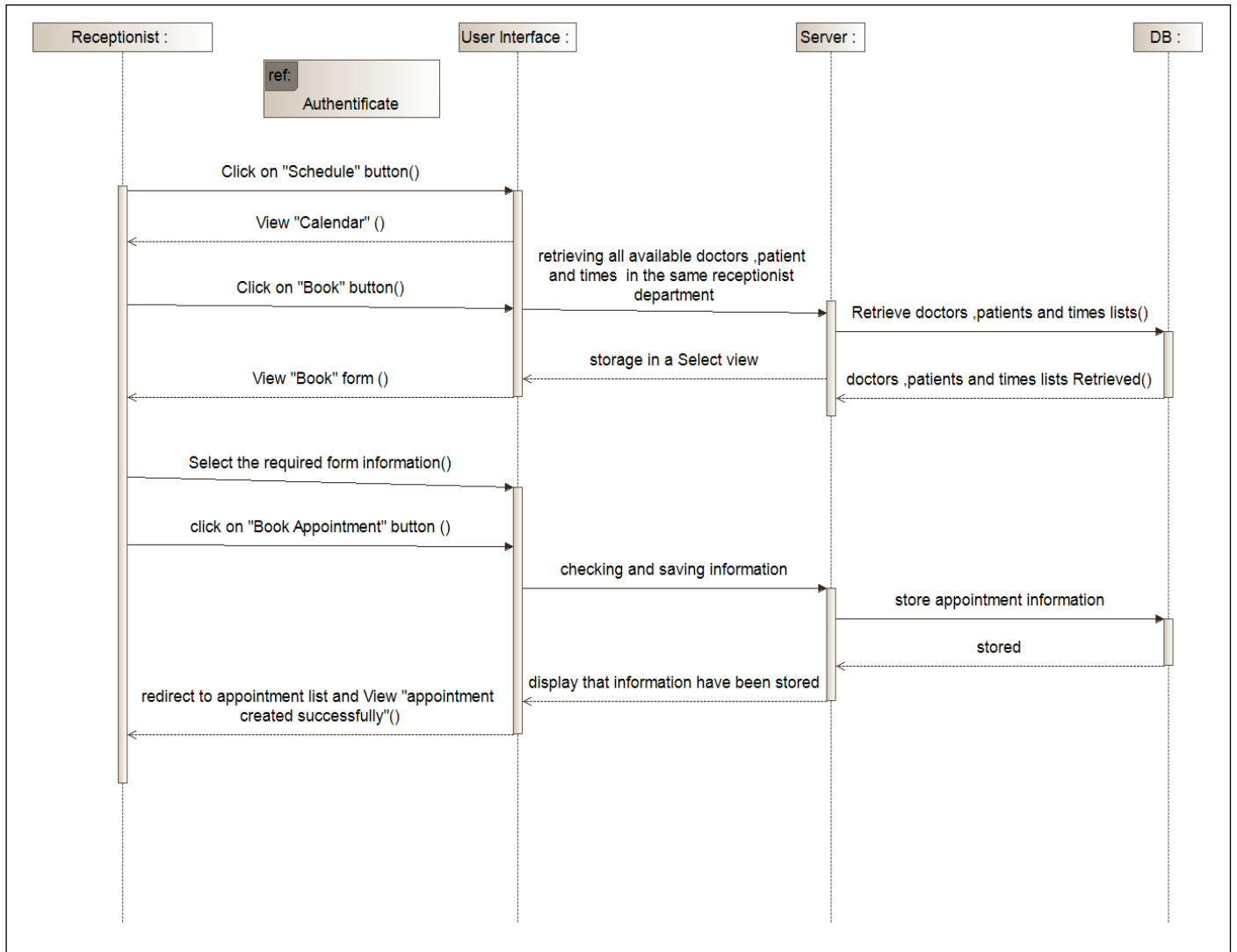


Figure 9 "Appointment Booking Sequence Diagram"

II.4.3.3 Sequence Diagram for 'Create Medical Record / Medical Document'

The *Figure 10* represents the sequence diagram that visualizes the chronological flow of actions and information exchanges between the doctor and the system during the creation of medical documents or medical records. It highlights the various steps of the process, from the doctor inputting record/document information to redirecting to the records/documents list page.

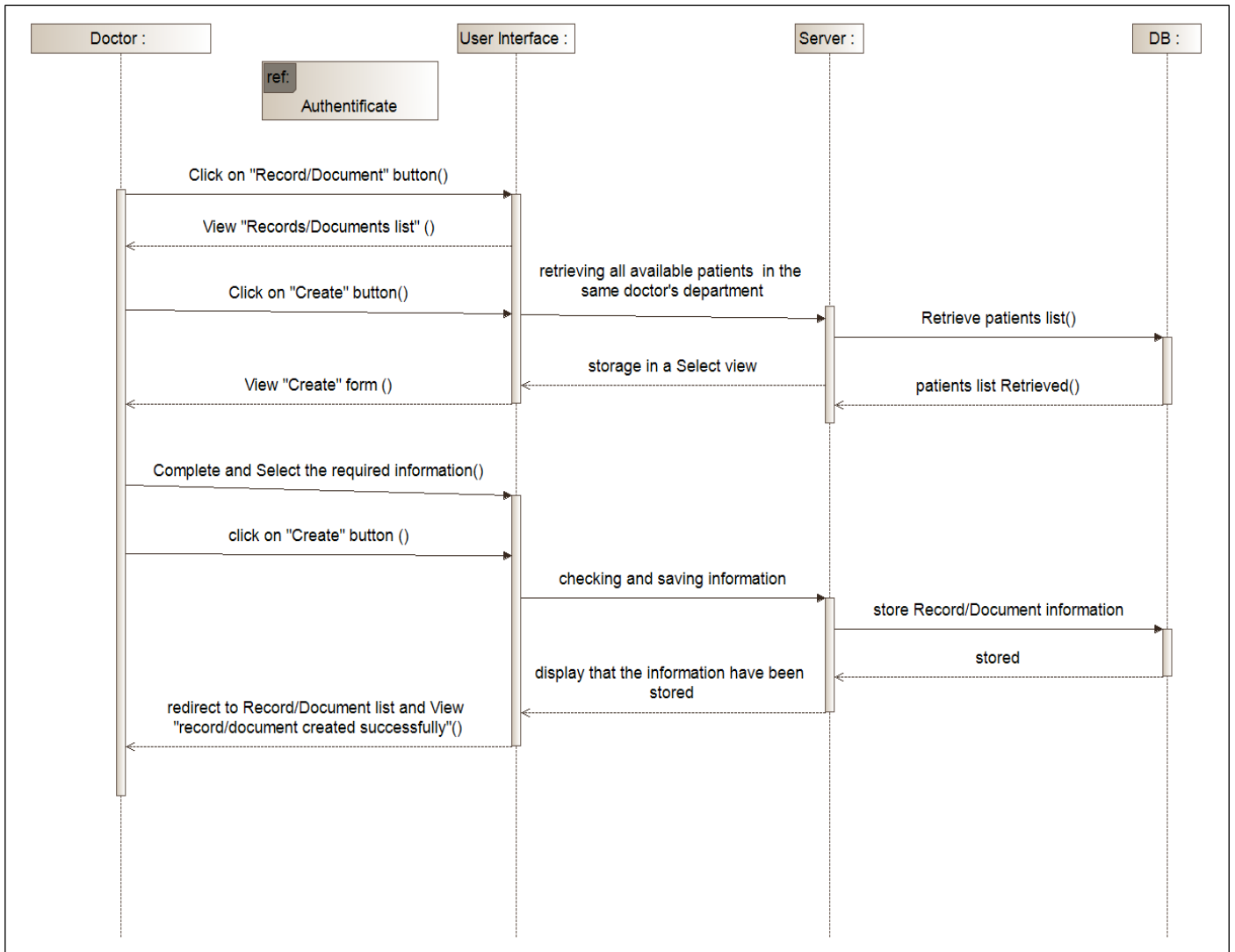


Figure 10 "Create Medical Record / Medical Document Sequence Diagram"

II.4.3.4 Sequence Diagram for 'Patient SignUp'

The *Figure 11* represents the sequence diagram that visualizes the chronological flow of actions and information exchanges between the patient and the system during registration(signup). It highlights the various steps of the process, from the patient inputting information to profile registration.

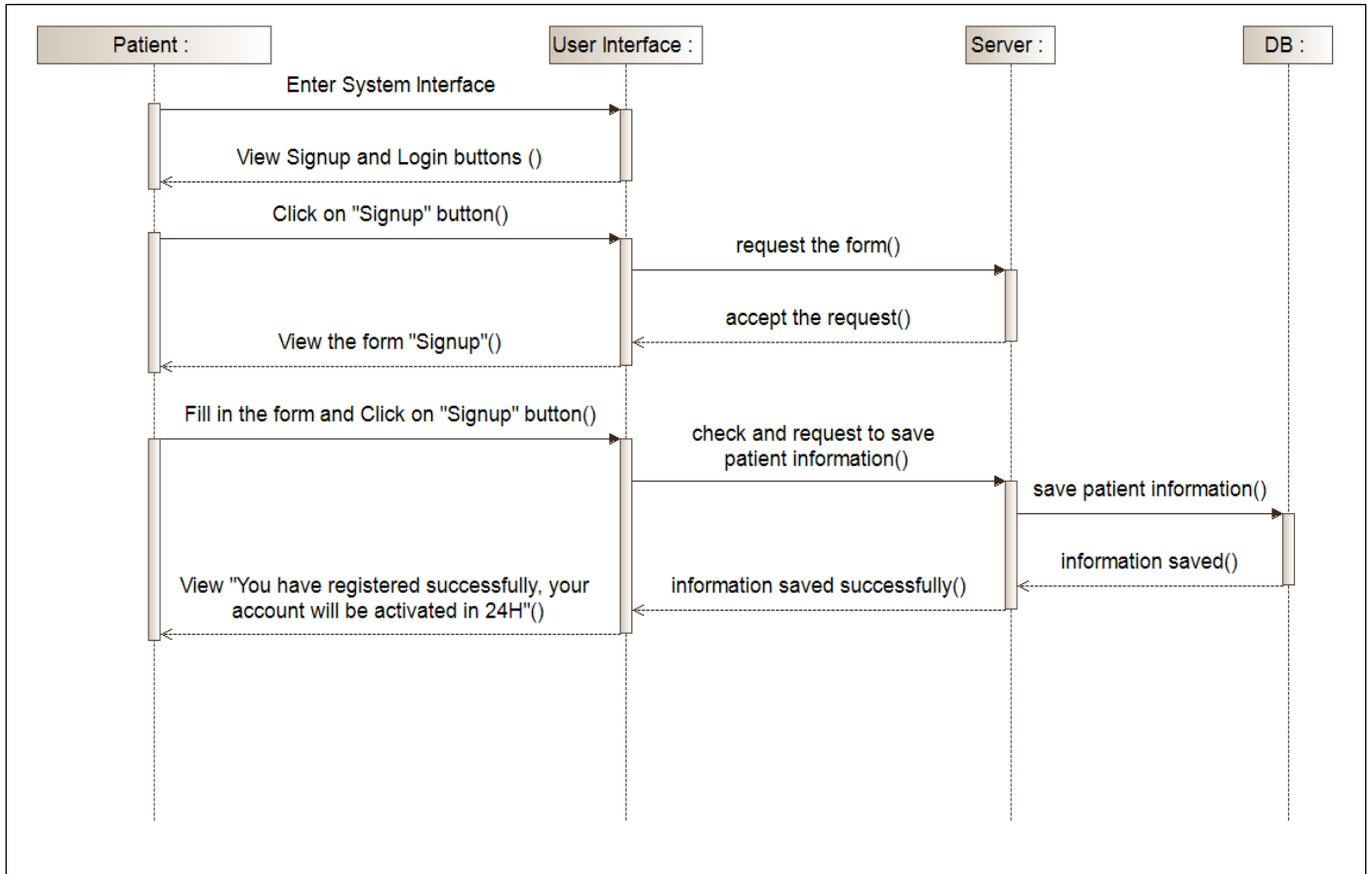


Figure 11 "Patient SignUp Sequence Diagram"

II.4.4 Class Diagram

Class diagrams provide a high-level overview of a system's design, helping to communicate and document the structure of the software. They are a fundamental tool in object-oriented design and play a crucial role in the software development lifecycle [8].

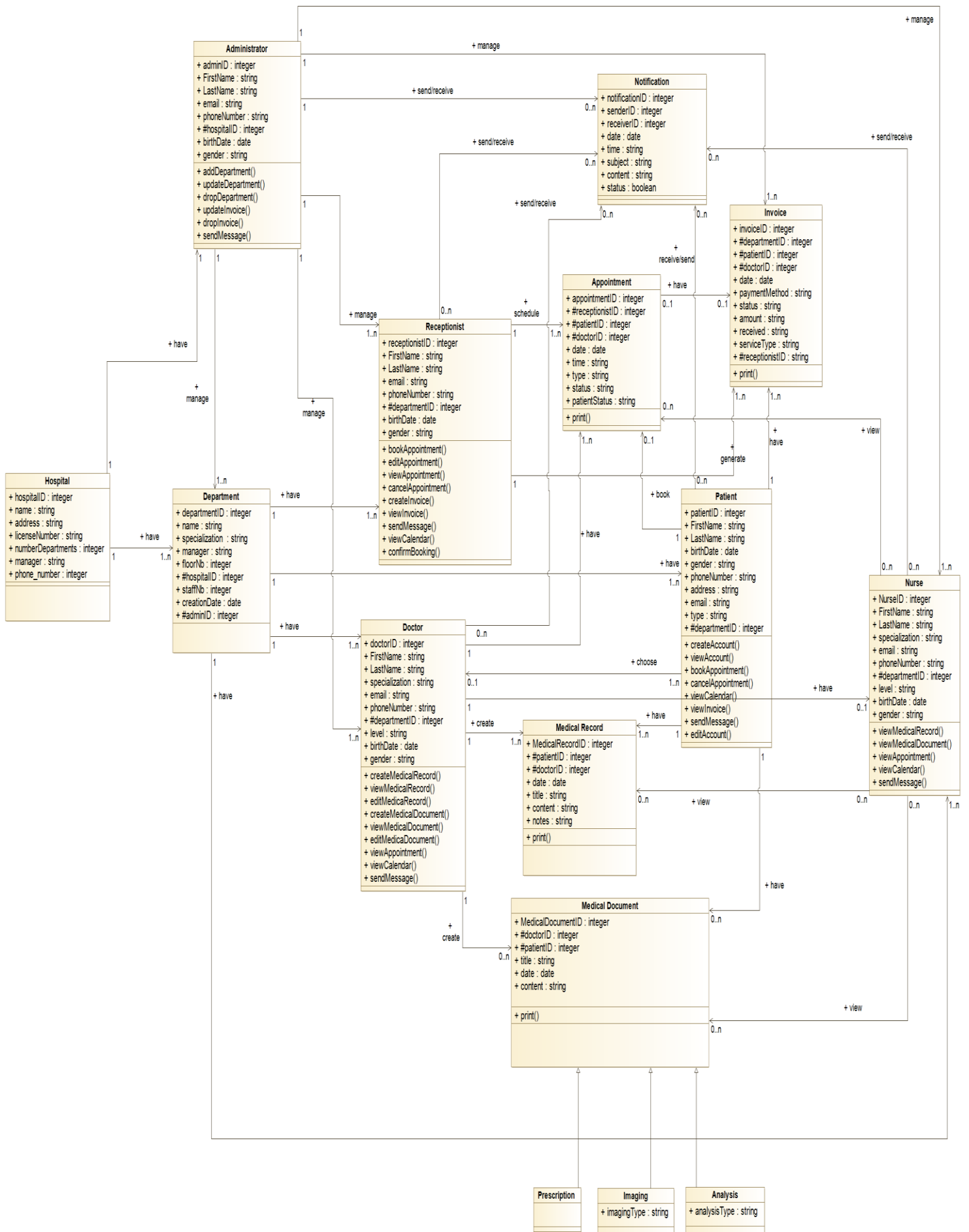


Figure 12 " Class Diagram"

The *Figure 12* is the class diagram that represents the structure of a hospital management system. It includes several key classes, their attributes, methods, and the relationships between them.

*Note: Users are Patients, Doctors, Receptionists, and Nurses.

Classes:

-Patient: Represents a registered/created patient in the hospital.

- Attributes: patientID, firstName, dateOfBirth, ...
- Methods: viewAppointments(), bookAppointment(), ...

-Doctor: Represents a created doctor in the hospital.

- Attributes: doctorID, firstName, specialization, level, ...
- Methods: viewAppointments(), addMedicalRecord(), ...

-Receptionist: Represents a created receptionist in the hospital.

- Attributes: receptionistID, firstName, level, ...
- Methods: viewAppointments(), createAppointment(), createInvoice(), ...

-Nurse: Represents a created nurse in the hospital.

- Attributes: nurseID, firstName, level, ...
- Methods: viewAppointments(), viewMedicalRecord(), ...

-Admin: Represents the administrator in the hospital.

- Attributes: adminID, firstName, ...
- Methods: addDepartment(), manageUsers(), ...

-Appointment: Represents an appointment in the hospital.

- Attributes: appointmentID, patientID, doctorID, date, time, status, ...
- Methods: schedule(), cancel(), updateStatus(), ...

-Invoice: Represents a billing invoice for medical services.

- Attributes: invoiceID, patientID, amount, paymentMethod, status, ...
- Methods: generateInvoice(), ...

-MedicalRecord: Represents the medical record of a patient.

- Attributes: recordID, patientID, doctorID, diagnosis, treatment, ...
- Methods: addRecord(), updateRecord(), viewRecord()

Relationships:

- Patient and Appointment: A patient can have zero or one appointment per day.
- Doctor and Appointment: A doctor can have multiple appointments (one-to-many relationship).
- Receptionist and Appointment: A receptionist schedules and manages multiple appointments (one-to-many relationship).
- Patient and Invoice: A patient can have multiple invoices (one-to-many relationship).
- Doctor and MedicalRecord: A doctor creates and updates multiple medical records or medical documents (one-to-many relationship).
- Patient and MedicalRecord: A patient has multiple medical records (one-to-many relationship).

- The 'Prescription', 'Analysis', and 'Imaging' classes inherit from the 'Medical Document' class (inheritance relationship).
- Notification and Users: All users can be notified by the Admin

This class diagram provides a clear overview of the main entities in the hospital management system and their interactions, ensuring an organized structure for managing users, appointments, medical records, and billing.

II.5 Conclusion

In this chapter, we have made every effort to provide a detailed and in-depth presentation of the project to be undertaken. We have used a combination of use case diagrams, sequence diagrams, and class diagrams to clarify and comprehensively describe the system's functionalities. These diagrams have given us a complete vision of the project, from its structure to its operation, and have guided our approach for the subsequent realization and implementation of the system.

Chapter III :

Modeling and Implementation

III.1 Introduction

We are now entering the operational phase of creating our Hospital Management system, having successfully completed the essential design phase. In this section, we will present the working methodology adopted for the realization of our project, as well as the tools and technologies used to achieve our objectives. Additionally, we will provide a detailed presentation of the fundamental architecture of our Hospital platform and its main interfaces.

III.2 Technologies and Tools Used

Our solution required different technologies and tools to accomplish. We include:

III.2.1 Technologies (Back-end)

COMPOSER :



Figure 13: Composer

Composer is a dependency management tool for the PHP programming language. It allows developers to declare the libraries, packages, and dependencies that their application needs. Composer facilitates the installation, updating, and management of the various libraries and packages required for a project. [9].

PHP :



Figure 14: PHP

PHP is a server-side programming language widely used for web development. It offers an easy-to-understand syntax, a large developer community, database support, and a robust ecosystem of frameworks and libraries. [10].

III.2.2 Technologies (Front-end)

HTML (HyperText Markup Language) :



Figure 15: HTML

HTML is the markup language used to structure the content of web pages. It allows for defining the basic structure of the page, organizing textual content, creating links, including images and media, designing forms, and adding semantic tags to improve accessibility and SEO. [11].

CSS (Cascading Style Sheets) :

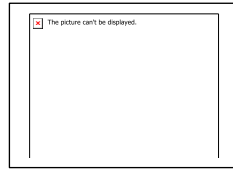


Figure 16: CSS

CSS is a styling language used to format and style the HTML elements of a web page. It uses selectors and rules to define visual properties, offers features such as hierarchy, inheritance, and media queries, and enables the creation of adaptive and responsive layouts. [12].

BOOTSTRAP :



Figure 17: Bootstrap

Bootstrap is a CSS framework that simplifies the creation of responsive websites. It offers a flexible grid, ready-to-use components, customizable styles, and comprehensive documentation. With Bootstrap, developers can design attractive and adaptive websites more quickly. [13].

JQUERY :



Figure 18: JQuery

jQuery is a versatile JavaScript library that simplifies DOM manipulation, event handling, effects, animations, and AJAX requests. It provides an intuitive syntax for selecting and manipulating HTML elements, making it easier to modify content, add interactivity, and create dynamic web pages. With its extensive collection of built-in functions and methods, jQuery streamlines the development process and allows developers to achieve impressive results with minimal code. [14].

JAVASCRIPT :



Figure 19: JavaScript

JavaScript is a versatile programming language primarily used to create interactive features on web pages. It offers an intuitive syntax, cross-platform compatibility, and allows DOM manipulation. Popular libraries and frameworks, such as jQuery and React.js, simplify development. In summary, JavaScript makes websites more dynamic and responsive. [15].

III.2.3 Database

PHPMYADMIN :



Figure 20: phpMyAdmin

phpMyAdmin is a free software tool written in PHP that is intended to handle the administration of a MySQL or MariaDB database server. You can use phpMyAdmin to perform most administration tasks, including creating a database, running queries, and adding user accounts. [16].

III.2.4 Server



Figure 21: XAMPP

XAMPP :

XAMPP is an all-in-one software distribution that facilitates local web development. It bundles several essential components such as Apache, MySQL, PHP, and Perl into a simplified installation. XAMPP provides a user-friendly interface for easily managing server services and configurations. This allows developers to create and test web applications locally before deploying them on a remote server. XAMPP is compatible with various operating systems, making it a practical and versatile solution for local web development. [17].

III.2.5 Development Tools

VISUAL STUDIO CODE :

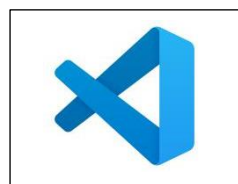


Figure 22: Visual Studio Code

Also known as VS Code, Visual Studio Code is a highly popular source code editor widely used by developers. It stands out for its user-friendly interface, high flexibility, and wide range of features. VS Code supports numerous programming languages and offers advanced features such as syntax highlighting, auto-completion, integrated debugging, and extension management. It also provides tight integration with version control tools like Git. With its high performance and multiple functionalities, Visual Studio Code has become a popular choice among developers for their development environment. [18].

III.2.6 Modeling Tools

MODELIO :



Figure 23: Modelio

Modelio is a modeling solution offering a wide range of functionality based on commonly used standards for Enterprise Architecture, Process Modeling, Software Development and Systems Engineering.

Modelio is first and foremost a modeling environment, supporting a wide range of models and diagrams and providing many services facilitating the modeling of your architectures, such as as model consistency-checking. Support for modeling and business processes (BPMN) is integrated into Modelio. These BPMN models can be linked to other standards supported by the tool, for example UML, so as to integrate these business processes into a larger context such as an enterprise architecture. [19].

III.3 Implementation

We will now present the main interfaces and functionalities of what follows.

➤ Home

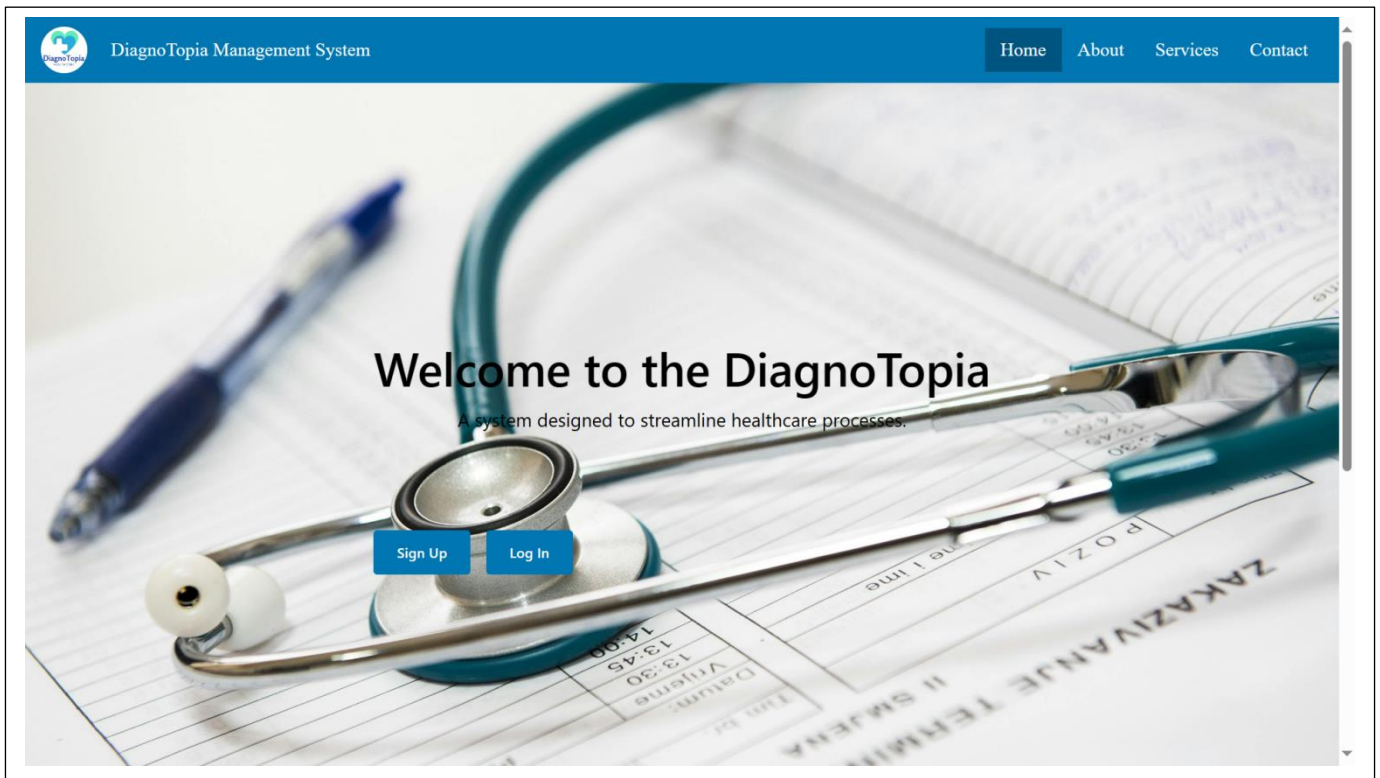


Figure 24 "Home"

➤ Signup

The screenshot displays a "SIGN UP" form overlaid on a blurred background of a hospital waiting area. The form is white with a light gray border and contains the following fields:

- First Name (text input)
- Last Name (text input)
- Gender (dropdown menu with "Select Gender" selected)
- Birth Date (text input with format "mm/dd/yyyy" and a calendar icon)
- Phone Number (text input)
- Email (text input)
- Address (text input)
- User Name (text input)
- Password (text input)
- Re Password (text input)

At the bottom of the form, there is a link for "[Home](#) Already have an account?" and a "Sign Up" button.

Figure 25 "Signup"

➤ Login

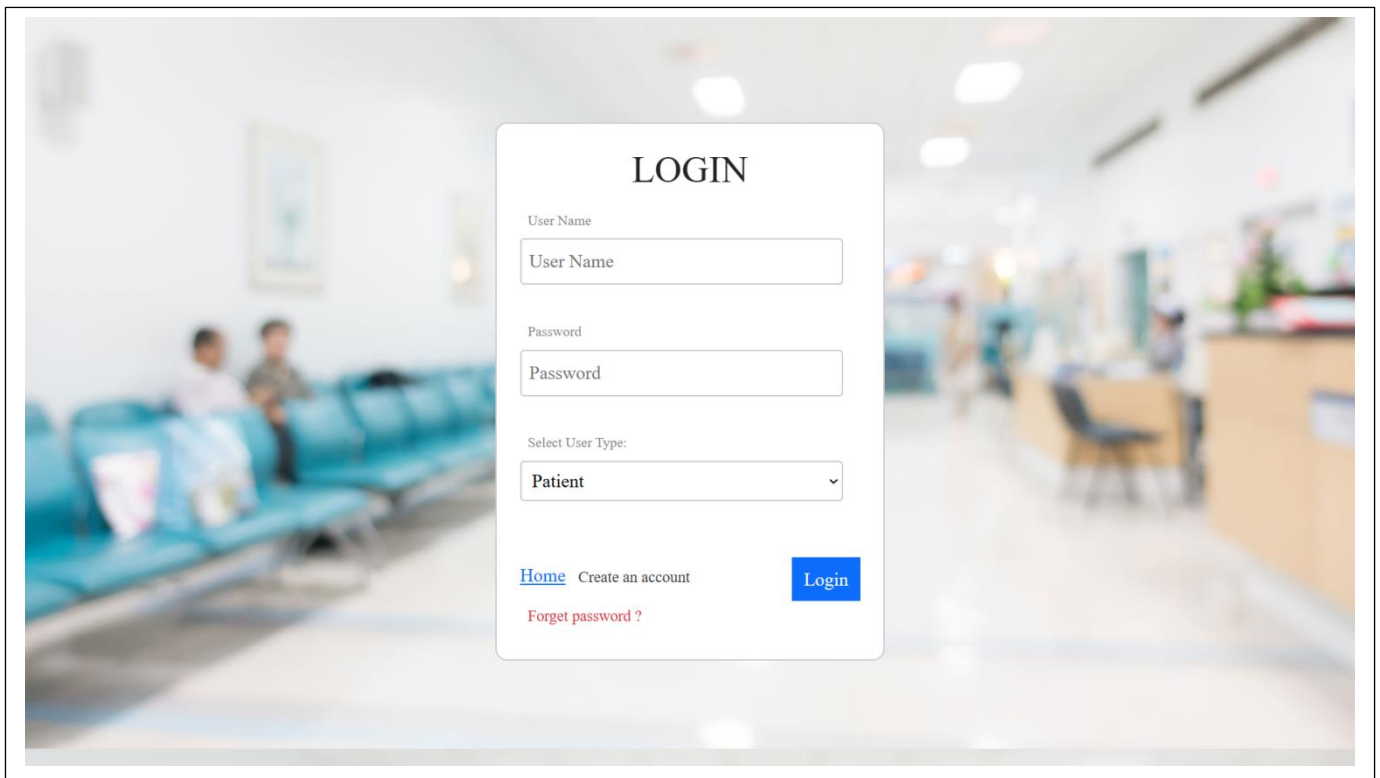


Figure 26 "Login"

➤ Patient Dashboard

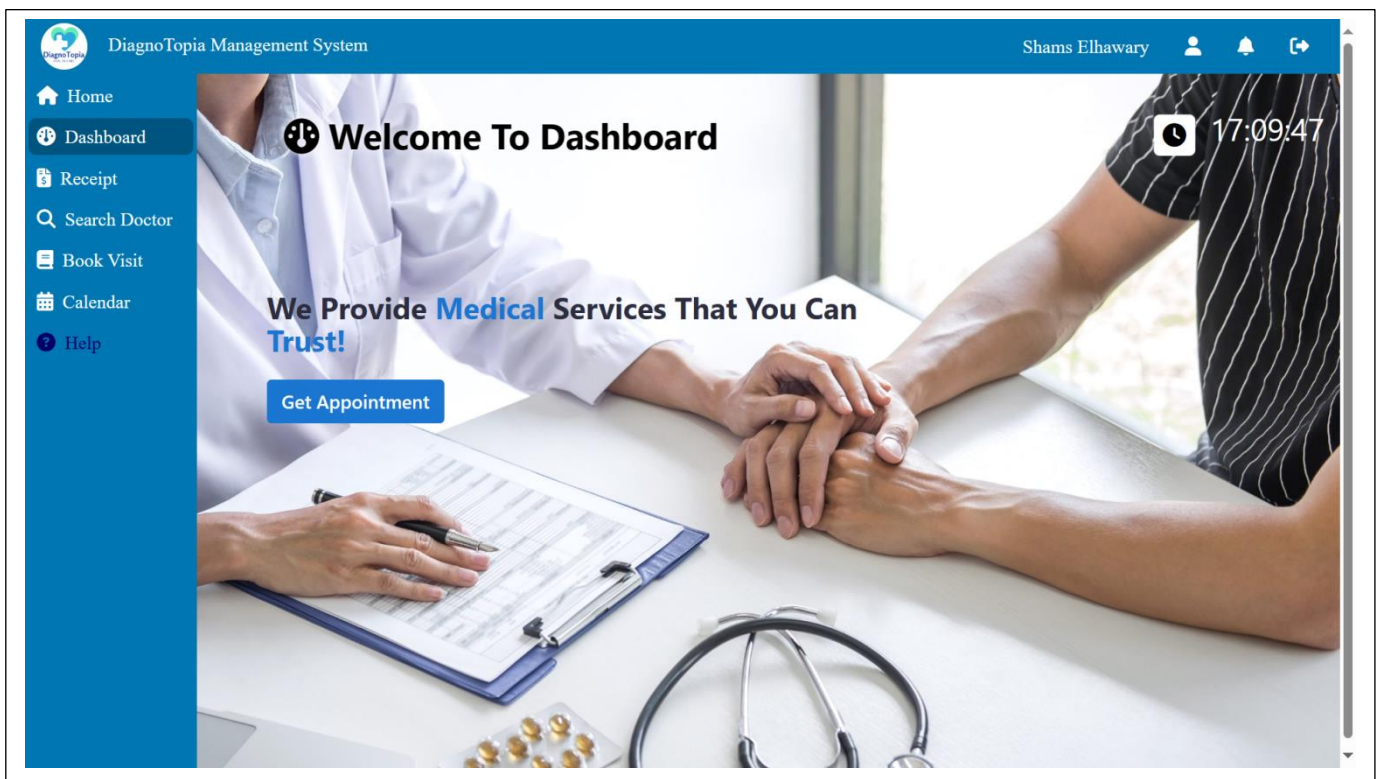
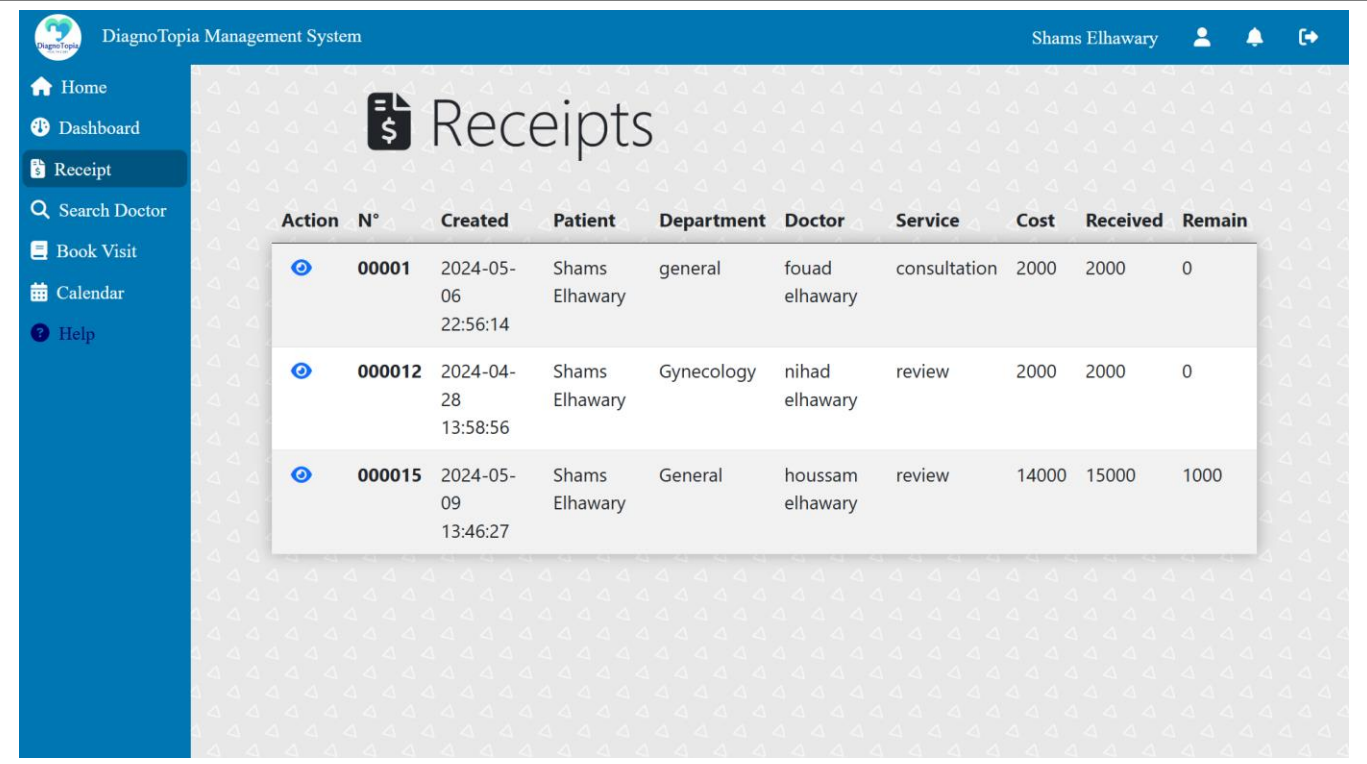


Figure 27 "Patient dashboard"

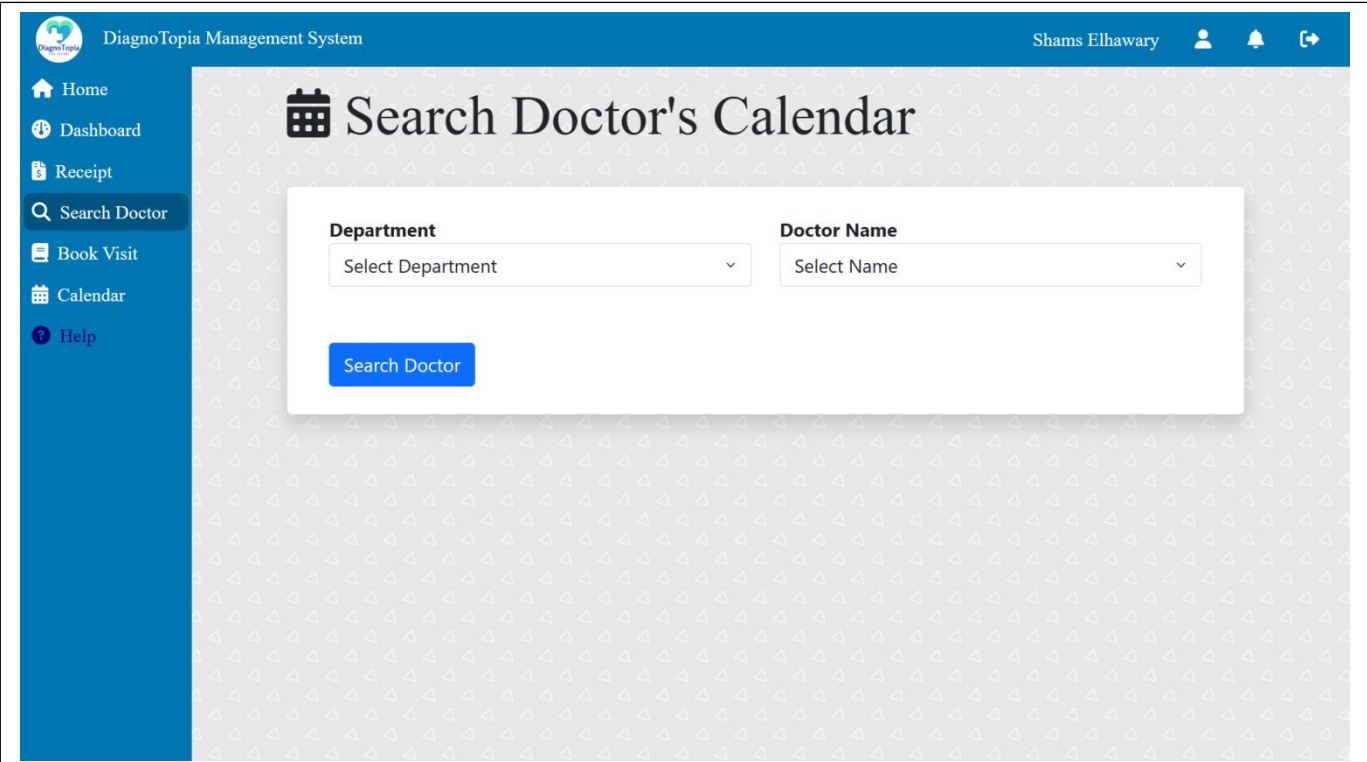
➤ Patient Receipts List



Action	N°	Created	Patient	Department	Doctor	Service	Cost	Received	Remain
	00001	2024-05-06 22:56:14	Shams Elhawary	general	fouad elhawary	consultation	2000	2000	0
	000012	2024-04-28 13:58:56	Shams Elhawary	Gynecology	nihad elhawary	review	2000	2000	0
	000015	2024-05-09 13:46:27	Shams Elhawary	General	houssam elhawary	review	14000	15000	1000

Figure 28 "Patient Receipts List"

➤ Patient Searching for a specific doctor



Department:

Doctor Name:

Figure 29 "Search for a specific doctor"

➤ Patient Book a Visit

DiagnoTopia Management System | Shams Elhawary

Book a Visit [View list](#) [Calendar](#)

Department: Select Department

Doctor Name: Select Name

Patient Name:

Appointment Type: Review

Date: mm/dd/yyyy

Time: 08:00 AM

[Book Appointment](#)

Figure 30 "Patient Book a Visit"

➤ Patient Calendar

DiagnoTopia Management System | Shams Elhawary

My Appointment Calendar [View list](#)

May 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9 21:58	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24 02:30	25
26	27	28	29	30	31	

Figure 31 "Patient calendar"

➤ Patient Send Report

The screenshot shows the 'Write a Report about a Problem' form within the DiagnoTopia Management System. The interface includes a blue sidebar with navigation options: Home, Dashboard, Receipt, Search Doctor, Book Visit, Calendar, and Help. The top header displays the system name and the user's name, Shams Elhawary. The main content area features a form with a title 'Write a Report about a Problem' and a question mark icon. Below the title are two input fields: 'Report Subject' and 'Report'. A blue 'Send Report' button is positioned at the bottom left of the form area. The background of the form has a decorative floral pattern.

Figure 32 "Send Report"

➤ Patient Notification Message

The screenshot shows the 'Report Messages' notification message within the DiagnoTopia Management System. The interface includes a blue sidebar with navigation options: Home, Dashboard, Receipt, Search Doctor, Book Visit, Calendar, and Help. The top header displays the system name and the user's name, Shams Elhawary. The main content area features a title 'Report Messages' and a table with the following data:

Action	N°	Administrator	Subject	Report Content
	1	ahmed alili	Replying to the Problem of bad service.	Hello Mm.Shams Elhawary , I 'm really sorry to hear about your situation. Could you please share more details about the problem so I can Help you. Thank you in advance.

Figure 33 "Notification Message"

➤ Admin : Dashboard

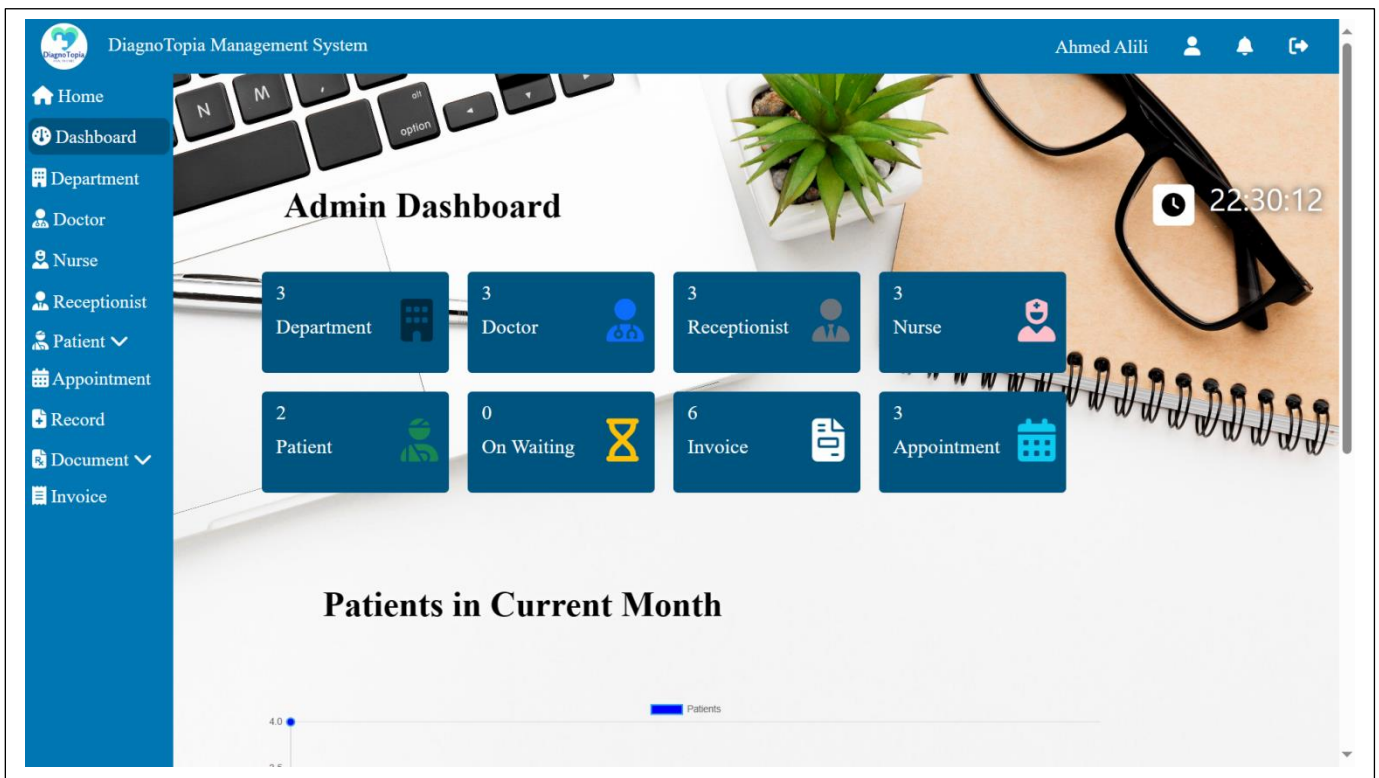


Figure 34 "Admin dashboard"

➤ Admin : Department list

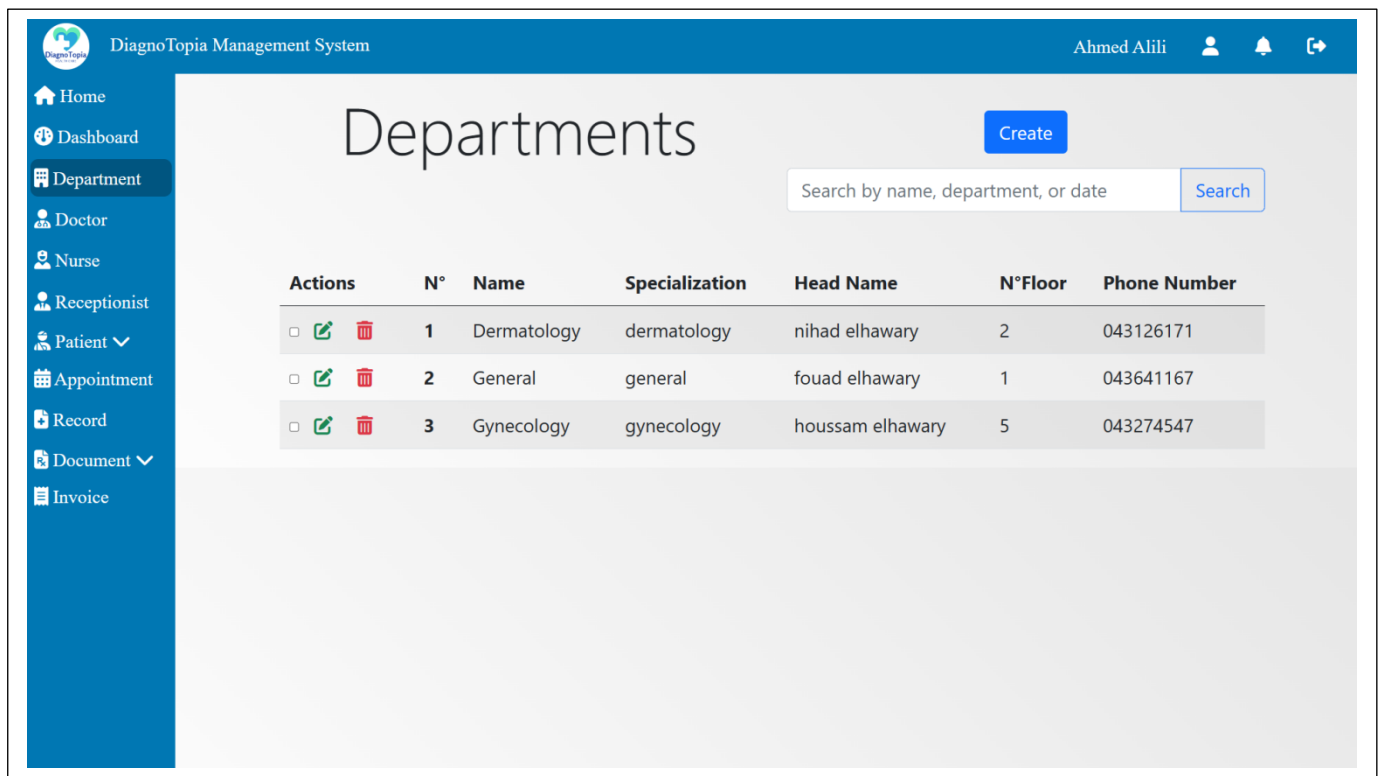


Figure 35 "Department List"

➤ Admin : Active Patients list

DiagnoTopia Management System

Ahmed Alili

Active Patients

Create

Search by name, department, or date Search

Actions	N°	Full Name	Gender	Birth Date	Phone Number	Status
	1	marwa meziani	female	1996-02-06	0677889955	active
	2	Hanna Zaid	female	2024-05-31	0576859465	non_user
	3	Shams Elhawary	female	1999-08-17	0599038273	active
	4	mahmoud ahmed	male	2024-05-15	0684930283	non_user

Figure 36 "Active Patients list"

➤ Admin : Invoices list

DiagnoTopia Management System

Ahmed Alili

Invoices

Create

Search by name, department, or date Search

Actions	N°	Created	Patient	Department	Doctor	Service	Cost	Created by Rec.
	0001	2024-05-06 22:56:14	Shams Elhawary	general	fouad elhawary	consultation	2000	Saliha Benaissa
	0009	2024-05-06 22:37:26	marwa meziani	general	fouad elhawary	surgery	55000	Saliha Benaissa
	0012	2024-04-28 13:58:56	Shams Elhawary	Gynecology	nihad elhawary	review	2000	Admin
	0013	2024-05-06 22:37:38	marwa meziani	General	houssam elhawary	review	1500	Saliha Benaissa
	0014	2024-05-06 23:07:08	marwa meziani	General	houssam elhawary	review	1500	Saliha Benaissa
	0015	2024-05-09 13:46:27	Shams Elhawary	General	houssam elhawary	review	14000	Admin

Figure 37 "Invoices List"

➤ Doctor : Dashboard

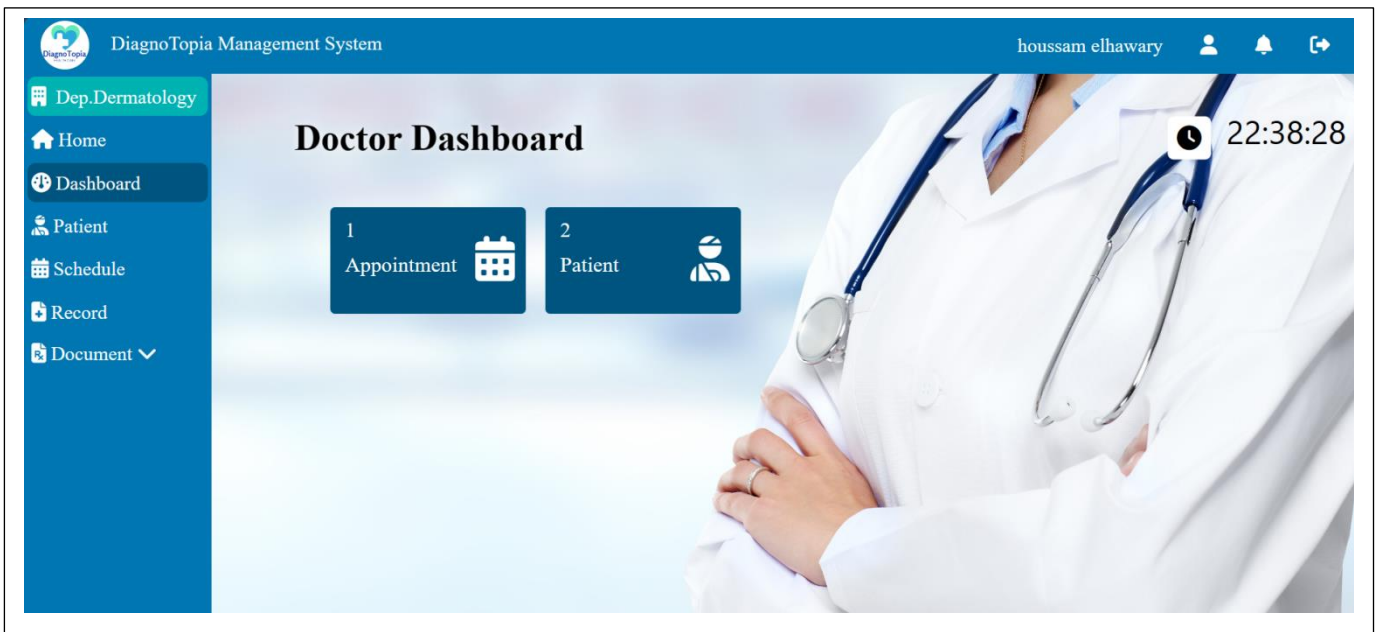


Figure 38 "Doctor dashboard"

➤ Doctor : Appointment Calendar

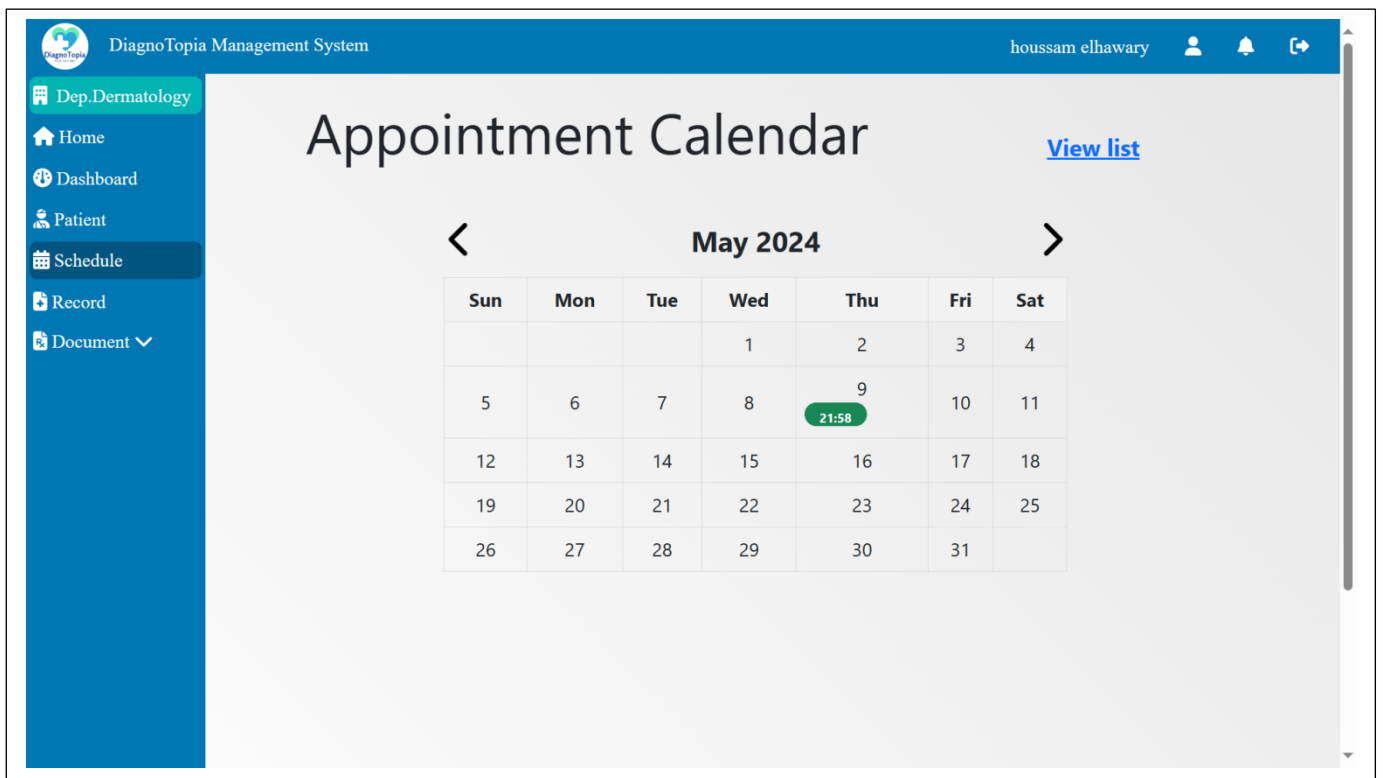


Figure 39 "Appointment Calendar"

➤ Doctor : Create Medical Record

DiagnoTopia Management System | houssam elhawary

Dep.Dermatology

Create

[View list](#)

* : required field

Patient Name **Title ***

Blood Type **Blood Pressure**

Heart Rate **Vaccinations**

Pre-Taken Medicines **Allergies**

Figure 40 "Create Medical Record"

➤ Doctor : Prescription List

DiagnoTopia Management System | houssam elhawary

Dep.Dermatology

Prescriptions

Create

Search by name, department, or date

Actions	N°	Created	Patient
View Edit	0005	2024-05-05 19:08:20	Shams Elhawary
View Edit	0014	2024-05-05 19:14:54	marwa meziani

Figure 41 "Prescription List"

➤ Receptionist : Dashboard

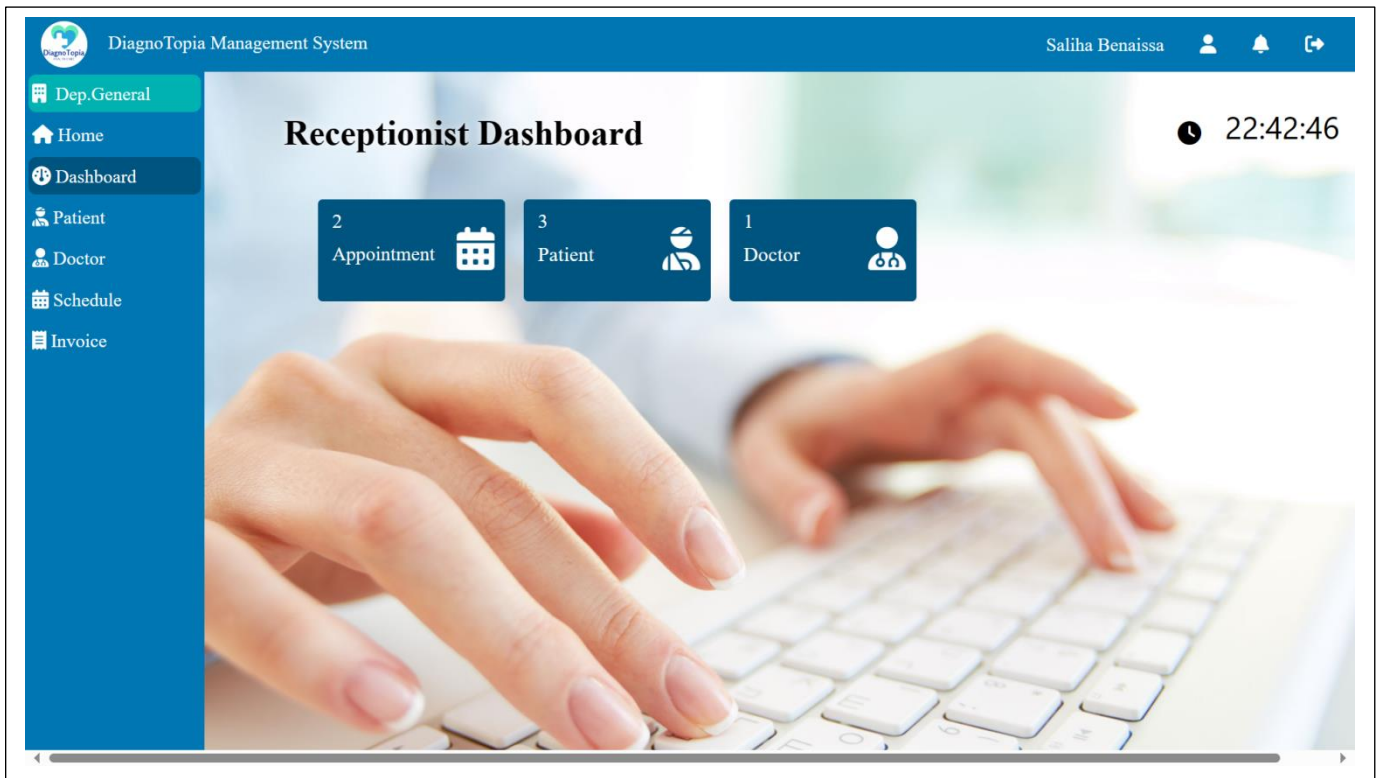


Figure 42 "Receptionist dashboard"

➤ Receptionist : Responsible Doctor Information

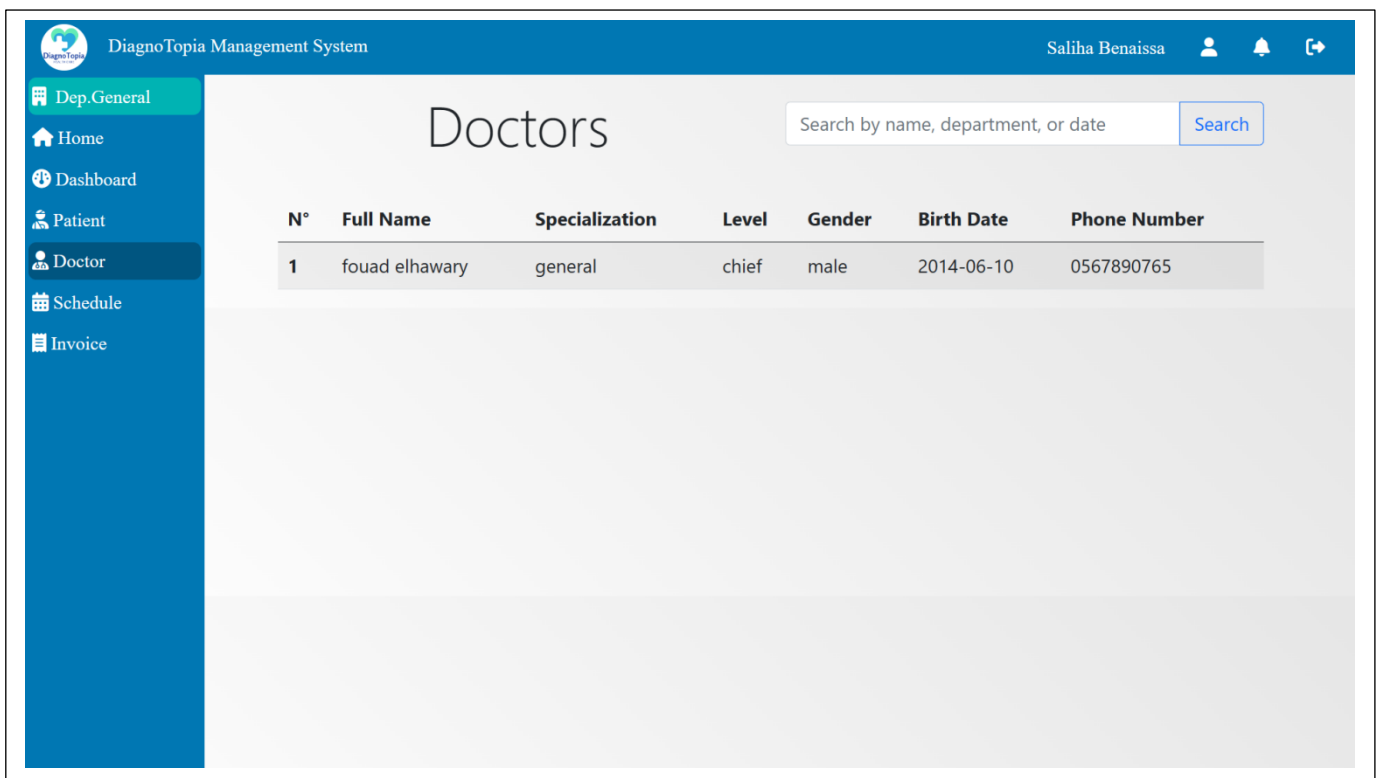


Figure 43 "Responsible Doctor Information"

➤ Receptionist : Book Appointment

The screenshot shows the 'Book Appointment' interface. The header includes the system name 'DiagnoTopia Management System' and the user 'Saliha Benaissa'. The left sidebar has a menu with 'Schedule' selected. The main form area contains the following fields:

- Patient Name:** Select Name (dropdown)
- Doctor Name:** Select Name (dropdown)
- Patient Status:** Pending (dropdown)
- Appointment Type:** Review (dropdown)
- Date:** mm/dd/yyyy (text input with calendar icon)
- Appointment Status:** Pending (dropdown)
- Time:** 08:00 AM (dropdown)

A blue 'Book Appointment' button is located at the bottom left of the form area.

Figure 44 "Book appointment"

➤ Receptionist : Create Invoice

The screenshot shows the 'Create Invoice' interface. The header includes the system name 'DiagnoTopia Management System' and the user 'Saliha Benaissa'. The left sidebar has a menu with 'Invoice' selected. The main form area contains the following fields:

- Patient Name:** Select Name (dropdown)
- Doctor Name:** Select Name (dropdown)
- Payment Method:** Select method (dropdown)
- Service Type:** Select type (dropdown)
- Received Amount:** (text input)
- Service Cost:** (text input)
- Remain:** (text input)

A blue 'Create' button is located at the bottom left of the form area.

Figure 45 "Create Invoice"

➤ Nurse : Dashboard

The screenshot shows the 'Nurse Dashboard' interface. The top header includes the system name 'DiagnoTopia Management System' and the user name 'Ahlam Ghani'. The left sidebar contains navigation links: 'Dep.General', 'Home', 'Dashboard', 'Patient', 'Doctor', 'Schedule', 'Record', and 'Document'. The main area features a large background image of a nurse and three summary cards: 'Appointment' with a value of 2, 'Patient' with a value of 3, and 'Doctor' with a value of 1. A digital clock in the top right corner displays '23:29:31'.

Figure 46 "Nurse dashboard"

➤ Nurse : View Responsible Doctor Information

The screenshot displays the 'View Responsible Doctor Information' page. The header shows 'DiagnoTopia Management System' and 'Ahlam Ghani'. The left sidebar is identical to the dashboard. The main content area is titled 'Doctor' and features a search bar with the placeholder text 'Search by name, department, or date' and a 'Search' button. Below the search bar is a table with the following data:

N°	Full Name	Specialization	Level	Gender	Birth Date	Phone Number
1	fouad elhawary	general	chief	male	2014-06-10	0567890765

Figure 47 "View Responsible Doctor Information"

➤ Nurse : View Doctor's Calendar

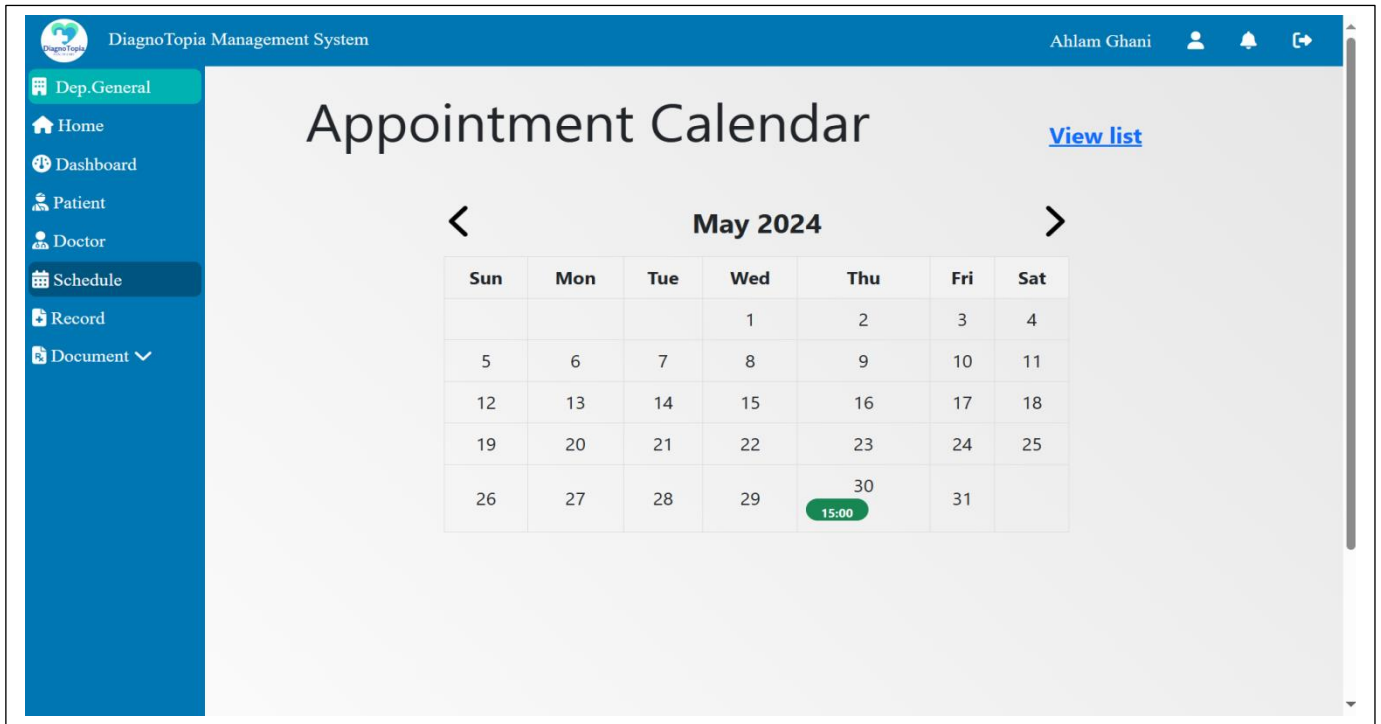


Figure 48 "View Doctor's Calendar"

➤ Nurse : View Patient Medical Record

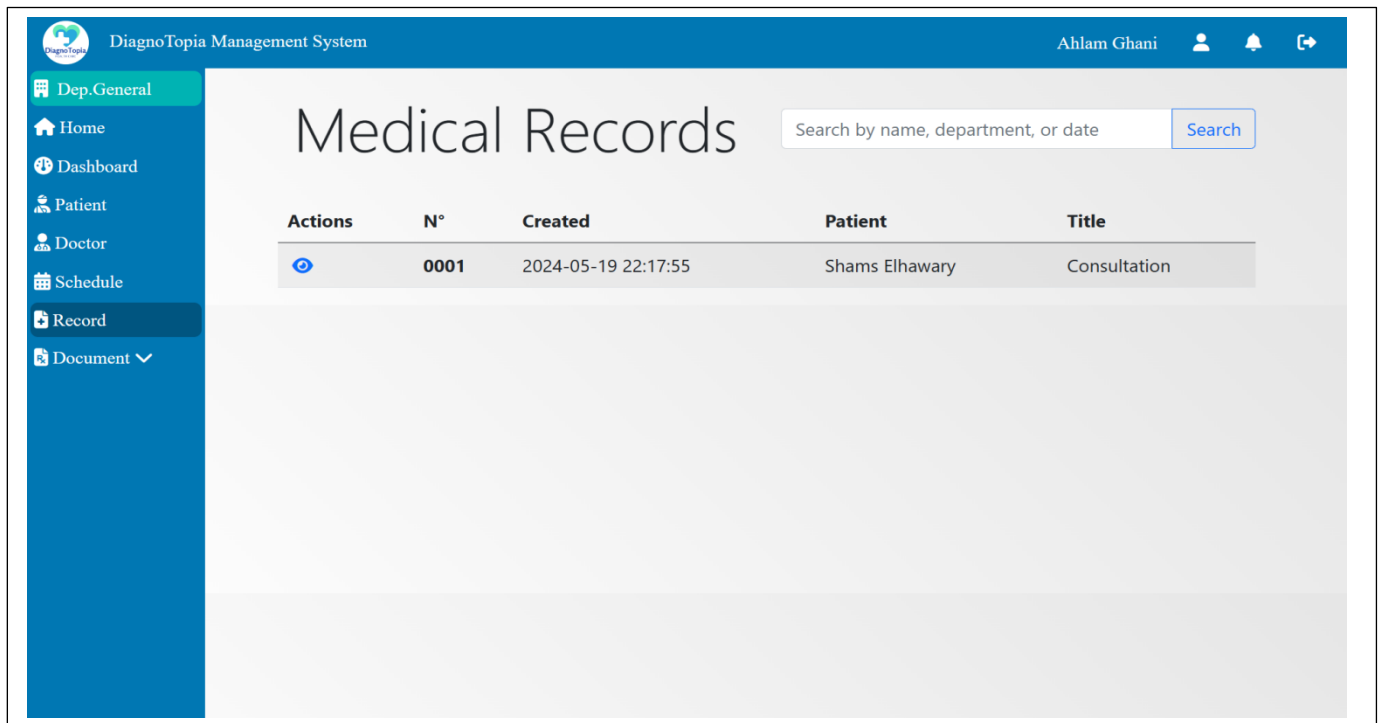


Figure 49 "View Patient Medical Record"

General Conclusion and Perspectives

This hospital management system offers a practical and efficient solution to meet the diverse needs of healthcare providers and patients. With this system, medical staff can easily manage patient records, schedule appointments, track medical history, and streamline administrative tasks, providing a seamless and efficient healthcare experience.

This system simplifies hospital operations by providing a user-friendly platform where healthcare providers can access patient information, manage medical documents, schedule appointments, view appointments in a Calendar view, and generate invoices easily. It also enables efficient management of patient data, optimizes appointment scheduling, and ensures access to medical records. This results in improved patient care, increased efficiency, and higher satisfaction rates among both patients and staff.

The future of hospital management systems is promising in Algeria, with continuous improvements in user experience and advanced functionalities. The integration of emerging technologies such as artificial intelligence and the Internet of Things will allow for greater personalization and more innovative services, such as predictive analytics for patient care, personalized treatment plans, and enhanced telemedicine capabilities.

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Summary

Our goal is to develop a comprehensive and efficient hospital-patient management system. This system aims to facilitate resource management and operations for healthcare facilities specialized in this field. Our solution ensures a user-friendly and intuitive experience.

- Doctors can easily view their schedules and manage medical documents and patient records through the web application.
- Nurses can help their doctors to view their near appointments and review medical records for patients.
- Receptionists can also easily manage appointments and invoices.
- Patients can book, view their appointments, and view their receipts.
- On the other hand, hospital administrators can effectively manage departments, staff, patients, invoices, and other hospital operations through a comprehensive administrative interface.

Security and a user-friendly interface are the priorities in our hospital management system, as we implement protective measures to ensure the confidentiality of patient data and use a simple and basic interface so patients can feel comfortable using it.

Keywords : hospital management, medical record, appointment, invoice, user-friendly interface, security.

Résumé

Notre objectif est de développer un système de gestion hospitalière et de patients complet et efficace. Ce système vise à faciliter la gestion des ressources et des opérations pour les établissements de santé spécialisés dans ce domaine. Notre solution garantit une expérience utilisateur conviviale et intuitive.

- Les médecins peuvent facilement consulter leurs horaires et gérer les documents médicaux et les dossiers des patients via l'application web.
- Les infirmières peuvent aider leurs médecins à consulter les rendez-vous proches et à examiner les dossiers médicaux des patients.
- Les réceptionnistes peuvent également gérer facilement les rendez-vous et les factures.
- Les patients peuvent réserver et consulter leurs rendez-vous, ainsi que visualiser leurs reçus.
- D'autre part, les administrateurs d'hôpitaux peuvent gérer efficacement les départements, le personnel, les patients, les factures et d'autres opérations hospitalières grâce à une interface administrative complète.

La sécurité et une interface conviviale sont les priorités dans notre système de gestion hospitalière, car nous mettons en œuvre des mesures de protection pour assurer la confidentialité des données des patients et utilisons une interface simple et basique afin que les patients se sentent à l'aise en l'utilisant.

Mots-clés : gestion hospitalière, dossier médical, rendez-vous, facture, interface conviviale, sécurité.

ملخص

- هدفنا هو تطوير نظام شامل وفعال لإدارة المستشفيات والمرضى. يهدف هذا النظام إلى تسهيل إدارة الموارد والعمليات للمرافق الصحية المتخصصة في هذا المجال. تضمن حلولنا تجربة مستخدم سهلة وبديهية.
- يمكن للأطباء بسهولة عرض جداولهم وإدارة الوثائق الطبية وسجلات المرضى من خلال تطبيق الويب.
 - يمكن للممرضات مساعدة الأطباء في عرض المواعيد القريبة ومراجعة السجلات الطبية للمرضى.
 - يمكن لموظفي الاستقبال إدارة المواعيد والفواتير بسهولة.
 - يمكن للمرضى حجز مواعيدهم وعرضها، بالإضافة إلى عرض إيصالاتهم.
- من ناحية أخرى، يمكن لمسؤولي المستشفى إدارة الأقسام، الموظفين، المرضى، الفواتير، والعمليات الأخرى بكفاءة من خلال واجهة إدارية شاملة.
- الأمان وواجهة المستخدم السهلة هما الأولوية في نظام إدارة المستشفيات لدينا، حيث نقوم بتنفيذ تدابير حماية لضمان سرية بيانات المرضى واستخدام واجهة بسيطة وأساسية حتى يشعر المرضى بالراحة عند استخدامها.
- الكلمات المفتاحية : إدارة المستشفيات، السجل الطبي، الموعد، الفاتورة، واجهة سهلة الاستخدام، الأمان.