



Comprehensive Medical Management System-Medicare

Medicare is a web-based platform designed to optimize the administration and operation of medical centers, clinics, and hospitals. The system allows users to manage medical appointments, clinical records, doctors, departments, hospital resources, and more, offering specialized modules based on the user's role: patient, doctor, or administrator.

System Version: 1.1

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Medicare is a comprehensive web-based system developed to improve the operational and clinical management of medical centers, hospitals, and clinics. The system centralizes the management of patients, doctors, medical appointments, departments, and hospital resources, facilitating efficient communication between the various stakeholders.

The MediCare system is a comprehensive web-based solution for medical centers and hospitals, comprised of two main areas:

- Public/information area: provides institutional information about the medical center (history, services, specialties, news, insurance, facilities, doctors).
- Private/role-managed area: registered users can schedule appointments, view medical reports, and view prescriptions; doctors manage patients and appointments; and the administrator controls all system data.

Objective

The primary goal of Medicare is to provide an intuitive and functional digital solution that allows medical centers to streamline their internal processes, from appointment scheduling to managing medical staff and physical resources, thereby improving the experience for both patients and healthcare workers.

Specific objectives:

- Provide information about the medical center's services.
- Manage medical appointments digitally.
- Offer separate dashboards for patients, doctors, and administrators.
- Automate the management of patients, appointments, departments, and clinical resources.

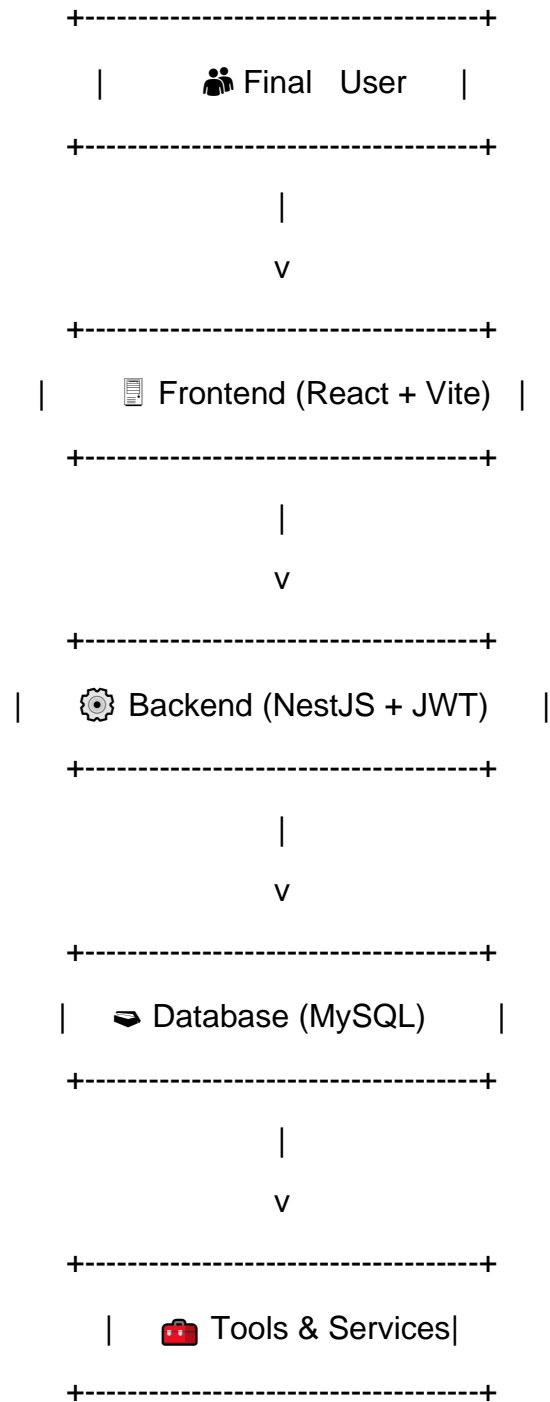
Key Features

- Informative site with details on medical services, specialties, news, and facilities.
- User registration and login with patient role.
- Doctor module for managing patients and assigned appointments.
- Complete administrator dashboard with full control over users, doctors, patients, departments, rooms, beds, shifts, roles, and more.
- Secure system using JWT authentication.
- Scalable architecture based on NestJS (backend) and React (frontend), with a MySQL database.

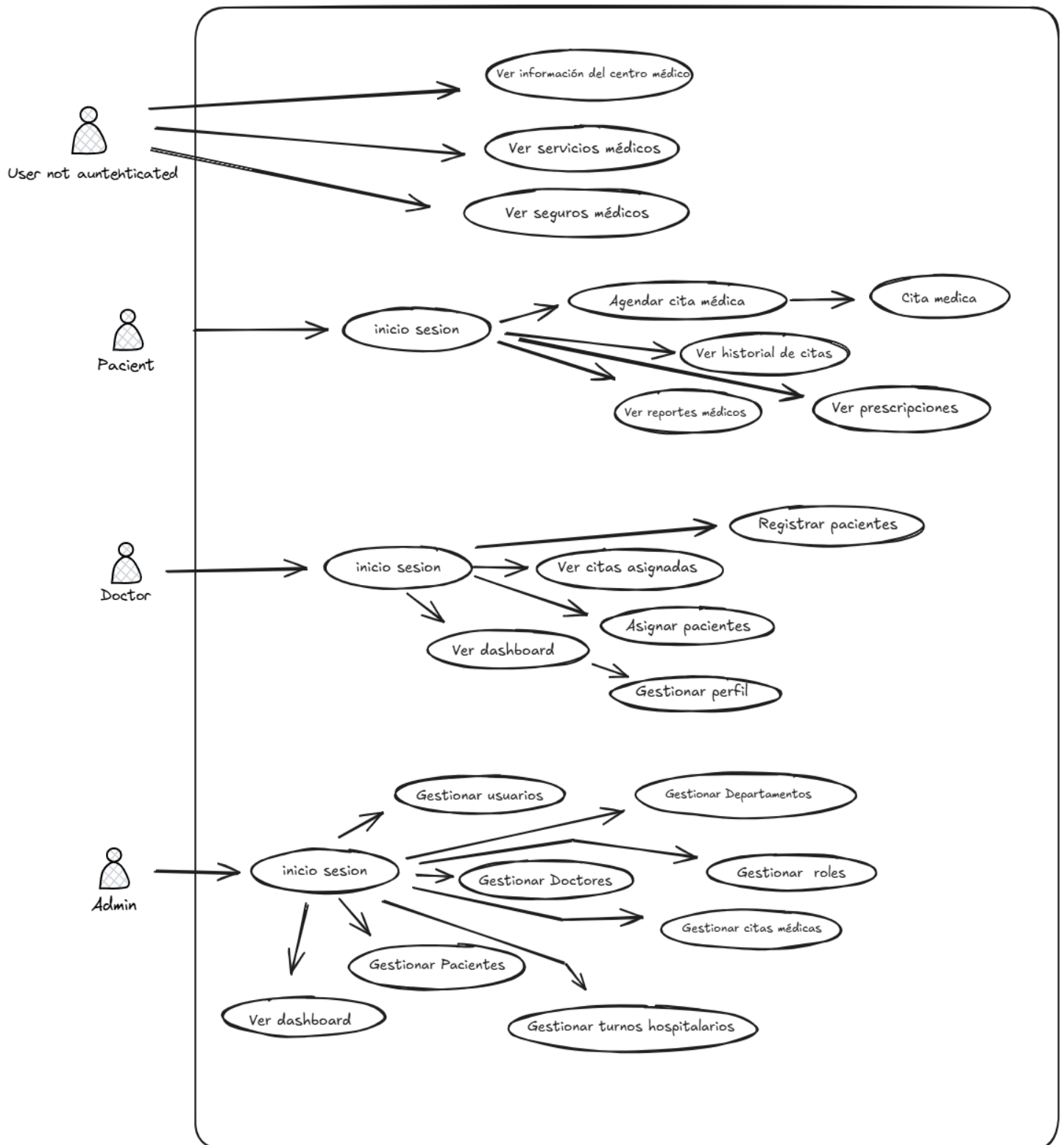
Who is it for?

- Small and medium-sized medical centers
- Public and private hospitals
- Specialized clinics
- Healthcare professionals who require a digital management tool

System Architecture



General diagram of the system



[Home] → [Public Navigation]

↳ [Register/Login?]

→ [Register] → [Patient Dashboard]

→ [Login] → [Validate] → [Role?]

→ [Doctor] → [Doctor Dashboard]

→ [Admin] → [Admin Dashboard]

→ [Patient] → [Patient Dashboard]

← [Logout]

← [End]

Technologies Used

The Medicare system is developed with modern and scalable technologies, aimed at providing an efficient experience for both development and system performance.

The main tools and frameworks used are detailed below:

Frontend

- React.js: JavaScript library for building dynamic and reactive user interfaces.
- Vite: Rapid build tool for front-end projects.
- TypeScript: JavaScript superset that adds static typing to improve code maintainability.
- React Router: For managing routes and navigation within the application.
- Tailwind CSS / Material UI: Styling frameworks for responsive and modern design.

Backend

- NestJS: Progressive Node.js framework for building scalable and well-structured applications.
- TypeScript: Used in the backend for better typing control and a clean architecture.
- JWT (JSON Web Token): For authentication and route protection.
- Swagger/OpenAPI: Interactive documentation for REST APIs.
- TypeORM / Sequelize (depending on the type of application you used): ORM for interacting with the MySQL database from NestJS.

Database

- MySQL: Relational database management system used to store and manage all system information.

Other

- Node.js: Backend execution environment that allows JavaScript to run outside the browser.
- NPM / Yarn: Package manager for installation and dependency management.
- Git / GitHub: Project version control.

System Modules and Functionalities

The Medicare system is divided into several modules that allow for efficient management of medical resources, users, and daily operations in a medical center or hospital. Each module has specific functionalities depending on the user's role: Patient, Doctor, or Administrator.

1. Public Module (Information Site)

This module is accessible without logging in and serves as the medical center's homepage.

Features:

- View general information about the medical center.
- Information on medical services offered:
 - Emergencies
 - Hospitalization
 - Surgery
 - Laboratory
 - Radiology and Imaging
- Details on accepted health insurance plans.
- Updated news section about the medical center.
- Multimedia gallery with photos of the facilities.
- History of the medical center.

- List of available medical specialties.
- Professional profiles of registered doctors.

2. User Module (Patients)

Users can register and automatically obtain the patient role, and then access their personal dashboard.

Features:

- Secure registration and login using JWT authentication.
- Schedule medical appointments by specialty and available doctor.
- View your complete medical appointment history:
 - Scheduled appointments
 - Completed appointments
 - Cancelled appointments
- Access medical reports issued by doctors.
- View medical prescriptions.
- Manage your profile:
 - Update personal information
 - Change password
 - View basic medical information

3. Doctors Module

This module is designed exclusively for medical professionals whose credentials are provided by the administrator.

Features:

- Login with credentials assigned by the administrator.
- Dashboard with general statistics:
 - Total assigned patients
 - Total scheduled and completed appointments
- View all assigned medical appointments:
- Status: pending, completed, canceled
- Ability to add new patients to the system.
- Assign existing patients to your personal care list.
- Manage your profile:
 - Edit personal and professional information
 - Update schedule availability (if applicable)
 - View your patients' medical history

4. Administrator Module

The most comprehensive role in the system, intended for staff responsible for the comprehensive management of the medical center.

Features:

- Dashboard with key system indicators:
 - Total patients
 - Total doctors
 - Total departments
 - Medical appointment statistics

- Staff Management:
 - Create, read, update, and delete employees

- User Management:
 - Create, read, update, and delete users (with patient role)

- Doctor Management:
 - Create, read, update, and delete doctors

- Patient Management:
 - Create, read, update, and delete patients

- Department Management:
 - Register, edit, delete, and list departments in the medical center

- Room Management:
 - Register hospital rooms
 - Assign room type (single, shared, ICU, etc.)

- Clinical Bed Management:
 - Register beds

- Assign beds to rooms
- Update occupancy status
- Workstation Management:
 - Register medical and non-medical positions
- Staff Role Management System:
 - Create, modify and delete roles (patient, doctor, admin, etc)
- Hospital Appointment Management:
 - Record medical and nursing appointments
- Medical Specialty Management:
 - Record, edit, and delete medical specialties
- Medical Appointment Management:
 - Create, modify, delete, and view all appointments in the system

Authentication and Role Management

Authentication and authorization in the Medicare system is designed to ensure that each user has access only to the functionality permitted according to their role within the system. This ensures the integrity, privacy, and security of medical and operational data.

Role Types

The system defines three (3) main roles:

ROL	DESCRIPTION
Patient	Registered user who can schedule appointments, view medical records, and manage their profile. They have limited access to specific features.
Doctor	Medical professional with access to their own dashboard, where they can view assigned patients, scheduled appointments, and manage related medical information.
Administrator	User with maximum privileges. They can manage users, doctors, patients, departments, hospital resources, and all system settings.

Note: The user role is automatically assigned upon patient registration. The doctor and administrator roles are manually assigned by the system administrator.

Authentication Flow

The authentication process is based on JWT (JSON Web Token) tokens, which allows secure communication between the client and server without the need to maintain active sessions in the backend.

Flow steps:

1. Registration (for patients only):

- The user enters their basic information (name, email, password).
- A record is created in the users table with the patient role.

2. Login:

- The user enters their email and password.
- The backend verifies the credentials against the database.
- If valid, a signed JWT token is generated containing user information (ID, name, role, etc.).
- This token is returned to the frontend and stored locally (e.g., in localStorage or cookies).
- This token is sent to the frontend via a secure, HTTP-only cookie, optionally with attributes such as Secure, HttpOnly, and SameSite.

3. Protected Access:

- Each time the user makes a request to the backend, the token is included in the Authorization header.
- The backend verifies the credentials against the database.

4. Logout:

- The backend deletes or expires the cookie containing the JWT token.
- This securely logs the user out.

Route Protection

All sensitive routes in the system are protected by guards that verify:

- That the user has a valid token stored in the cookie.
- That the user's role has permission to access that route or resource.

For example:

- Only users with the administrator role can access routes such as /api/doctors, /api/patients, /api/departments, etc.
- Only users with the doctor role can access paths such as /api/appointments/own.

Additional Security

- Encrypted passwords: User passwords are stored in the database using a secure hash (bcrypt).
- Token expiration: JWT tokens have a limited lifetime (e.g., 24 hours), improving system security.
- Secure cookies: Cookies with attributes such as HttpOnly, Secure, and SameSite=Strict/Lax are used to prevent unauthorized access.
- Field validation: All endpoints validate input data before processing it (using NestJS DTOs and pipes).
- Error handling: Clear and controlled responses to unauthorized access attempts or invalid credentials.

Database Model (MySQL)

- users: id, name, email, password, role_id, created_at
- roles: id, name
- doctors: id, user_id, specialty_id, ...
- patients: id, user_id, date_of_birth, address, ...
- appointments: id, patient_id, doctor_id, date, status
- departments: id, name, description
- specializations: id, name, description
- rooms: id, number, type, floor

- beds: id, room_id, status
- shifts: id, name, start_time, end_time
- jobs: id, name, description
- news: id, title, content, image, post_date
- medical_records: id, appointment_id, diagnosis, prescription
- login_history
- bed_assignments
- doctor_availability
- doctor_patients
- insurance
- pharmacy
- prescriptions
- procedures
- refresh_tokens
- staff
- staff_shifts

Entity-Relationship Model of the Database

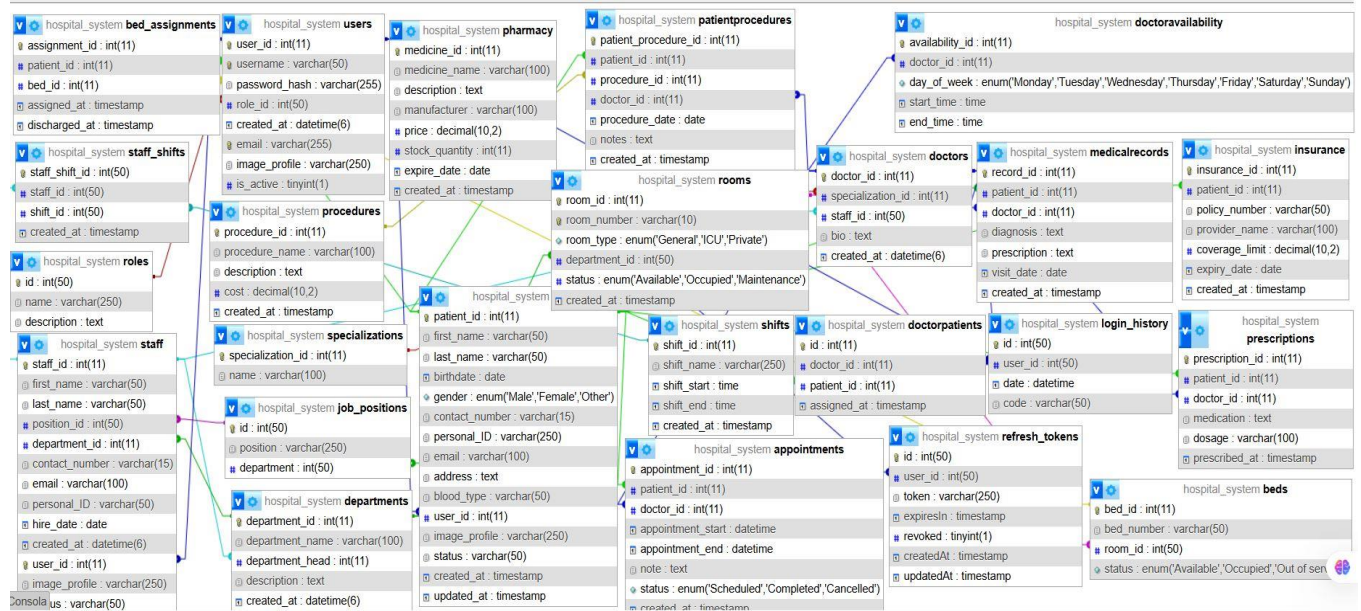
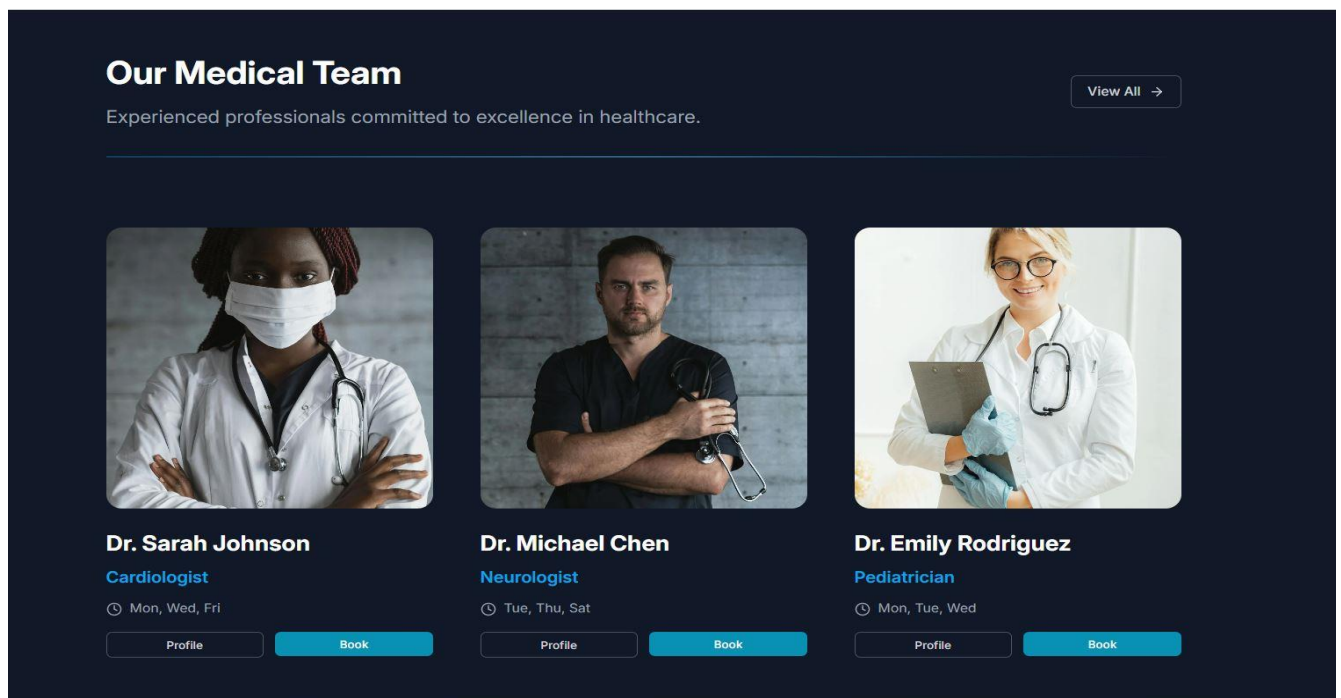
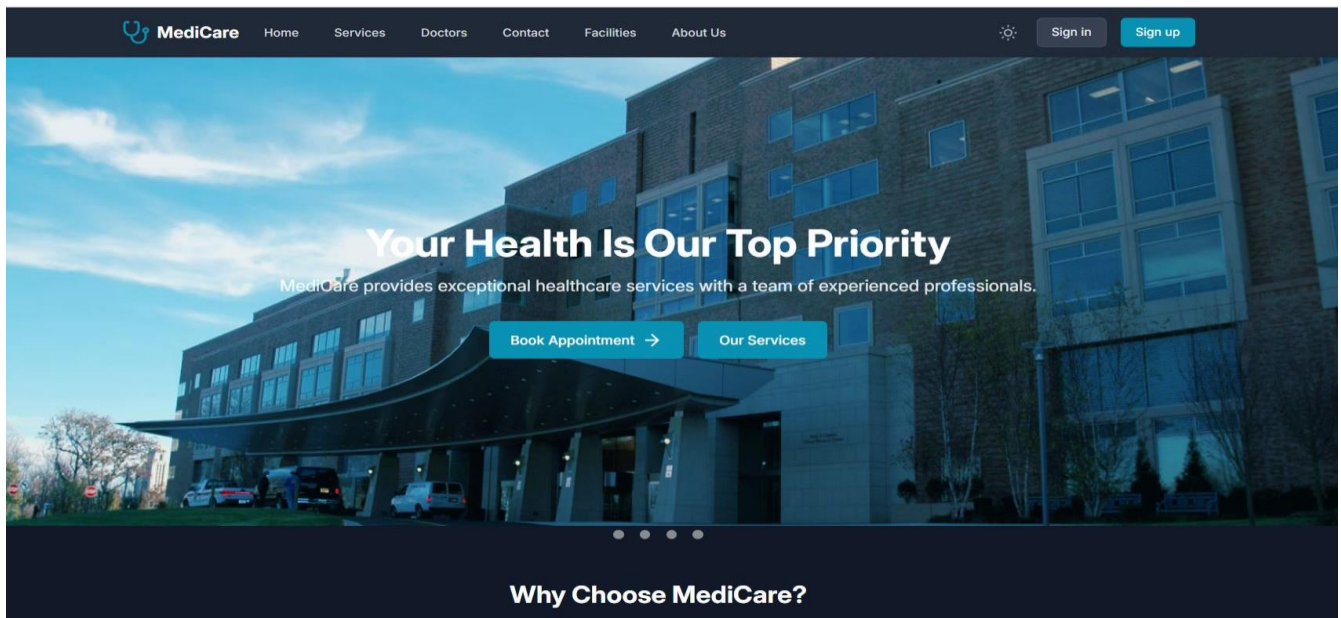
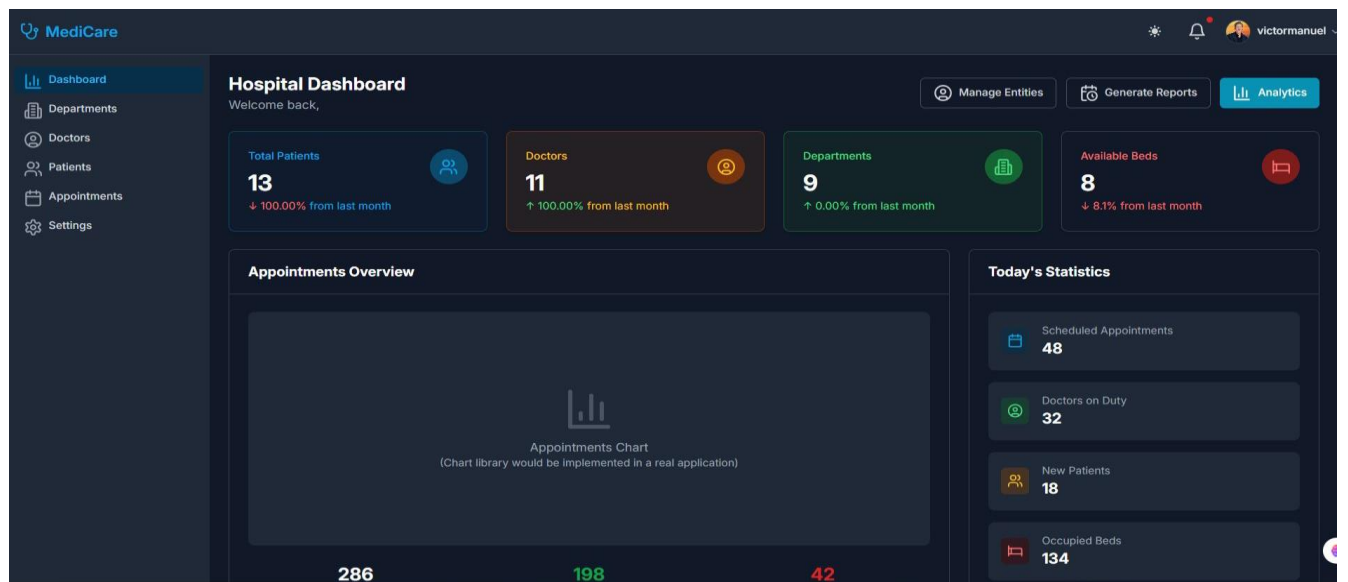
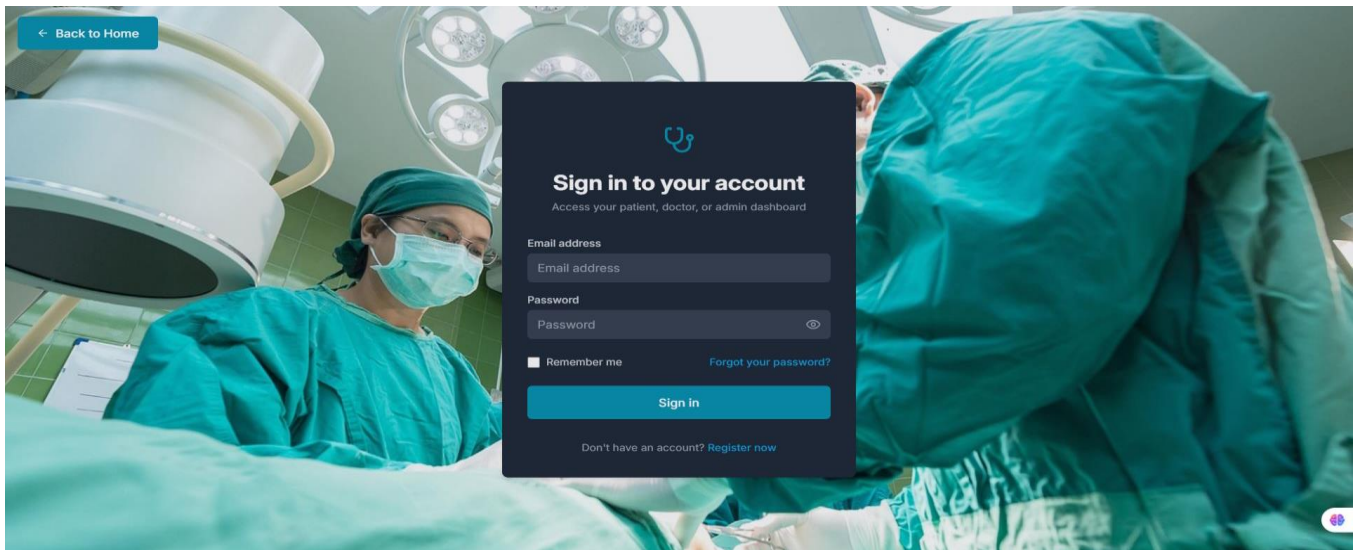


Image Gallery of the Interfaces





MediCare Manage Patients

Staff Users Admins Doctors Patients Departments Rooms Beds Job Positions Roles Shifts Medical Specializations

Search patients by name, contact, or department...

Add a New Patient

Name	Last Name
dd/mm/yyyy	Male
Contact Number	Personal ID
Email	Address
Active	Select Blood Type

Upload Profile Image

Choose File

Add Patient

Full Name	Birthdate	Gender	Contact Number	Email	Status	Profile Image	Actions
-----------	-----------	--------	----------------	-------	--------	---------------	---------

MediCare

Ana

Dashboard


Appointments

Medical Records

Profile

Settings

My Profile



robert prevost

Patient ID: P12345

Username : Ana

Personal Information

Full Name

robert prevost

Date of Birth

29/3/1968

Email

victor253@gmail.com

Phone

521545121247

Gender

Male

Blood Type

A-

Address Information

Street Address

4fdhdhgfdh

City

Anytown

State/Province

State

Zip/Postal Code

12345

Country

United States

MediCare

Ana

Dashboard

Appointments

Medical Records

Profile

Settings

Welcome,

Here's an overview of your health information

Book Appointment

Upcoming Appointments

0

Completed Visits

12

Prescriptions

4

Medical Records

8

Upcoming Appointments

View all

Failed to load data

Recent Medical Records

View all

Annual Checkup

Aug 15, 2023

General health evaluation and preventive care assessment.

View Report

Blood Test Results

Jun 28, 2023

Complete blood count and metabolic panel results.

Current Prescriptions

Amoxicillin

Dosage

500mg

Frequency

Twice daily

Start Date

Sep 10, 2023

End Date

Sep 17, 2023

Instructions:

MediCare

Ana

Dashboard

Appointments

Medical Records

Profile

Settings

My Appointments

Search by doctor name or spe

dd/mm/yyyy

to

dd/mm/yyyy

All Statuses

Book Appointment

Dr. victor camacaro

11 de junio de 2025, 16:59

Specialty: cardiology

Status: Scheduled

Reschedule

Cancel

Dr. victor camacaro

25 de mayo de 2025, 15:13

Specialty: cardiology

Status: Scheduled

Reschedule

Cancel

Dr. victor camacaro

22 de mayo de 2025, 14:03

Specialty: cardiology

Status: Scheduled

Reschedule

Cancel

Dr. jose perez

22 de mayo de 2025, 13:28

Specialty: Anesthesiology

Status: Scheduled

Reschedule

Cancel

22

MediCare

Ana

Dashboard

Appointments

Medical Records

Profile

Settings

Medical Records

Patient Information

Name: robert prevost
Date of Birth: 29/3/1968
Contact: 521545121247

Search by diagnosis...

dd/mm/aaaa

to

dd/mm/aaaa

Medical Records

Diagnosis: Fever and flu symptoms and something

Visit Date: 30 de marzo de 2025, 20:00

Doctor: victor camacaro

Prescription: Paracetamol and fluids

Edit

Diagnosis: John is a 35-year-old male who presents with acute onset lower back pain for the past 3 days. The pain started after lifting heavy boxes at work. He rates the pain as 7/10 in intensity, describing it as sharp and localized to the lumbar region. The pain worsens with movement and bending forward but improves with rest. No associated bowel or bladder symptoms.

Visit Date: 3 de marzo de 2025, 20:00

Doctor: victor camacaro

Prescription: Ibuprofen 400mg orally every 6 hours as needed for pain,Acetaminophen 500mg orally every 4-6 hours as needed for pain

Edit

MediCare

Ana

Dashboard

Appointments

Medical Records

Profile

Settings

Book Appointment

Select Specialization

Choose a specialization

Select Doctor

Choose a doctor

Start Time

dd/mm/aaaa --:--

End Time

dd/mm/aaaa --:--

Additional Notes

Enter any additional notes here...

Book Appointment

MediCare

victor23

Dashboard

Appointments

Patients

Profile

Settings

Welcome, Dr. victor23

viernes, 18 de julio de 2025

Add Patient

Manage Schedule

Today's Appointments

0

0 completed

Upcoming

0

No pending

Total Patients

1

View full list

Add New Patient

Easily add a new patient to the system

Add Patient

Manage Appointments

View and manage your appointments.

Go to Appointments

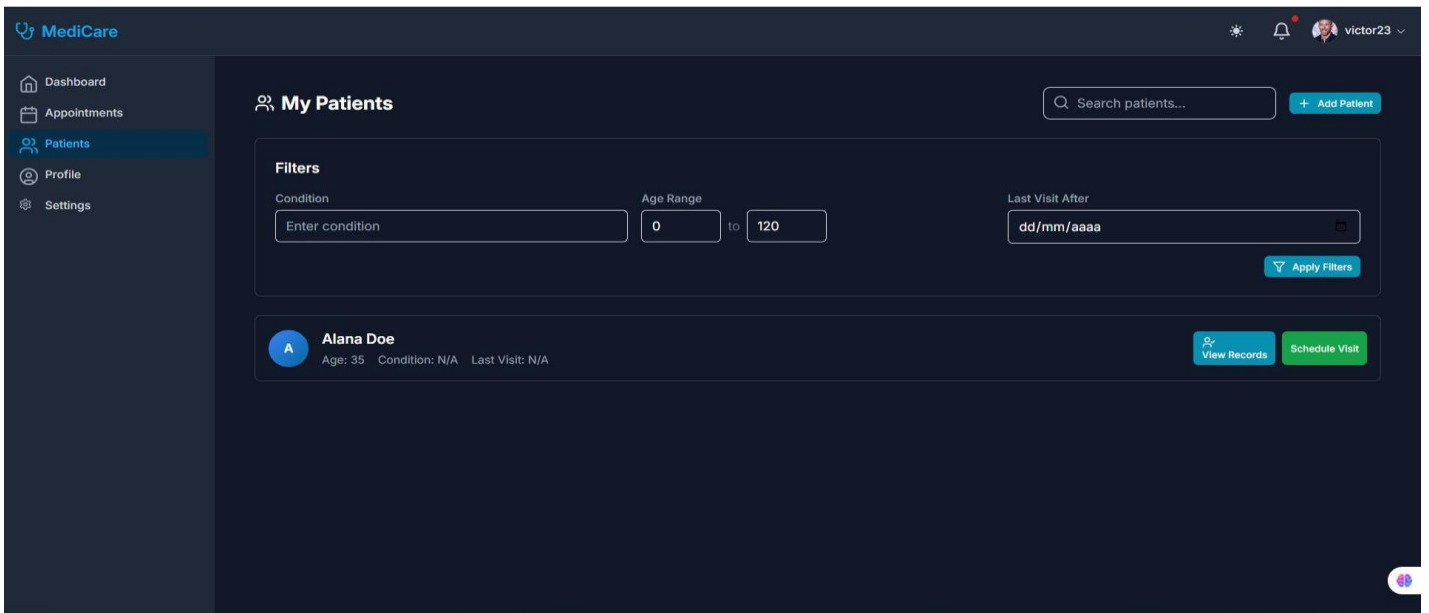
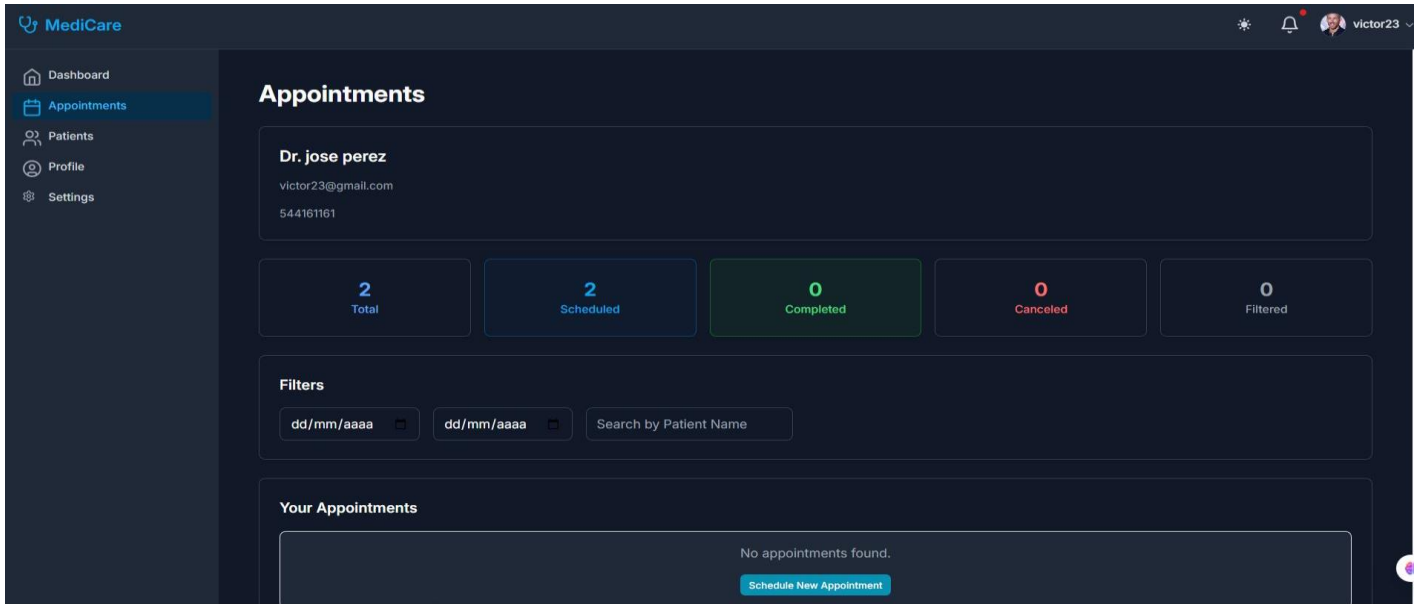
Today's Schedule

View all


No appointments scheduled for today


Enjoy your day off!


23





Edit


 First Name
jose


 Specialization
Anesthesiology


 Email
victor23@gmail.com


 Personal ID
454655

 Bio
es un buen doctor

 Last Name
perez

 Department
Cardiology

 Phone
544161161

 Hire Date
1119-03-30



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