

Healthcare Manager

-technical report-

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● Purpose

- National Reality

In many countries, healthcare services are often overburdened, leading to long waiting times for appointments and difficulties in managing patient records. Electronic Health Records (EHR) systems are not uniformly adopted, and patients often face challenges in accessing their medical histories across different healthcare providers.

- International Reality

Internationally, there are several successful implementations of healthcare management platforms. For instance, platforms like MyChart (USA) and Patient Access (UK) offer similar functionalities but are often limited to specific healthcare providers or regions. These platforms demonstrate the feasibility and benefits of integrated healthcare management systems but also highlight the need for a more universally accessible solution.

● Existing Solutions

1. MyChart (USA)

- Features: Appointment scheduling, medical history access, secure messaging, prescription renewals.
- Technologies: Developed by Epic Systems, uses proprietary software, integration with healthcare providers' systems.
- Marketing Approach: Targeted towards large healthcare providers and hospitals, emphasizing patient engagement and data integration.

2. Patient Access (UK)

- Features: Online consultations, appointment booking, medical records access, repeat prescriptions.
- Technologies: Developed by EMIS Health, web-based application, integration with NHS services.
- Marketing Approach: Focuses on accessibility and convenience for NHS patients, promoting digital health services.

3. Teladoc Health (International)

Features: Telehealth consultations, mental health services, medical advice, and second opinions.

Technologies: Cloud-based platform, mobile and web applications.

Marketing Approach: Emphasizes the convenience of telehealth and the broad range of services offered globally.

● Overview of Technologies for proposed solution

1. Frontend:

- **Blazor:** Chosen for its ability to build interactive web UIs using C# instead of JavaScript, leveraging the .NET ecosystem.
- **Bootstrap:** For responsive design and ease of use.

2. Backend:

- **.NET:** Selected for its robustness, performance, and seamless integration with Blazor.
- **ASP.NET Core:** For building secure and scalable web APIs.

3. Database:

- **PostgreSQL:** Chosen for its robustness, extensibility, and support for complex queries and transactions.
- **MongoDB:** To handle unstructured data, such as medical records and chat logs.

4. Authentication and Security:

- **JWT (JSON Web Tokens):** For secure authentication and authorization processes.
- **TLS/SSL Encryption:** To ensure data transmission security.

5. APIs:

- **OpenAPI (SwaggerHub):** For designing and documenting RESTful APIs, ensuring clarity and standardization.

● Business Model Canvas

Healthcare Manager Business Model Canvas

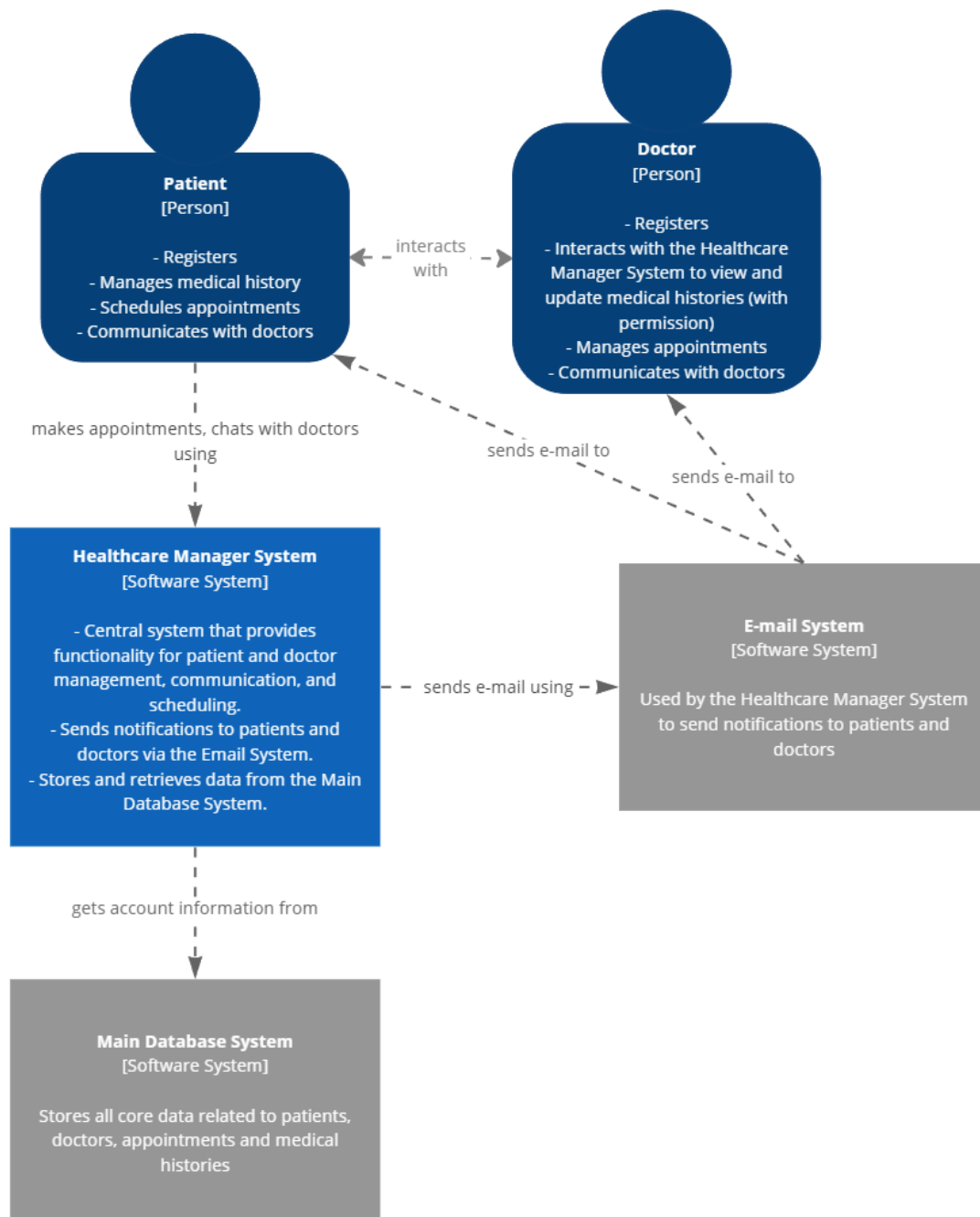
Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
Whom will you work with as you run the business? Name your partners and the roles they will take on. - Medical facilities (hospitals, clinics) - Technology providers	What are the tasks and activities that must be done every day to keep the business running? - App development and maintenance - Ensuring security of user's data and compliance of highest security standards	What is the need you are trying to address? What value will your product bring to the target audience? - Fast and convenient way for patients to access medical services - Organized and easy to use platform for doctors to handle appointments, to quickly and easily reach the patient and their medical records - Security and trust	What relationships will you establish with each customer segment? - Personalized support - Direct and honest feedback	Who is your target market? What are the characteristics of your early adopters? List the personas that you expect to use your product. - Medical facilities open to the general public - Patients or even potential patients of before mentioned medical facilities
	Key Resources What are the tangible and intangible things you need to create your product? - Technology infrastructure - Skilled development team - Thorough testing procedures - Financial backing		Channels Where will your product be available? List the ways you plan to reach your target audience - Company website - Social media - Targeted ads	
Cost Structure What are the fixed and variable costs for launching your product or service? Consider the cost at each stage - from setting up and hiring all the way to marketing and distribution. - Development, QA and maintenance - Marketing and customer acquisition - Cloud infrastructure and potential upgrades			Revenue Streams How will you generate income? Show a pricing model of your product or service and include other revenue sources, such as sales and subscription fees. - Partnerships - Subscriptions	

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● C4 Diagram

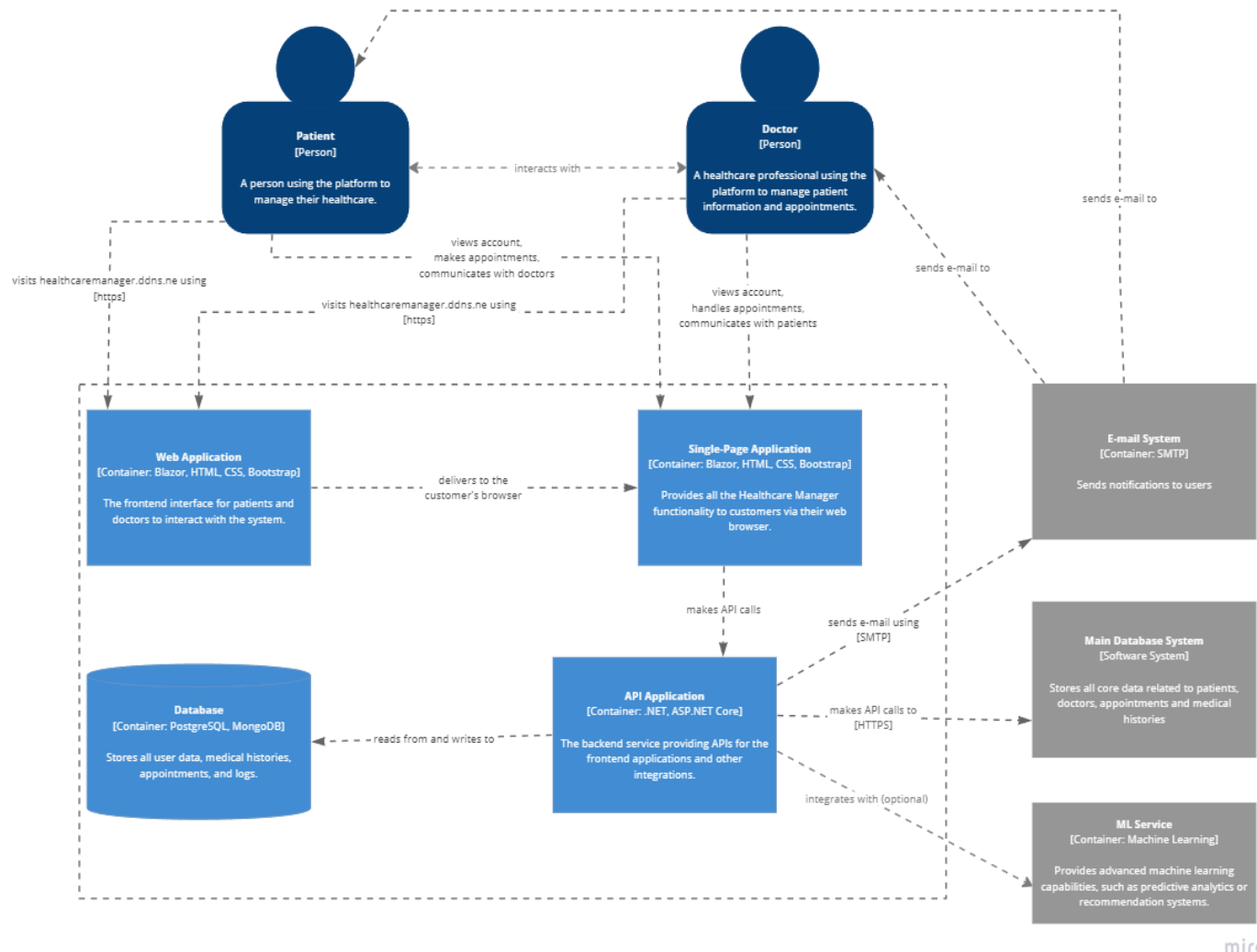
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○ Context



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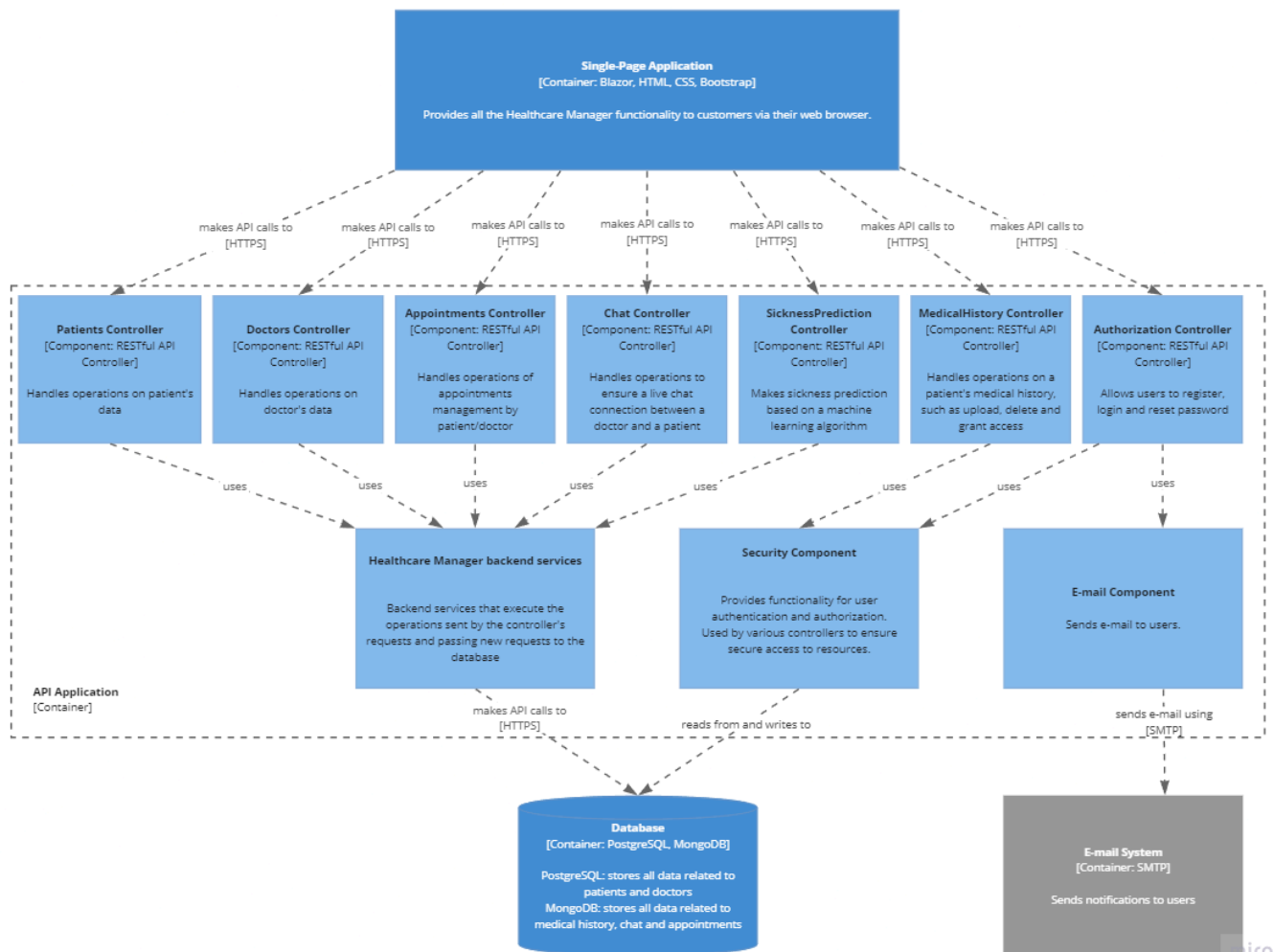
○ Containers



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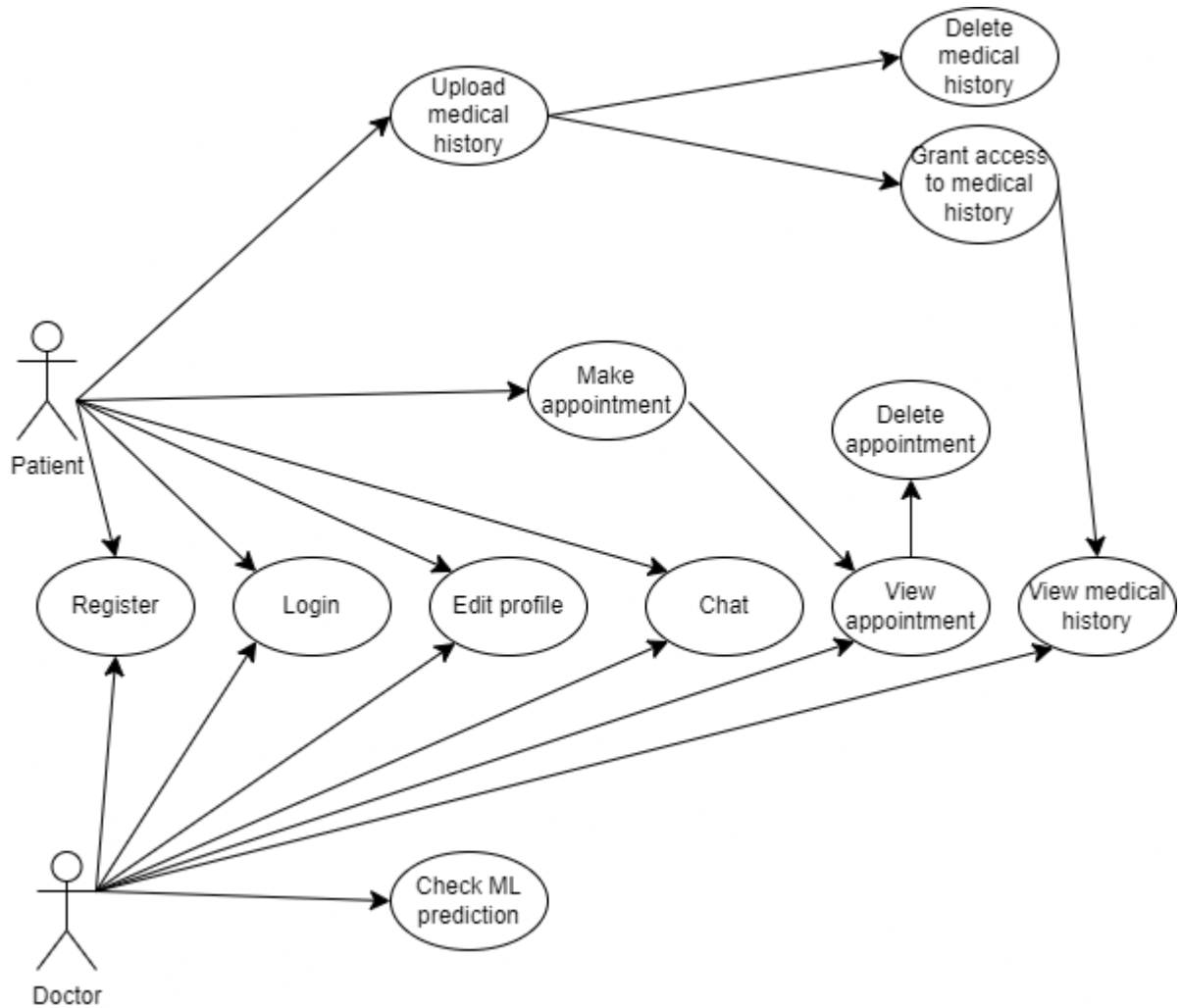
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○ Components



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● Use Case Diagram



● APIs

The API will open the following endpoints to the UI:

- /users
- /doctors
- /authentication (sign-up + login)
- /medical_history
- /chat
- /appointments
- /ml

Authentication Endpoint:

- /reset_token

Patient Endpoint:

- POST: /register
- POST: /login
- PUT: /profile
- DELETE: /profile
- POST: /appointment
- PUT: /appointment
- DELETE: /appointment

Doctor Endpoint:

- POST: /register
- POST: /login
- PUT: /profile
- DELETE: /profile
- POST: /appointment
- PUT: /appointment
- DELETE: /appointment

Chat Endpoint:

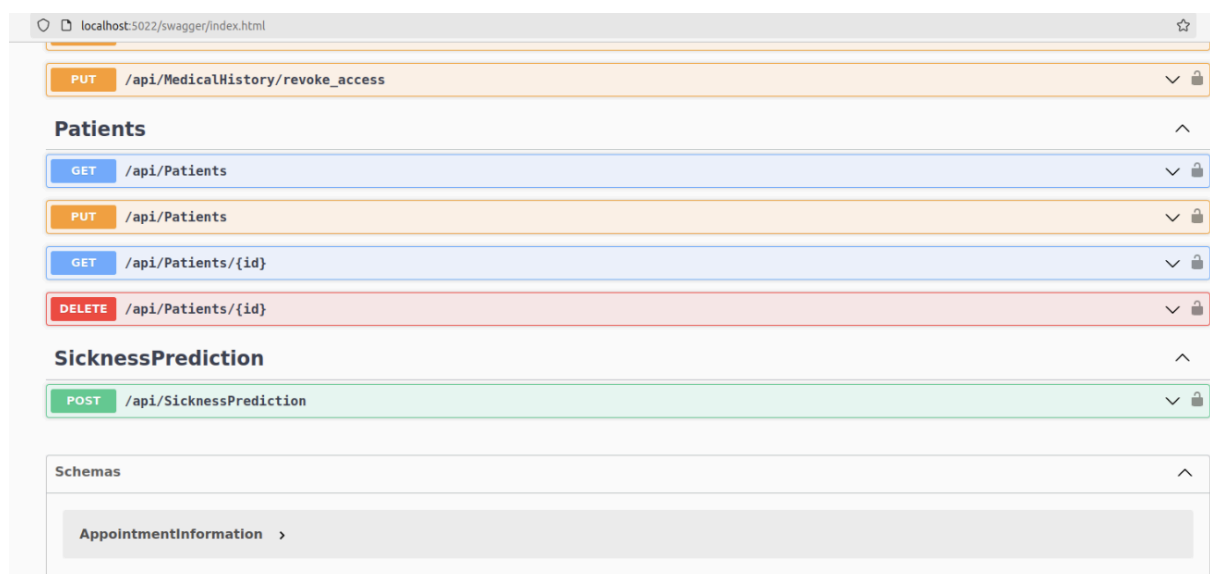
- POST: /
- GET: /

Appointments Endpoint:

- POST: /
- GET: /

Medical History Endpoint:

- POST: / (only by patient)
- GET: / (only by patient)
- PUT: / (only by doctor)
- DELETE: / (only by patient)
- POST: /grant_access
- POST: /revoke_access



localhost:5022/swagger/index.html

Authorize

Appointments

- POST /api/Appointments
- PUT /api/Appointments
- GET /api/Appointments/patient/{id}
- GET /api/Appointments/doctor/{id}

Authorization

- POST /api/Authorization/login
- POST /api/Authorization/register
- POST /api/Authorization/reset_password
- POST /api/Authorization/refresh_token

Chat

- POST /api/Chat/send_message
- POST /api/Chat/get_conversation

Doctors

- GET /api/Doctors
- PUT /api/Doctors
- DELETE /api/Doctors/{id}

MedicalHistory

- GET /api/MedicalHistory/{id}
- DELETE /api/MedicalHistory/{id}
- GET /api/MedicalHistory/user/{userId}
- GET /api/MedicalHistory
- POST /api/MedicalHistory
- PUT /api/MedicalHistory
- POST /api/MedicalHistory/check_access
- PUT /api/MedicalHistory/grant_access
- PUT /api/MedicalHistory/revoke_access

Patients

● Functionality flows:

1. Patient Registration:

- User fills out the registration form.
- System verifies email.
- User uploads medical history (optional).

- System stores user data securely.
- 2. Doctor Registration:
 - User fills out the registration form with professional details.
 - System verifies credentials.
 - User sets consultation prices and lists services (optional).
 - System stores user data securely.
- 3. Appointment Scheduling:
 - Patient selects a doctor and preferred time slot.
 - Appointment is booked and added to both patient's and doctor's calendars.
- 4. Medical History Management:
 - Patient uploads or modifies medical history.
 - System encrypts and stores data.
 - Patients grant or revoke access to doctors as needed.
 - Doctors view and update records with permission.
- 5. Communication:
 - Patient or doctor initiates chat.
 - System establishes a secure connection.
 - Messages are exchanged in real-time.
 - Chat logs are stored securely for future reference.

● **Future features:**

1. Telemedicine Integration:
 - Video Consultations: Allow patients to have video consultations with doctors directly through the platform.
 - Remote Monitoring: Integrate with wearable devices to monitor patient vitals in real-time and provide data to doctors.
2. AI and Machine Learning improvements:
 - Predictive Analytics: Use machine learning to predict patient health issues based on historical data and suggest preventive measures.
 - Personalized Recommendations: Provide personalized health tips and reminders based on patient data.
 - Chatbots: Implement AI-powered chatbots to assist with common patient queries and appointment scheduling.
3. Enhanced Medical History Management:
 - Advanced Search and Filters: Allow patients and doctors to easily search and filter medical records.
 - Document Recognition: Use OCR technology to digitize and categorize paper-based medical records.
 - Interoperability: Ensure compatibility with other healthcare systems to facilitate seamless data exchange.
4. Improved Communication:

- Group Chats: Enable group chats for patients to discuss their conditions with multiple doctors or support groups.
 - Secure Messaging: Implement end-to-end encryption for all communications between patients and doctors.
5. Appointment Management:
- Automated Reminders: Send automated reminders for upcoming appointments via email, SMS, or push notifications.
 - Waitlist Management: Allow patients to join waitlists for earlier appointment slots if they become available.
 - Virtual Waiting Room: Create a virtual waiting room experience for patients before their appointments.
6. Health Tracking and Reporting:
- Health Dashboards: Provide patients with dashboards to track their health metrics over time.
 - Custom Reports: Allow patients to generate custom health reports to share with other healthcare providers or for personal records.
7. Enhanced Security and Privacy:
- Multi-Factor Authentication: Implement multi-factor authentication for all users to enhance security.
 - Data Anonymization: Ensure patient data is anonymized when used for research or analytics to protect privacy.
 - Audit Logs: Maintain detailed audit logs to track all access and modifications to patient data.
8. Financial and Insurance Management:
- Billing and Invoicing: Integrate billing and invoicing features for consultations and other services.
 - Insurance Claims: Allow patients to submit insurance claims directly through the platform and track their status.
 - Cost Estimator: Provide a cost estimator tool for patients to get an estimate of their healthcare expenses.
9. Community and Support:
- Patient Forums: Create forums for patients to share experiences and support each other.
 - Doctor Ratings and Reviews: Allow patients to rate and review their doctors to help others make informed decisions.
 - Resource Library: Provide access to a library of healthcare resources, articles, and videos.
10. Mobility and Accessibility:
- Mobile App Enhancements: Continuously improve the mobile app with new features and better usability.
 - Accessibility Features: Ensure the platform is accessible to users with disabilities by following WCAG guidelines.
11. Integration with Other Services:

- Pharmacy Integration: Integrate with pharmacies for prescription fulfillment and delivery.
- Laboratory Integration: Connect with laboratories for seamless test ordering and result retrieval.
- Fitness and Nutrition Apps: Integrate with popular fitness and nutrition apps to provide a holistic view of patient health.

● Conclusion:

By continuously adding and improving features, the healthcare management platform can better meet the needs of patients and doctors, enhance user satisfaction, and stay competitive in the rapidly evolving healthcare industry. These suggested features provide a roadmap for future development, ensuring the platform remains innovative and valuable.

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