Topic : Hospital Management System

Team No : 1

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Business Problem Statement

Efficient hospital appointment management is essential for both patients and healthcare providers. Traditional appointment scheduling methods are prone to inefficiencies such as double bookings, long wait times, and scheduling conflicts. Additionally, managing doctor availability, patient records, and emergency cases manually results in administrative burdens and delays in medical services.

The Hospital Appointment Management System aims to address these challenges by developing a database-driven solution that optimizes scheduling, reduces wait times, prioritizes urgent cases, and ensures secure access to patient data. This system will streamline hospital operations while improving patient satisfaction.

Mission Objectives

The database is made to meet the following main goals:

Easy Scheduling of Appointments

Depending on the doctor's availability, patients can make, change, and cancel appointments. The system lessens scheduling problems and avoids overbooking.

Management of Doctor Availability

Doctors are able to instantly adjust their availability. By avoiding duplicate bookings, the system ensures workload balance.

Managing Queues and Cutting Down on Wait Times

Giving emergency cases precedence over regular examinations. To improve the patient experience, estimated wait times are displayed.

Access Control Based on Roles

Patients have access to their past appointments. Physicians are solely able to control their own schedules. Admins have the ability to keep an eye on all appointments and change reservations as necessary.

Compliance & Data Security

Protect private patients and appointment data with encryption. Put in place stringent access control measures to safeguard private health data.

Automated Reminders & Notifications

Sending reminders and confirmations via email and SMS can help reduce no-shows.

Database Entities and Relationships

Patient (Patient_ID, Name, DOB, Contact, Email, Medical_History_ID) Stores patient details and links to medical records. Has multiple Appointments and Payments.

Doctor (Doctor_ID, Name, Specialization, Contact, Availability_Status, Department_ID) Contains doctor details and availability. Belongs to a Department, has multiple Appointments, follows a Schedule.

Appointment (Appointment_ID, Patient_ID, Doctor_ID, Date, Time, Status, Emergency_Flag) Tracks scheduled, completed, and canceled appointments. Linked to Patients, Doctors, Payments, and Notifications.

Department (Department_ID, Name, Description) Categorizes doctors by specialty. Linked to multiple Doctors.

Schedule (Schedule_ID, Doctor_ID, Day, Start_Time, End_Time, Status) Manages doctor availability. Belongs to a Doctor.

Payment & Billing (Payment_ID, Appointment_ID, Patient_ID, Amount, Payment_Status, Payment_Method) Stores payment details for consultations. Linked to Patients and Appointments.

Notification & Reminders (Notification_ID, Appointment_ID, Type, Sent_Time, Status) Sends automated reminders for scheduled appointments. Linked to Appointments.

Medical Record (Medical_History_ID, Patient_ID, Diagnosis, Prescription, Test_Results, Date) Stores previous diagnoses, prescriptions, and test results. Belongs to a Patient.

Admin/Staff (Admin_ID, Name, Role, Contact, Email, Permissions_Level) Manages scheduling conflicts and overrides emergency cases. Overseas Appointments and Emergency Cases.

Emergency & Walk-in Case (Emergency_ID, Patient_ID, Assigned_Doctor_ID, Severity_Level, Status, Timestamp) Handles urgent cases requiring immediate attention. Linked to Patients and Doctors.

Key Database Design Decisions

Relationships & Entity Selection

The main link between patients, doctors, payments, and notifications is an appointment. To avoid conflicts, the Schedule entity tracks the availability of doctors. To enable high-priority handling, emergency cases are kept apart from appointments in storage. To guarantee that patients receive reminders, notifications are connected to appointments.

Integrity of Data and Normalization

Third Normal Form (3NF) is used in the database to reduce duplication and boost productivity. To prevent data duplication, each entity only has pertinent attributes.

Compliance & Security

Only authorized data can be accessed by patients, physicians, and administrators thanks to role-based access control, or RBAC. To protect privacy, sensitive data (such as health information and payments) must be encrypted.

Performance and Scalability

The Schedule entity enables real-time updates on the availability of doctors. For quick lookups, indexing is applied to the patient, doctor, and appointment IDs. Telemedicine consultations and insurance provider integration are examples of potential future extensions.

ER Diagram

Doctor
- Doctor ID
- Name
- Specialization
- Contact
- Availability
- Department ID

Admin
- Admin ID
- Name
- Role
- Contact
- Email
- Permission and access level

Appointment
- Appointment ID
- Patient ID
- Doctor ID
- Date
- Time
- Status
- Emergency flag

Patient
- Patient ID
- Name
- DOB
- Contact
- Email
- Medical History ID

Emergency Case
- Emergency_ID
- Patient ID
- Assigned Doctor ID
- Severity level
- Status
- Timestamp

Notifications
- Notification ID
- Type
- Sent time
- Status

Department
- Department ID
- Name
- Description

schedule
- Schedule ID
- Doctor ID
- Day
- Start time
- End time
- Status

Medical Record
- Medical History ID
- Patient ID
- Date
- Prescription
- Diagnosis
- Test results

Payment
- Payment ID
- Patient ID
- Appointment ID
- Amount
- Payment status
- Payment method

Relationships:
- Is assigned to
- Manages
- oversees
- Attends
- Books
- In case of
- has
- Belongs to
- Makes
- Follows
- Triggers
- Generates