Schema Documentation

Hospital, Pharmacy, and Blood Bank Management System

Introduction

This document describes how Schema will be created in the Hospital, Pharmacy, and Blood Bank Management System. This system involves multiple users such as doctors, receptionists, pharmacists, blood managers, and administrators accessing shared data. Proper Tables and their attributes are mentioned here.

Main Entities

- Doctor
- Receptionist
- Patient
- ER Shifts
- OT
- Pharmacist
- Medicine
- Blood Manager
- Donors
- Blood
- Donation
- ER Patient
- ER Patient Entry
- ER Shift Doctor
- Prescription
- Prescription Medicine
- Dispensing
- Blood Request Fulfillment
- Appointment
- Blood_Request

USER ROLES:

Role 1: Administrator

Manages the entire system with full access to all modules, users, and configurations. Responsible for user management, system settings, reporting, and overall monitoring, but does not perform clinical or operational tasks

Role 2: Doctor

Diagnoses and treats patients, manages prescriptions, and requests blood when needed. Has access to patient records and participates in appointments, ER shifts, and surgeries, but cannot handle pharmacy or blood bank operations

Role 3: Pharmacist

Manages medicine inventory and dispenses prescriptions. Ensures safe medication use, tracks stock and expiry, and handles pharmacy transactions, but cannot prescribe medicines or access full medical records

Role 4: Blood Manager

Handles blood bank operations including donor management, blood collection, storage, and request fulfillment. Ensures blood availability and safety but cannot make medical decisions or access unrelated modules

Role 5: Receptionist

Manages patient registration and appointment scheduling. Coordinates doctor availability, ER shifts, and OT bookings, with access limited to administrative and basic patient information

Doctor:

Purpose: Stores information about registered doctors including their specialization and contact details. Central entity linked to prescriptions, appointments, and patients.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for doctors
Name	STRING	FALSE	Full name of the doctor
Email	STRING	FALSE	Doctor's official email address
P_No	STRING	FALSE	Doctor's phone number
Specialization	STRING	FALSE	Medical specialization (e.g. Cardiology, Orthopedics)

Receptionist:

Purpose:
The receptionist is responsible for scheduling events like appointments and manages the patients with the hospital and its staff.

Attributes	Data type	Nullable	Description
ID (PK)	INT	False	A unique identifier to differentiate multiple receptionists
Name	STRING	False	Receptionist’s given name
Email	STRING	False	Contact information to connect over the internet
P_No	INT	False	Contact information to enable voice call

Patient:

Purpose: Stores patient personal information and blood group. Central entity connected to appointments, prescriptions, and blood bank requests.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each patient
Name	STRING	FALSE	Full name of the patient
Email	STRING	FALSE	Patient's contact email
B_Gr	STRING	FALSE	Blood group of the patient CHECK (B_Gr IN ('A+','A-','B+','B-','AB+','AB-','O+','O-'))
P_No	STRING	FALSE	Patient's phone number

ER_Shift

Purpose:
This entity is used to manage and track working shifts in the emergency room. It used to allocate the date and time of the shift.

Attributes	Data type	Nullable	Description
ID (PK)	INT	FALSE	Unique identifier to differentiate between ER shifts
Receptionist_ID(FK)	INT	TRUE	References Receptionist table that receptionist coordinating this shift (can be NULL if no receptionist assigned yet)
Time	TIME	FALSE	Specify the time of the ER shift

Date	DATE	FALSE	Specify the date of the ER shift

OT:

Purpose: Stores information about OT number and whether it is available or not. Central entity connected to doctors,nurses,patients through OT management.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for OT
is_available	BOOL	FALSE	Whether OT is available or not

Pharmacist

Purpose: Stores pharmacist details. Pharmacists manage the medicine bank and handle prescriptions requested by doctors.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each pharmacist
Name	STRING	FALSE	Full name of the pharmacist
Email	STRING	FALSE	Pharmacist's contact email
P_No	STRING	FALSE	Pharmacist's phone number

Medicine:

Purpose: Tracks medicine inventory in the pharmacy. Stores stock levels, expiry dates, and batch numbers. Managed by pharmacists and requested by doctors.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each medicine entry

Name	STRING	FALSE	Name of the medicine
Stock	INT	FALSE	Current quantity available in stock, CHECK (Stock >= 0)
Expiry_Date	DATE	FALSE	Expiry date of the medicine batch
Batch_No(PK)	STRING	FALSE	Unique batch number from the supplier

Blood_Manger:

Purpose:
The blood manager handles all the operations related to the blood bank. Keeps track of blood storage, collection and distribution.

Attributes	Data type	Nullable	Description
ID (PK)	INT	FALSE	A unique identifier to differentiate multiple managers
Name	STRING	FALSE	Manager's given name
Email	STRING	FALSE	Contact information to connect over the internet
P_No	INT	FALSE	Contact information to enable voice call

Donor:

Purpose: Stores information about the people who donated bloods and date at which they donated.

Attributes	Datatype	Nullable	Description
ID	INT	FALSE	Blood Group

Name	STRING	FALSE	Name of person
P_no	INT	FALSE	Phone number
Email	STRING	FALSE	Email address
B_Gr	STRING	FALSE	Blood Group
Last Donate	DATE	FALSE	Last Donate Date

Blood:

Purpose: Stores information about the blood groups we have, amount and their collected date.

Attributes	Datatype	Nullable	Description
B_Gr	INT	FALSE	Blood Group
Collected_Date	DATE	FALSE	Date at which this blood was collected B_Gr and Collected_Date will make the PK
Status	STRING	FALSE	CHECK (Status IN ('available', 'reserved', 'used', 'expired', 'discarded'))
Expiry Date	DATE	FALSE	Date at which blood will expire
ID(PK)	INT	FALSE	Uniquely Identify each record
Unit	INT	FALSE	Total amount of Blood

Appointment:
Purpose:
Used to manage and schedule meetings between patients and doctors. It records details of the appointment such as date, time, status, and the receptionist who scheduled the appointment.

Attributes	Data type	Nullable	Description
ID (PK)	INT	FALSE	A unique identifier to differentiate multiple

			appointments
Receptionist_ID (FK)	INT	FALSE	Receptionist ID to identify who made the appointment
Patient_ID (FK)	INT	FALSE	Patient ID to identify who the appointment was made for
Doctor_ID (FK)	INT	FALSE	Doctor ID to identify which doctor is going to handle the appointment
Date	DATE	FALSE	Specify the date of appointment
Time	TIME	FALSE	Specify the time of the appointment
Status	STRING	FALSE	Check if appointment is: pending, cancelled, completed
OT_ID(FK)	INT	TRUE	OT ID if it is needed

Prescription:

Purpose: Stores information of what prescription doctor gave to his patient.

Attributes	**Datatype**	**Nullable**	**Description**
ID(PK)	INT	FALSE	Unique identifier for each record
Doctor ID(FK)	INT	FALSE	ID of doctor
Patient ID(FK)	INT	FALSE	ID of patient
Date	DATE	FALSE	Date at which this prescription was defined

Prescription Medicine:

Purpose: Stores information of what prescription requires what medicine.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each record
Prescription_ID(FK)	INT	FALSE	ID of Prescription
Medicine_ID(FK)	INT	FALSE	ID of Medicine
Quantity	INT	FALSE	Quantity in which medicine is required

Dispensing:

Purpose: Stores information of what medicine is given is by what pharmacist to what prescription.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each record
Medicine_ID(FK)	INT	FALSE	ID of medicine
Pharmacist_ID(FK)	INT	FALSE	ID of pharmacist
Prescription_ID(FK)	INT	FALSE	ID of prescription
Quantity	INT	FALSE	Quantity in which medicine is given

Blood_Request_Fulfillment:

Purpose: Stores information about blood requests who are fulfilled.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each record
Request_ID(FK)	INT	FALSE	ID of request
Blood_ID(FK)	INT	FALSE	ID of blood
Manager_ID(FK)	INT	FALSE	ID of manager
Quantity_Provided	INT	FALSE	Quantity in which blood is given

Fulfillment Date	DATE	FALSE	Date at which this was fulfilled

ER_Management:

Purpose: Stores information about what doctors and nurses are working in this ER shift.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for ER Managements
Doctor_ID(FK)	INT	FALSE	Which Doctor is working
ER_ID(FK)	INT	FALSE	Which Shift is being used

Blood_Request:

Purpose: Stores information about patients who need blood, doctor who requested it and which blood group is needed and how much quantity is needed and whether the request is fulfilled or not.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for OT
Doctor_ID(FK)	INT	FALSE	Doctor who requested it
Patient_ID(FK)	INT	FALSE	Patient who needed it
Quantity_Needed	INT	FALSE	How much blood is needed
Status	STRING	FALSE	Request is "complete", "pending" or “cancelled”
Request_Date	DATE	FALSE	Date at which blood was requested

Donation:

Purpose: Records each blood donation event. Links donors to the blood inventory and tracks when donations occurred. Managed by blood managers to maintain accurate donation history.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each donation record
Donor_ID(FK)	INT	FALSE	References Donors table that which donor made this donation
Manager_ID(FK)	INT	FALSE	References Blood_Manager table that which blood manager processed the donation
Blood_ID(FK)	INT	FALSE	References Blood table that which blood inventory entry this donation contributed to
Donation_Date	DATE	FALSE	Date when the donation was made
Status	STRING	FALSE	Status of the donation (completed/cancelled /deferred) CHECK (Status IN ('completed','cancelled','deferred'))

ER_Patient:

Purpose: Stores information about patients who arrive at the Emergency Room. Links to the main Patient table and tracks ER-specific details like arrival time.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each ER patient record

Name	STRING	FALSE	Full name of the emergency patient
Age	INT	FALSE	Age of the patient CHECK (Age >= 0 AND Age <= 150)
P_No	STRING	FALSE	Patient's phone number for contact
Arrival_Time	TIME	FALSE	Time when patient arrived at ER

ER_Patient_Entry:

Purpose: Junction table linking ER patients to specific ER shifts and doctors. Tracks which doctor treated which ER patient during which shift, including diagnosis and treatment status.

Attributes	**Datatype**	**Nullable**	**Description**
ID(PK)	INT	FALSE	Unique identifier for each ER patient entry
ER_Patient_ID(FK)	INT	FALSE	References ER_Patient table that which emergency patient
Doctor_ID(FK)	INT	FALSE	References Doctor table that which doctor treated this patient
ER_ID(FK)	INT	FALSE	References ER_Shift table that which ER shift this occurred during
Status	STRING	FALSE	Treatment status of the patient CHECK (Status IN ('waiting','in_treatment','admitted','discharged','transferred')) Default: 'waiting'

ER_Shift_Doctor:

Purpose: Junction table linking doctors to ER shifts. Tracks which doctors are assigned to which emergency shifts, managing ER staffing schedules.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each shift assignment
Doctor_ID(FK)	INT	FALSE	References Doctor table that which doctor is assigned
ER_ID(FK)	INT	FALSE	References ER_Shift table that which ER shift they're assigned to

Blood_Request_Fulfillment:

Purpose: Junction table tracking how blood requests are fulfilled. Links blood requests to specific blood inventory units and records which blood manager processed the fulfillment.

Attributes	Datatype	Nullable	Description
ID(PK)	INT	FALSE	Unique identifier for each fulfillment record
Request_ID(FK)	INT	FALSE	References Blood_Request table that which request is being fulfilled
Blood_ID(FK)	INT	FALSE	References Blood table that which blood inventory unit is being allocated
Manager_ID(FK)	INT	FALSE	References Blood_Manager table that which blood manager processed this fulfillment
Quantity_Provided	INT	FALSE	Number of blood units provided to fulfill this request

			CHECK (Quantity_Provided > 0)
Fulfillment_Date	DATE	FALSE	Date when the blood was allocated and provided

Index specifications with rationale

1. idx_er_doctor_availability

This query runs every time a patient enters the ER. Without the index, the database reads every single shift record in the table just to find doctors assigned to one specific ER. With the help of the index, we can directly jump to the right ER to extract the information

2. idx_blood_type_status

This query runs every time a patient needs blood. Instead of the database reading the entire blood inventory table and filtering, the composite index on both blood group and availability status lets the database find matching rows in one go. Only a small set of rows need to be checked for expiry date after.

3. idx_blood_request_status

This query runs when the user wants to check for pending requests and when a blood request is fulfilled. Instead of scanning the requests table repeatedly, the index is used to prevent this full scan.

4. idx_medicine_name

This query runs every time a doctor writes a prescription or a pharmacist checks stock. Without the index, the database reads every medicine record to find one by name. Instead the index is used to speed up this process.