CS353 Project

Hospital Appointment Management System - MediSync

Design Report

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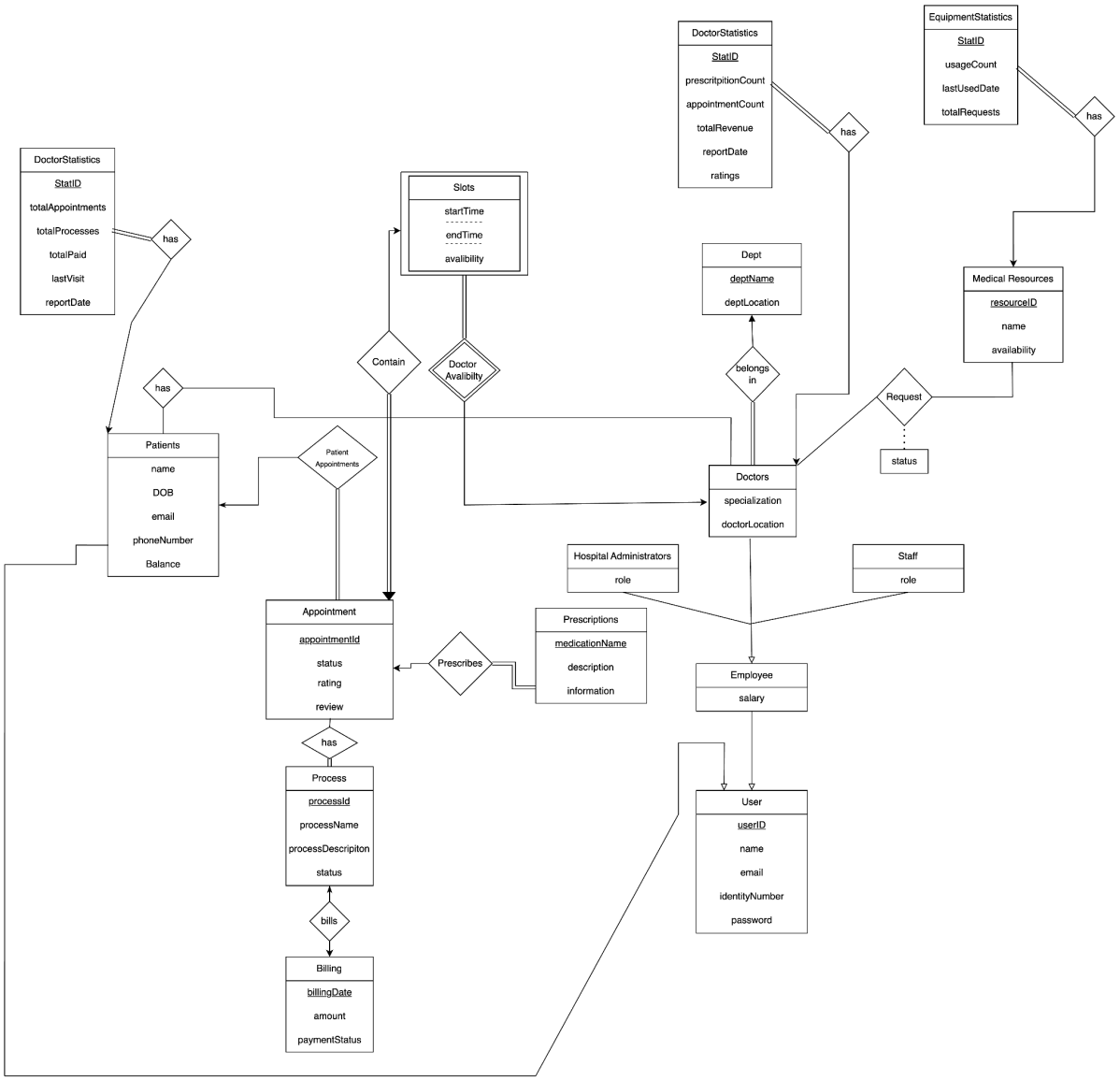
1. Design of the Database

1.1 Revised E/R Diagram



1.2 Relations

DoctorStatistics(**StatID**, prescriptionCount, appointmentCount, totalRevenue, reportDate, ratings,doctorID)

Domains:

- StatID: Integer (unique identifier)
- prescriptionCount: Integer (non-negative count)
- appointmentCount: Integer (non-negative count)
- totalRevenue: Decimal/Money (non-negative amount)
- reportDate: Date (valid calendar date)
- rating: Decimal/Float (typically 0-5 scale)
- doctorID: Integer (matches existing doctor ID)

Candidate Keys:

- StatID
- (doctorID, reportDate) - assuming one statistics record per doctor per date

Primary Key: **StatID** (as indicated in bold in the schema)
Foreign Keys: doctorID references Doctors(employeeID)

EquipmentStatistics(**StatID**, usageCount, lastUsedDate, totalRequests,equipmentID)

Domains:

- StatID: Integer (unique identifier)
- usageCount: Integer (non-negative count)
- lastUsedDate: Date (valid calendar date)
- totalRequests: Integer (non-negative count)
- equipmentID: Integer (matches existing equipment ID)

Candidate Keys:

- StatID
- (equipmentID, lastUsedDate) - assuming one statistics record per equipment per date

Primary Key: **StatID** (as indicated in bold in the schema)
Foreign Keys: equipmentID references MedicalResources(resourceID)

MedicalResources(**resourceID**, name, availability)

Domains:

- resourceID: Integer (unique identifier)
- name: String (equipment name)
- availability: Boolean/String (e.g., "Available", "In Use", "Maintenance")

Candidate Keys:

- resourceID
- name - assuming equipment names are unique in the system

Primary Key: **resourceID** (as indicated in bold in the schema)
Foreign Keys: None

Dept(**deptName**, deptLocation)

Domains:

- deptName: String (department name)
- deptLocation: String (physical location)

Candidate Keys:

- deptName
- deptLocation - assuming each location houses only one department

Primary Key: **deptName** (as indicated in bold in the schema)
Foreign Keys: None

Doctors(**employeeID**, specialization, doctorLocation, *deptName*)

Domains:

- employeeID: Integer (unique identifier)
- specialization: String (medical specialty)
- doctorLocation: String (office/clinic location)
- deptName: String (department name)

Candidate Keys:

- employeeID

Primary Key: **employeeID** (as indicated in bold in the schema)

Foreign Keys:

- deptName references Dept(deptName)
- employeeID references Employee(employeeID)

Staff(**employeeID**, role)

Domains:

- employeeID: Integer (unique identifier)
- role: String (job title/role)

Candidate Keys:

- employeeID

Primary Key: **employeeID** (as indicated in bold in the schema)
Foreign Keys: employeeID references Employee(employeeID)

DoctorPatient(**doctorID,patientID**)

Domains:

- doctorID: Integer (doctor identifier)
- patientID: Integer (patient identifier)

Candidate Keys:

- (doctorID, patientID)

Primary Key: **(doctorID, patientID)** (as indicated in bold in the schema)
Foreign Keys:

- doctorID references Doctors(employeeID)
- patientID references Patient(patientID)

HospitalAdministirators(**employeeID**, role)

Domains:

- employeeID: Integer (unique identifier)
- role: String (administrative role)

Candidate Keys:

- employeeID

Primary Key: **employeeID** (as indicated in bold in the schema)

Foreign Keys: employeeID refer

ences Employee(employeeID)

Patients(**patientID**, name, DOB, email, phoneNumber, Balance)

Domains:

- patientID: Integer (unique identifier)
- name: String (patient name)
- DOB: Date (date of birth)
- email: String (valid email format)
- phoneNumber: String (valid phone number format)
- Balance: Decimal/Money (account balance)

Candidate Keys:

- patientID
- email - assuming email addresses are unique
- phoneNumber - assuming phone numbers are unique
- (name, DOB) - assuming name and birth date combinations are unique

Primary Key: **patientID** (as indicated in bold in the schema)
Foreign Keys: patientID references User(userID)

PatientStatistics(***StatID***,*patientID,totalAppointments,totalProcesses,totalPaid,lastVisit,reportDate*)

Domains:

- StatID: Integer (unique identifier)
- patientID: Integer (patient identifier)
- totalAppointments: Integer (non-negative count)

- totalProcesses: Integer (non-negative count)
- totalPaid: Decimal/Money (non-negative amount)
- lastVisit: Date (valid calendar date)
- reportDate: Date (valid calendar date)

Candidate Keys:

- StatID
- (patientID, reportDate) - assuming one statistics record per patient per date

Primary Key: **StatID** (as indicated in bold in the schema)
Foreign Keys: patientID references Patients(patientID)

Slots(**doctorID**,**slotID**, **startTime, endTime**, availability)

Domains:

- doctorID: Integer (doctor identifier)
- slotID: Integer (slot identifier)
- startTime: DateTime (appointment start time)
- endTime: DateTime (appointment end time)
- availability: Boolean/String (e.g., "Available", "Booked")

Candidate Keys:

- (doctorID, slotID)
- (doctorID, startTime, endTime) - assuming no overlapping slots for same doctor

Primary Key: **(doctorID, slotID, startTime, endTime)** (as indicated in bold in the schema)
Foreign Keys: doctorID references Doctors(employeeID)

Contain(appointmentID,doctorID,**slotID**, **startTime, endTime)**

Domains:

- appointmentID: Integer (appointment identifier)
- doctorID: Integer (doctor identifier)
- slotID: Integer (slot identifier)
- startTime: DateTime (start time)
- endTime: DateTime (end time)

Candidate Keys:

- (appointmentID, doctorID, slotID, startTime, endTime)
- appointmentID - assuming each appointment is assigned to exactly one slot

Primary Key: Composite key of **(appointmentID, doctorID, slotID, startTime, endTime)**

Foreign Keys:

- appointmentID references Appointment(appointmentID)
- (doctorID, slotID, startTime, endTime) references Slots(doctorID, slotID, startTime, endTime)

Appointment(**appointmentID**, status, rating, review, *patientID*, *doctorID*)

Domains:

- appointmentID: Integer (unique identifier)
- status: String (e.g., "Scheduled", "Completed", "Cancelled")
- rating: Integer/Float (typically 1-5 scale)
- review: Text (patient feedback)
- patientID: Integer (patient identifier)
- doctorID: Integer (doctor identifier)

Candidate Keys:

- appointmentID
- (patientID, doctorID, startTime, endTime) - assuming a patient can't have multiple appointments with the same doctor at the same time

Primary Key: **appointmentID** (as indicated in bold in the schema)
Foreign Keys:

- patientID references Patients(patientID)
- doctorID references Doctors(employeeID)

Process(**processID**, processName, processDescription, status, *appointmentID*)

Domains:

- processID: Integer (unique identifier)
- processName: String (name of medical procedure/service)

- processDescription: Text (detailed description)
- status: String (e.g., "Scheduled", "In Progress", "Completed")
- appointmentID: Integer (appointment identifier)

Candidate Keys:

- processID
- (appointmentID, processName) - assuming each procedure type is performed only once per appointment

Primary Key: **processID** (as indicated in bold in the schema)
Foreign Keys: appointmentID references Appointment(appointmentID)

Billing(**billingID**, billingDate, amount, paymentStatus, *processID*)

Domains:

- billingID: Integer (unique identifier)
- billingDate: Date (invoice date)
- amount: Decimal/Money (charged amount)
- paymentStatus: String (e.g., "Paid", "Pending", "Overdue")
- processID: Integer (process identifier)

Candidate Keys:

- billingID
- (processID, billingDate) - assuming one billing record per process per date

Primary Key: **billingID** (as indicated in bold in the schema)
Foreign Keys: processID references Process(processID)

Prescriptions(**prescriptionID**, medicationName, description, information, *doctorID*, *appointmentID*)

Domains:

- prescriptionID: Integer (unique identifier)
- medicationName: String (name of medication)
- description: Text (usage instructions)
- information: Text (additional information)
- doctorID: Integer (doctor identifier)
- appointmentID: Integer (appointment identifier)

Candidate Keys:

- prescriptionID
- (doctorID, appointmentID, medicationName) - assuming each medication is prescribed only once per doctor-appointment pair

Primary Key: **prescriptionID** (as indicated in bold in the schema)

Foreign Keys:

- doctorID references Doctors(employeeID)
- appointmentID references Appointment(appointmentID)

Employee(**employeeID**, salary)

Domains:

- employeeID: Integer (unique identifier)
- salary: Decimal/Money (employee salary)

Candidate Keys:

- employeeID

Primary Key: **employeeID** (as indicated in bold in the schema)
Foreign Keys: employeeID references User(userID)

User(**userID**, name, email, identityNumber, password)

Domains:

- userID: Integer (unique identifier)
- name: String (user name)
- email: String (valid email format)
- identityNumber: String (government-issued ID)
- password: String (hashed password)

Candidate Keys:

- userID
- email - assuming email addresses are unique
- identityNumber - assuming government IDs are unique

Primary Key: **userID** (as indicated in bold in the schema)
Foreign Keys: None

Request(***doctorID*, *resourceID***, status)

Domains:

- doctorID: Integer (doctor identifier)
- resourceID: Integer (resource identifier)
- status: String (e.g., "Pending", "Approved", "Denied")

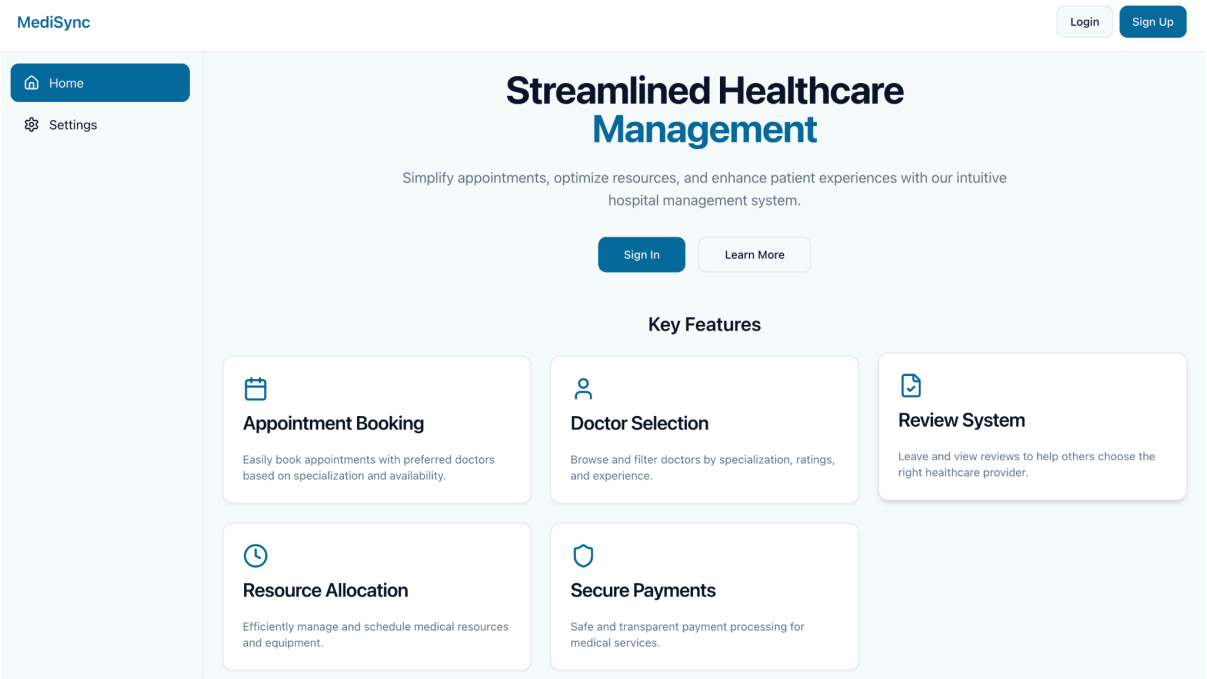
Candidate Keys:

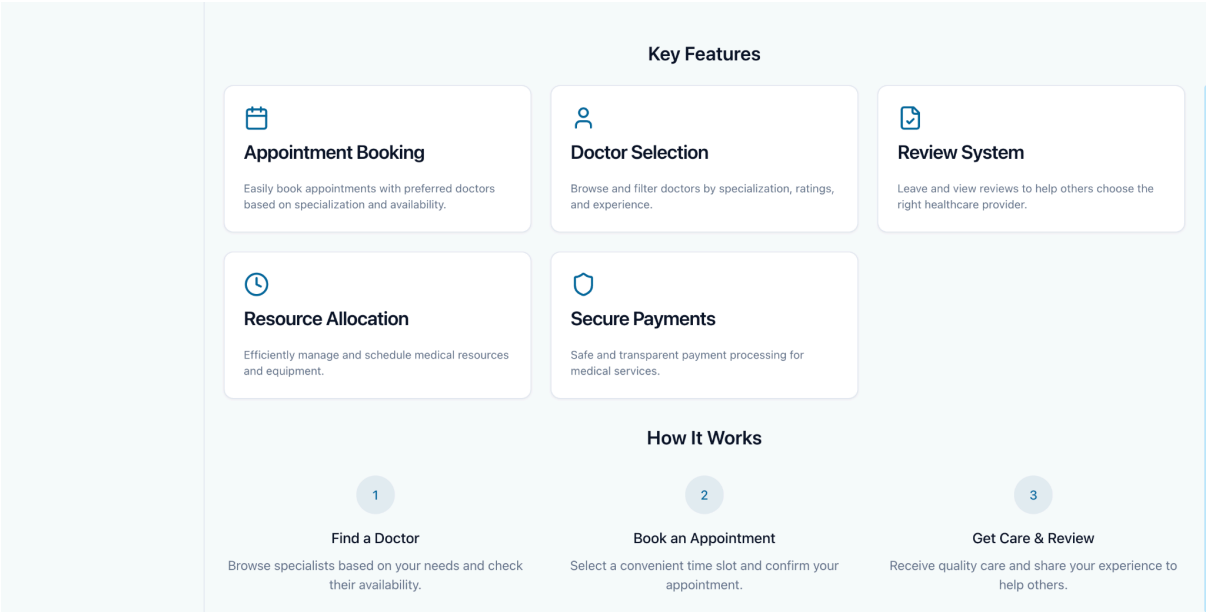
- (doctorID, resourceID)

Primary Key: **(doctorID, resourceID)** (composite key as indicated)
Foreign Keys:

- doctorID references Doctors(employeeID)
- resourceID references MedicalResources(resourceID)

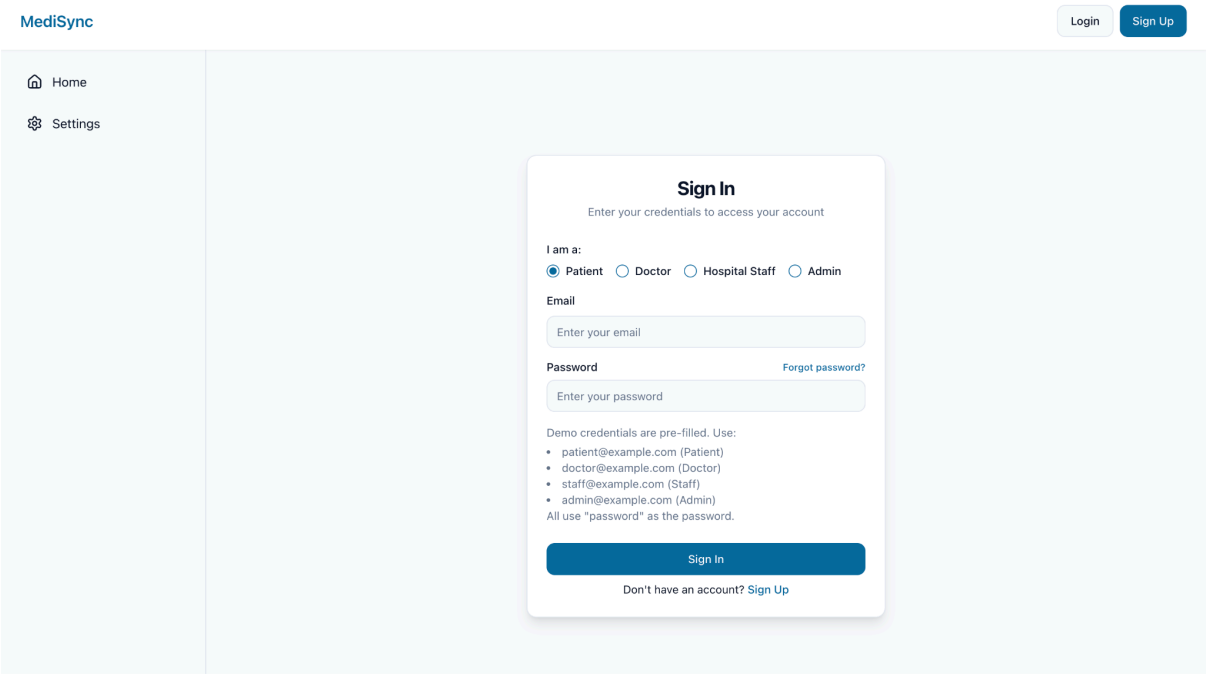
2. User Interface Design & Corresponding SQL Statements





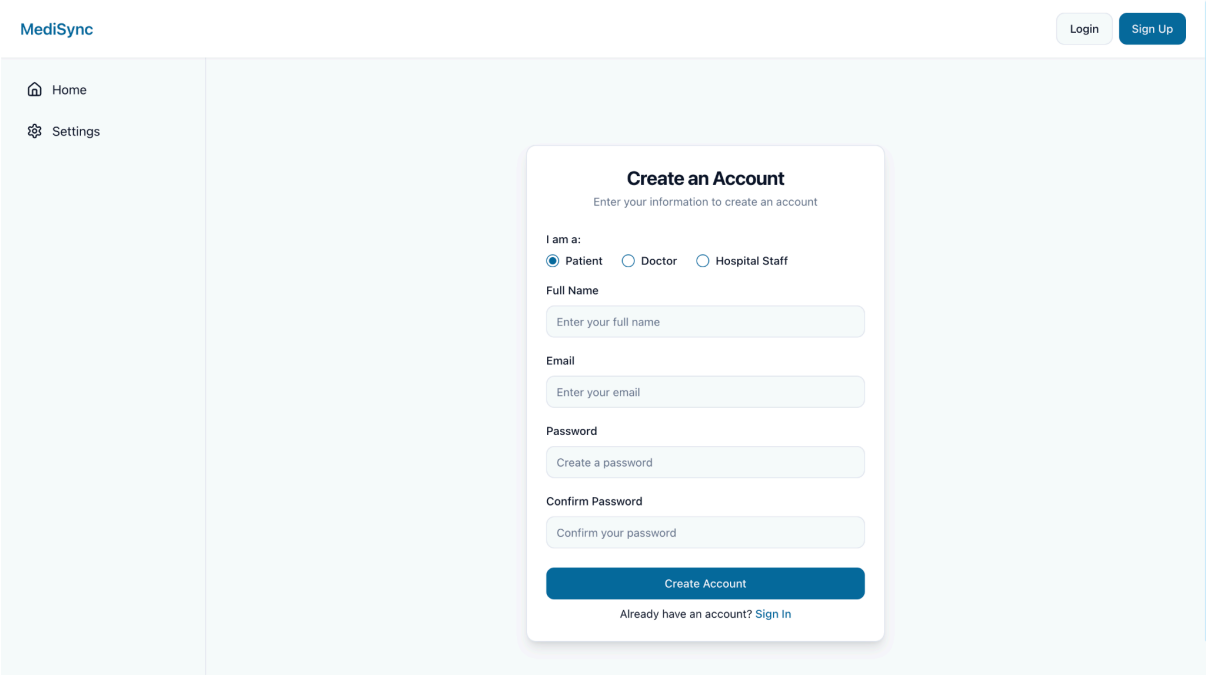
The information here is static.

Sign In




```
SELECT u.userID, u.name, u.email,
   CASE
      WHEN p.patientID IS NOT NULL THEN 'Patient'
      WHEN d.employeeID IS NOT NULL THEN 'Doctor'
      WHEN s.employeeID IS NOT NULL THEN 'Staff'
      WHEN ha.employeeID IS NOT NULL THEN 'Admin'
   END AS role
FROM User u
LEFT JOIN Patients p ON u.userID = p.patientID
LEFT JOIN Doctors d ON u.userID = d.employeeID
LEFT JOIN Staff s ON u.userID = s.employeeID
LEFT JOIN HospitalAdministrators ha ON u.userID = ha.employeeID
WHERE u.email = ? AND u.password = ?;
```

Sign Up



Query to create a new patient user:

```
-- First insert into User table
INSERT INTO User (name, email, identityNumber, password)
VALUES (?, ?, ?, ?);

-- Then insert into Patients table with the generated userID
INSERT INTO Patients (patientID, name, DOB, email, phoneNumber, Balance)
VALUES (LAST_INSERT_ID(), ?, NULL, ?, ?, 0);
```

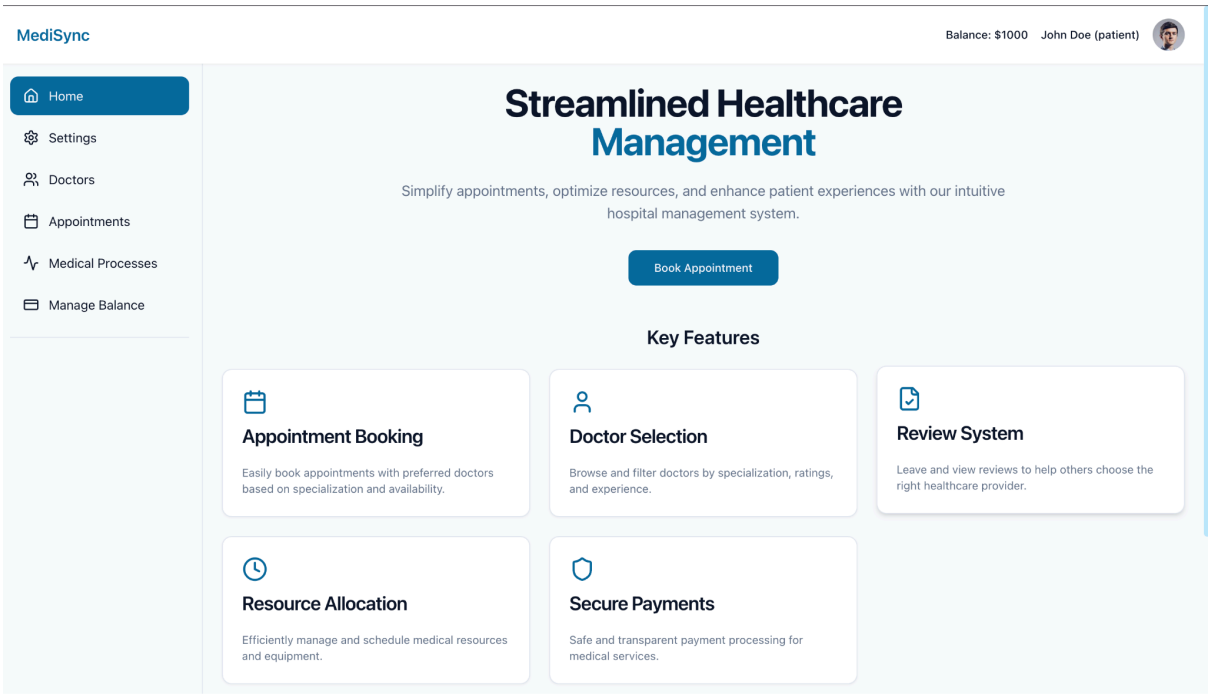
Query to create a new doctor user:

```
-- First insert into User table
INSERT INTO User (name, email, identityNumber, password)
VALUES (?, ?, ?, ?);

-- Then insert into Employee table
INSERT INTO Employee (employeeID, salary)
VALUES (LAST_INSERT_ID(), NULL);

-- Finally insert into Doctors table
INSERT INTO Doctors (employeeID, specialization, doctorLocation, deptName)
VALUES (LAST_INSERT_ID(), NULL, NULL, NULL);
```

Query to create a new staff user:

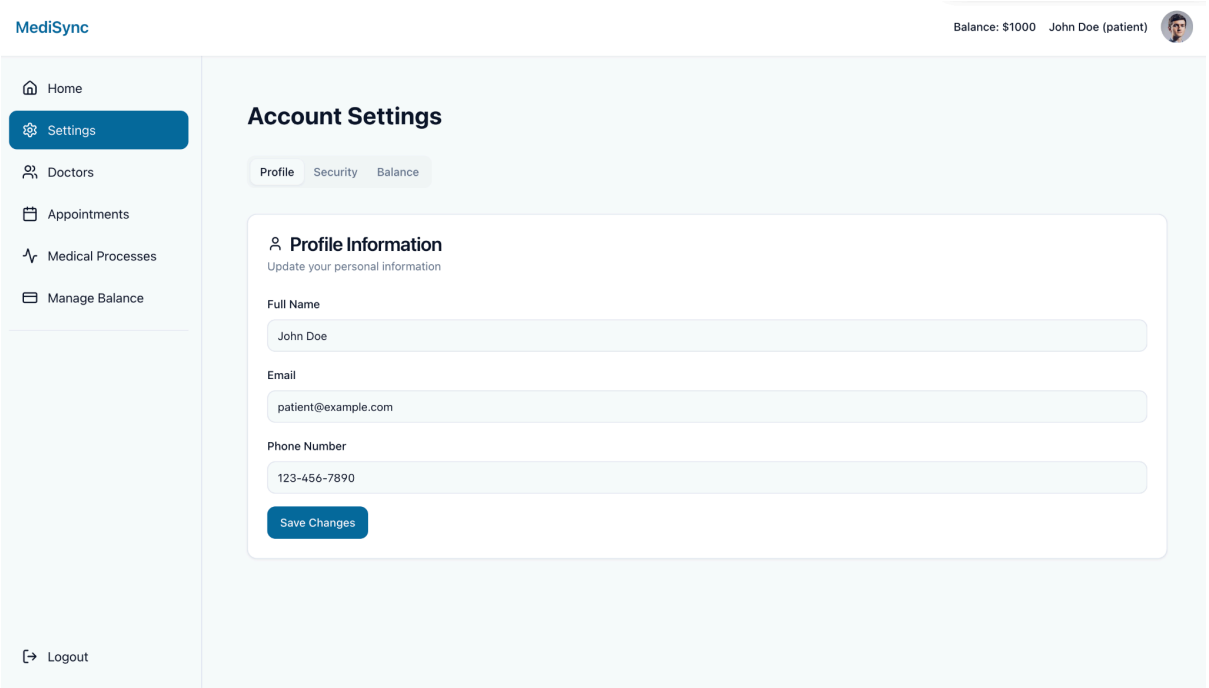
```
-- First insert into User table
INSERT INTO User (name, email, identityNumber, password)
VALUES (?, ?, ?, ?);

-- Then insert into Employee table
INSERT INTO Employee (employeeID, salary)
VALUES (LAST_INSERT_ID(), NULL);

-- Finally insert into Staff table
INSERT INTO Staff (employeeID, role)
VALUES (LAST_INSERT_ID(), ?);
```

Patient Home Page




```
SELECT p.name, p.Balance
FROM Patients p
WHERE p.patientID = ?;
```

Settings - Account Settings



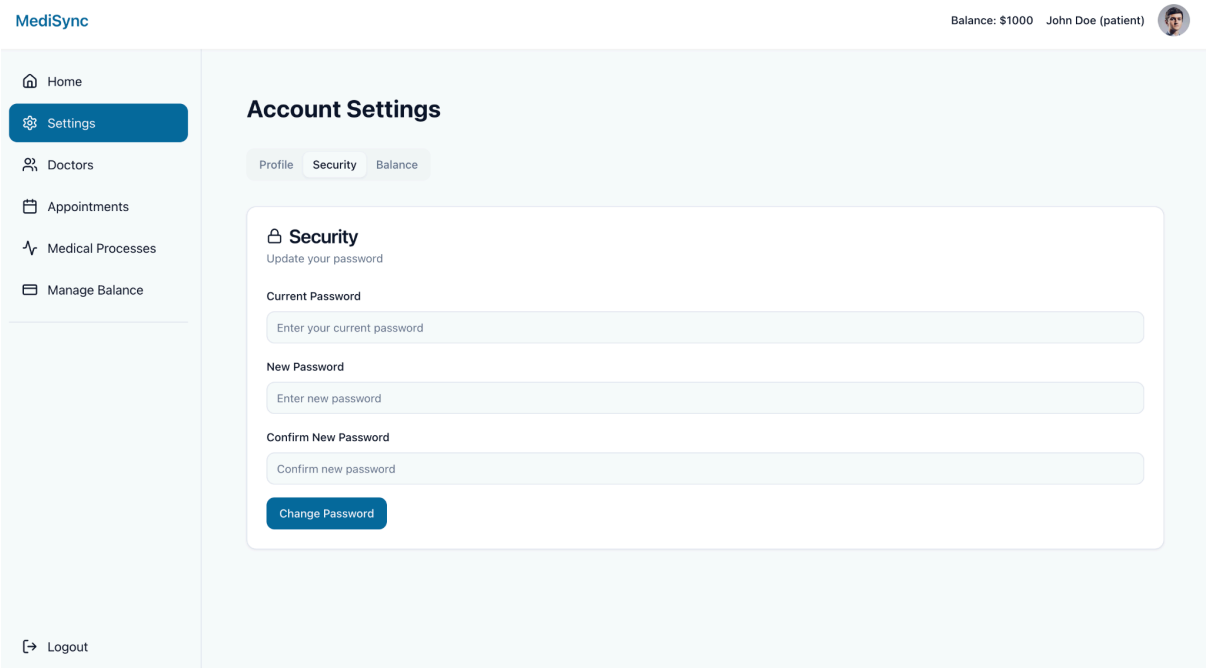
Query to get patient profile information:

```
SELECT p.name, p.email, p.phoneNumber, p.DOB
FROM Patients p
WHERE p.patientID = ?;
```

Query to update patient profile information:

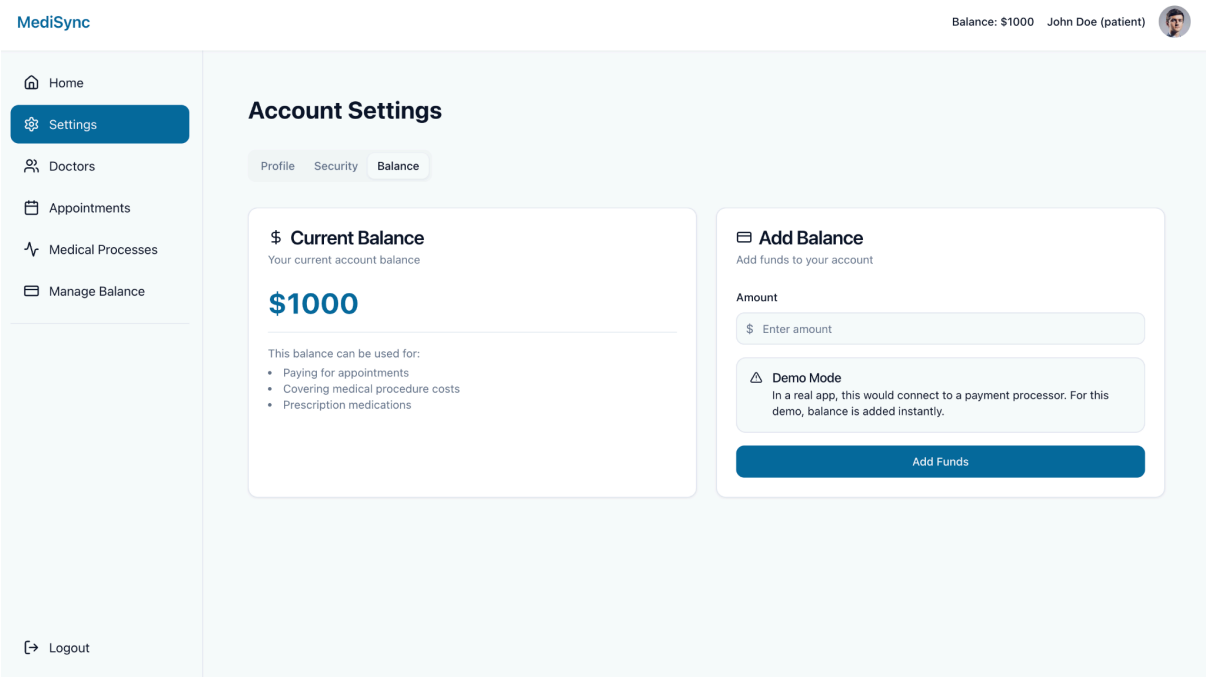
```
-- Update in User table
UPDATE User
SET name = ?
WHERE userID = ?;

-- Update in Patients table
UPDATE Patients
SET name = ?, email = ?, phoneNumber = ?
WHERE patientID = ?;
```

Settings - Security Settings



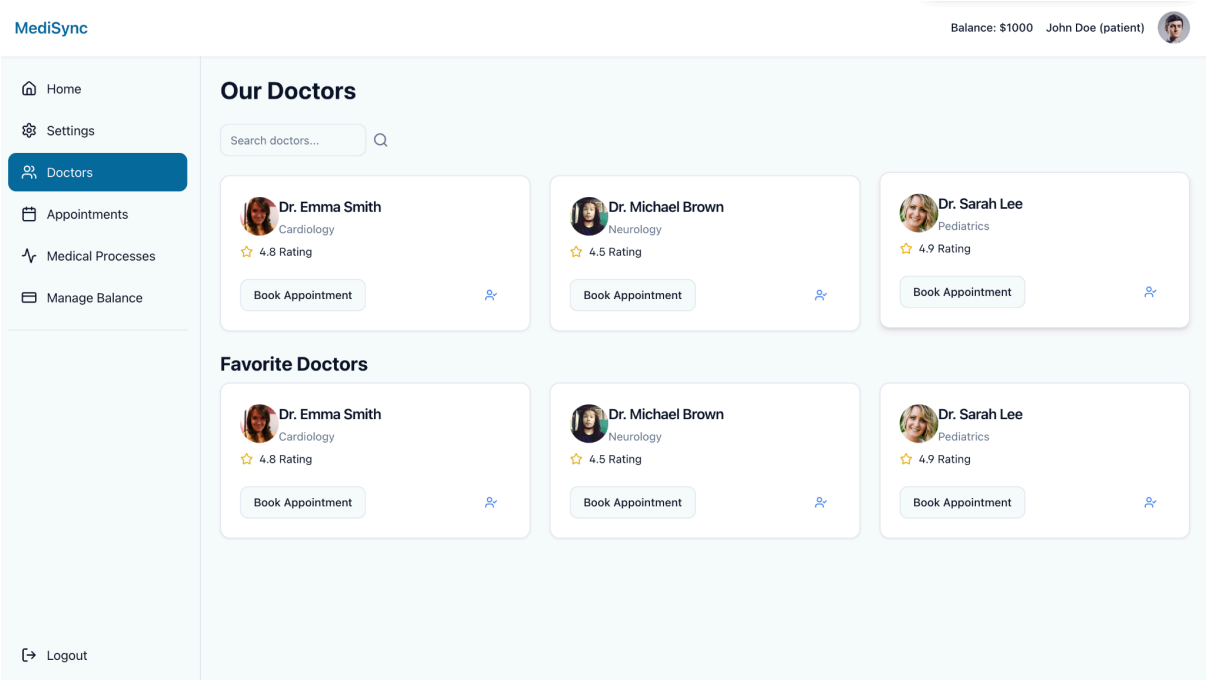

```
-- First verify the current password
SELECT userID
FROM User
WHERE userID = ? AND password = ?;

-- If the verification succeeds, update the password
UPDATE User
SET password = ?
WHERE userID = ?;
```

Settings - Balance Settings




```
-- Query to retrieve the current balance for a patient
SELECT Balance
FROM Patients
WHERE patientID = ?;

-- Query to add funds to a patient's account
UPDATE Patients
SET Balance = Balance + ?
WHERE patientID = ?;
```

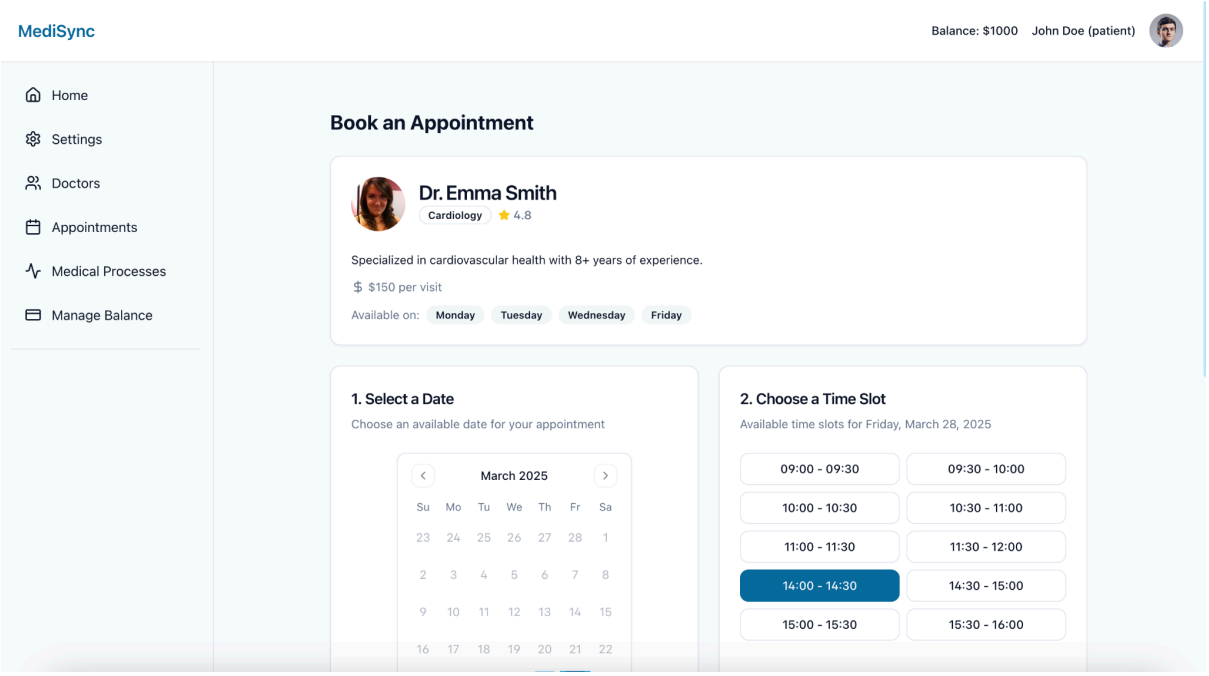
Patient - Doctors Page

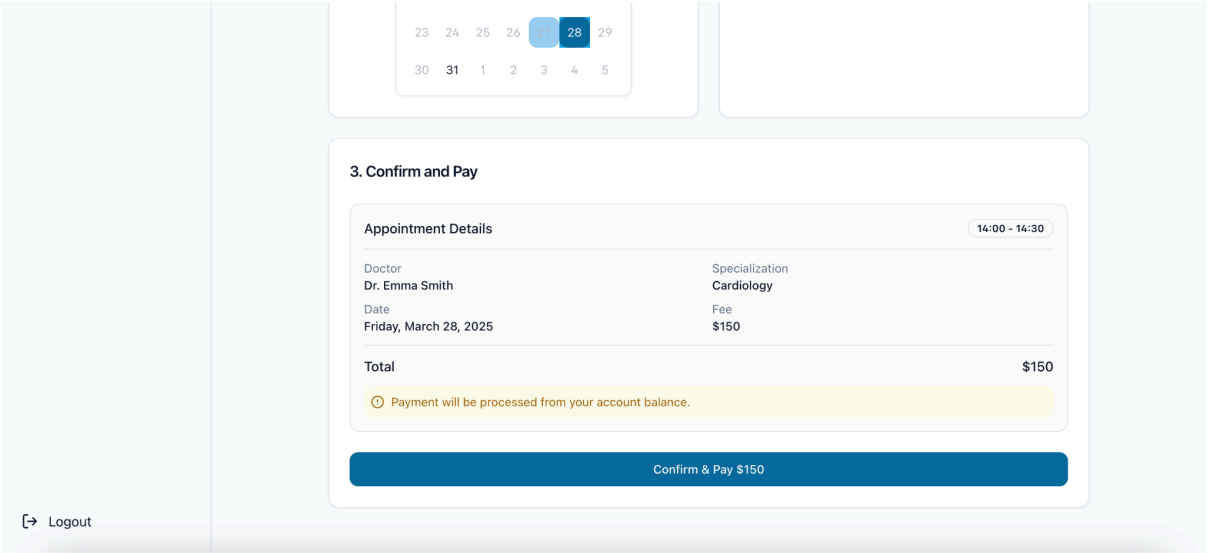



```
SELECT D.employeeID,D.specialization, DS.ratings
FROM Doctors D
JOIN DoctorStatistics DS ON D.employeeID = DS.doctorID
WHERE D.specialization = 'Cardiology' AND DS.rating >= 4.5;
```

You can change or specify the specialization and rating here

Patient - Book Appointment Page





1. Get Doctor Information and Rating

```
-- Get doctor information including average rating
SELECT d.employeeID, u.name, d.specialization,
       (SELECT AVG(a.rating) FROM Appointment a WHERE a.doctorID = d.employeeID) AS avg_rating
FROM Doctors d
JOIN User u ON d.employeeID = u.userID
WHERE d.employeeID = ?;
```

2. Get Doctor's Available Days

```
-- Get days of the week when the doctor has available slots
SELECT DISTINCT
    CASE DAYOFWEEK(s.startTime)
        WHEN 1 THEN 'Sunday'
        WHEN 2 THEN 'Monday'
        WHEN 3 THEN 'Tuesday'
        WHEN 4 THEN 'Wednesday'
        WHEN 5 THEN 'Thursday'
        WHEN 6 THEN 'Friday'
        WHEN 7 THEN 'Saturday'
    END AS available_day
FROM Slots s
WHERE s.doctorID = ?
AND s.availability = 'Available'
AND s.startTime > NOW()
ORDER BY DAYOFWEEK(s.startTime);
```

3. Get Available Dates for a Specific Month

```
-- Get available dates for a specific month
SELECT DISTINCT DATE(s.startTime) AS available_date
FROM Slots s
WHERE s.doctorID = ?
AND s.availability = 'Available'
AND YEAR(s.startTime) = ?
AND MONTH(s.startTime) = ?
ORDER BY available_date;
```

4. Get Available Time Slots for a Specific Date

```
-- Get available time slots for a specific date
SELECT s.slotID, s.startTime, s.endTime
FROM Slots s
WHERE s.doctorID = ?
AND s.availability = 'Available'
AND DATE(s.startTime) = ?
ORDER BY s.startTime;
```

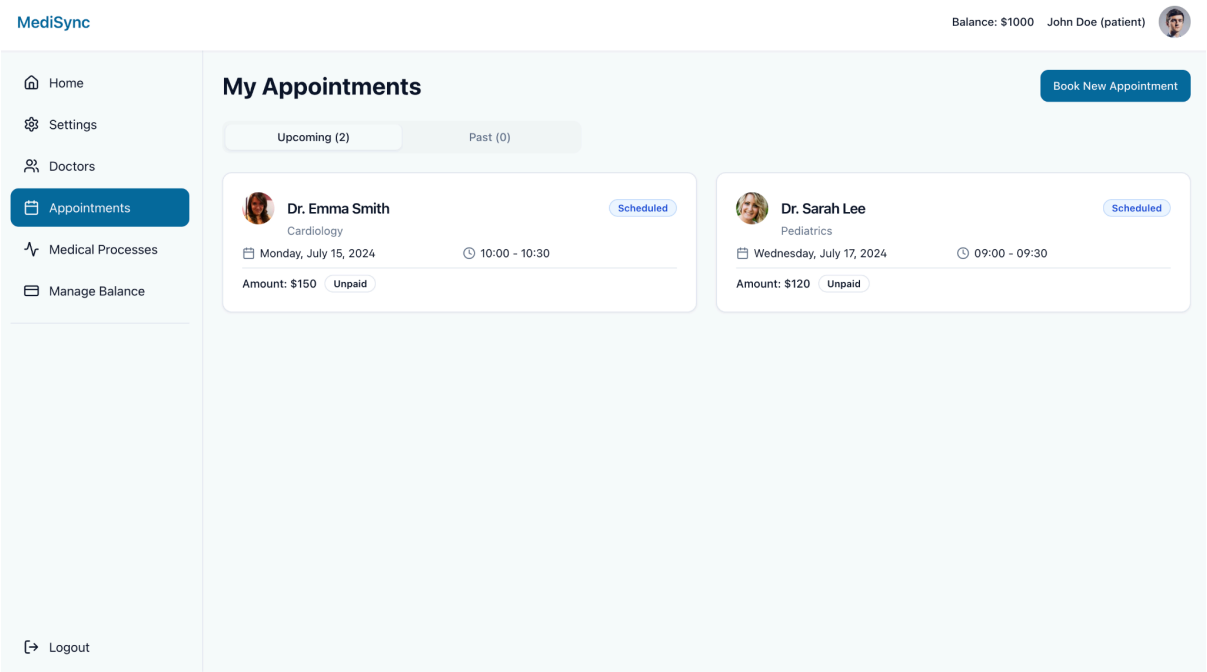
5. Check Patient Balance

```
-- Check if patient has enough balance for the appointment
SELECT Balance
FROM Patients
WHERE patientID = ?
AND Balance >= ?;
```

6. Book the Appointment

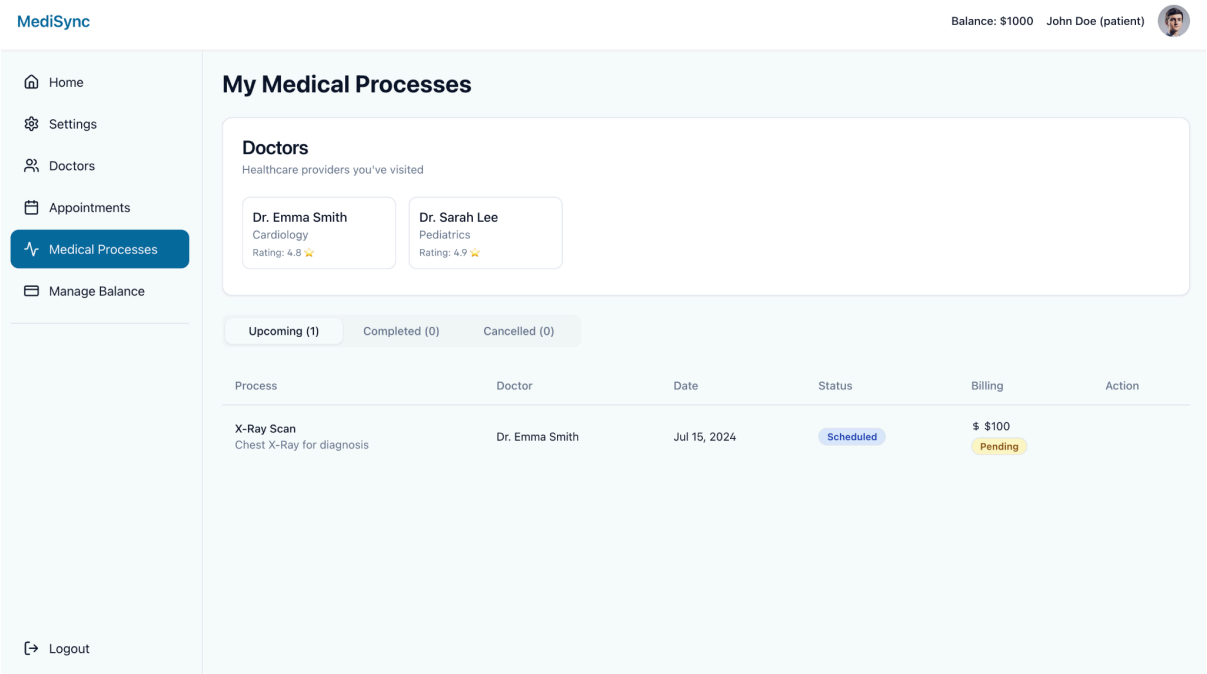
```
-- 1. Create new appointment
INSERT INTO Appointment (status, rating, review, patientID, doctorID)
VALUES ('Scheduled', NULL, NULL, ?, ?);

-- 2. Get the newly created appointment ID
SET @appointment_id = LAST_INSERT_ID();

-- 3. Update slot to be booked
UPDATE Slots
SET availability = 'Booked'
WHERE doctorID = ? AND slotID = ?;

-- 4. Create the appointment-slot relationship
INSERT INTO Contain (appointmentID, doctorID, slotID, startTime, endTime)
VALUES (@appointment_id, ?, ?, ?, ?);

-- 5. Deduct appointment fee from patient balance
UPDATE Patients
SET Balance = Balance - ?
WHERE patientID = ?;
```

Patients - Appointments Page



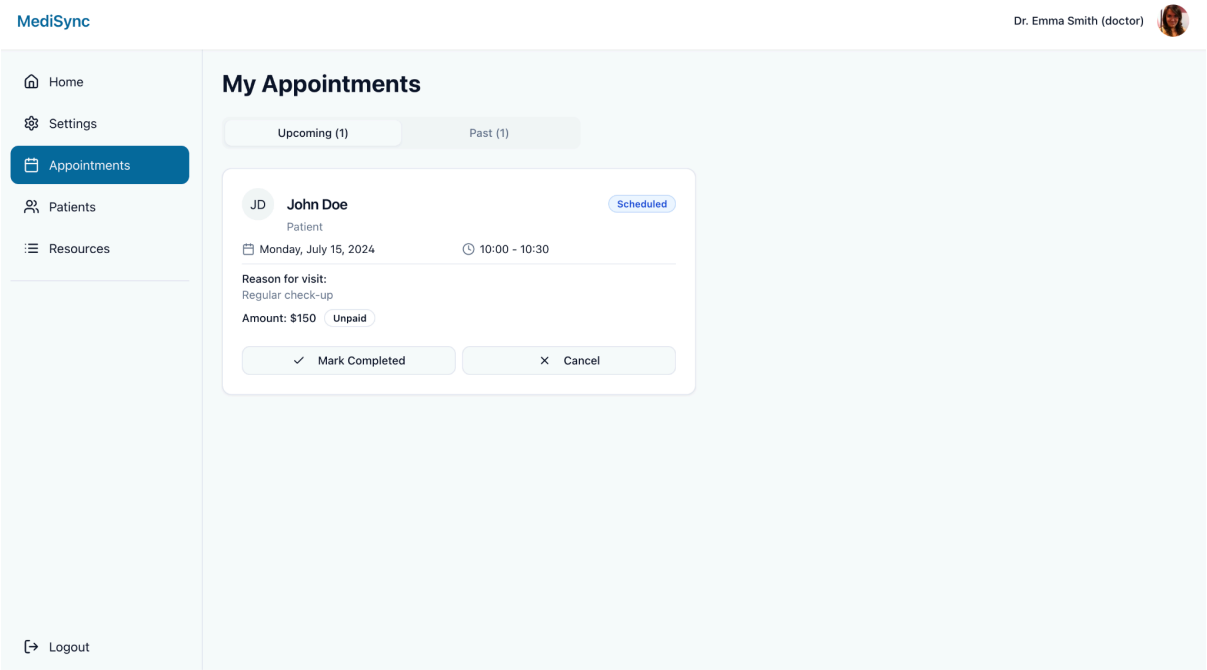

```
SELECT
    U2.name AS doctor_name,
    D.specialization,
    A.status,
    C.startTime,
    C.endTime
FROM User U
JOIN Patients P ON U.userID = P.patientID
JOIN Appointment A ON P.patientID = A.patientID
JOIN Doctors D ON A.doctorID = D.employeeID
JOIN User U2 ON D.employeeID = U2.userID
JOIN Contain C ON A.appointmentID = C.appointmentID
WHERE U.name = 'John Doe'
ORDER BY C.startTime;
```

Patients - Medical Processes Page




```
SELECT
    P.processName,
    P.processDescription,
    U2.name AS doctor_name,
    DATE(C.startTime) AS process_date,
    P.status,
    B.amount,
    B.paymentStatus
FROM User U
JOIN Patients Pa ON U.userID = Pa.patientID
JOIN Appointment A ON Pa.patientID = A.patientID
JOIN Doctors D ON A.doctorID = D.employeeID
JOIN User U2 ON D.employeeID = U2.userID
JOIN Process P ON A.appointmentID = P.appointmentID
JOIN Billing B ON P.processID = B.processID
JOIN Contain C ON A.appointmentID = C.appointmentID
WHERE U.name = 'John Doe'
ORDER BY C.startTime;
```

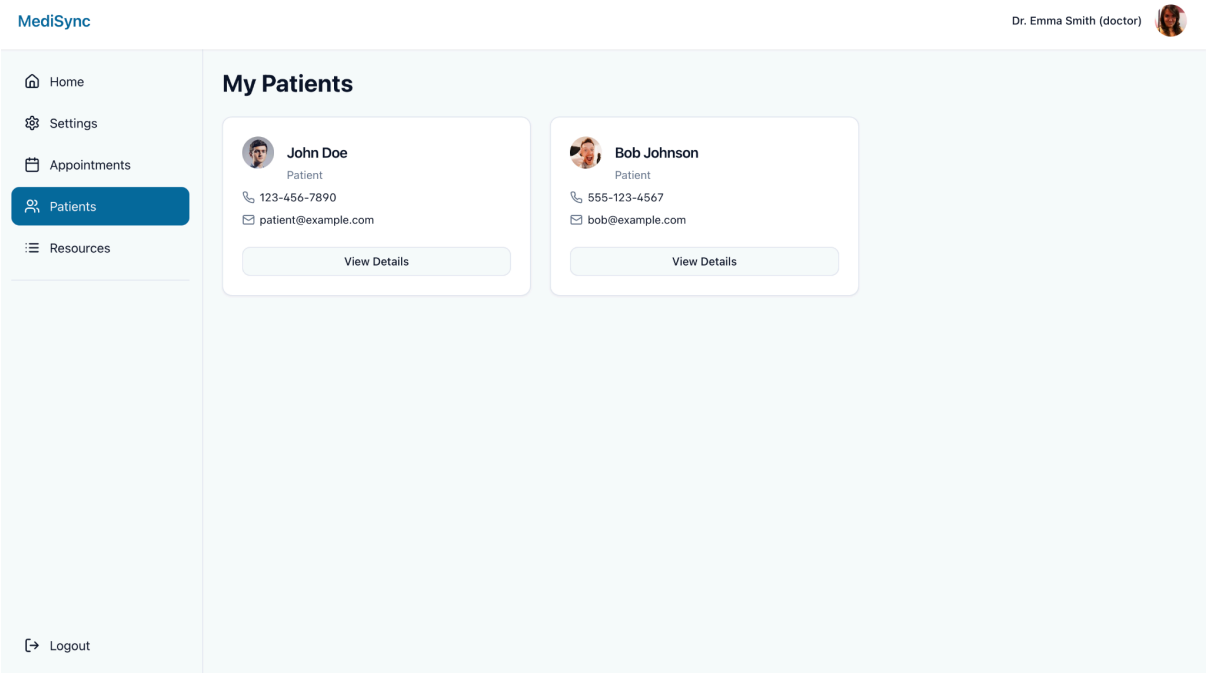
Doctor - Appointments Page




```
-- Get upcoming appointments for a doctor
SELECT
    a.appointmentID,
    p.patientID,
    u.name AS patient_name,
    c.startTime,
    c.endTime,
    a.status,
    'Regular check-up' AS visit_reason,
    '$150' AS amount,
    CASE WHEN b.paymentStatus = 'Paid' THEN 'Paid' ELSE 'Unpaid' END AS
payment_status
FROM Appointment a
JOIN Patients p ON a.patientID = p.patientID
JOIN User u ON p.patientID = u.userID
JOIN Contain c ON a.appointmentID = c.appointmentID
LEFT JOIN Process pr ON a.appointmentID = pr.appointmentID
LEFT JOIN Billing b ON pr.processID = b.processID
WHERE a.doctorID = ?
AND c.startTime > NOW()
AND a.status = 'Scheduled'
ORDER BY c.startTime;

-- Get past appointments for a doctor
SELECT
    a.appointmentID,
    p.patientID,
```

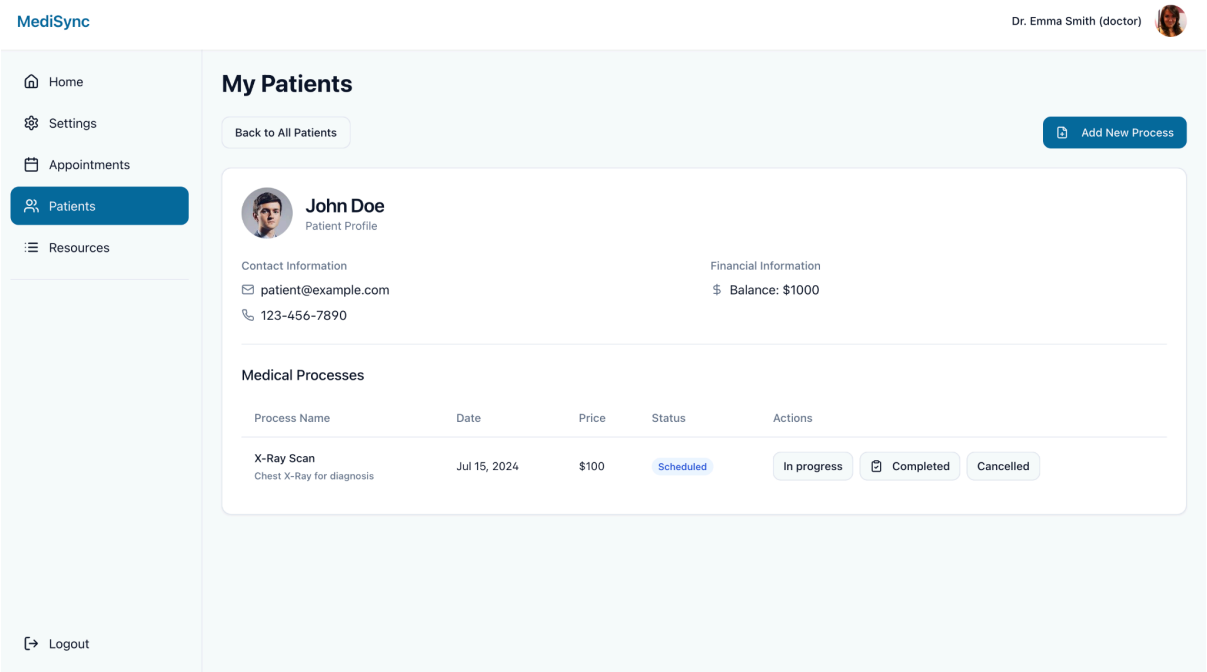
```
    u.name AS patient_name,
    c.startTime,
    c.endTime,
    a.status,
    'Regular check-up' AS visit_reason,
    '$150' AS amount,
    CASE WHEN b.paymentStatus = 'Paid' THEN 'Paid' ELSE 'Unpaid' END AS
payment_status
FROM Appointment a
JOIN Patients p ON a.patientID = p.patientID
JOIN User u ON p.patientID = u.userID
JOIN Contain c ON a.appointmentID = c.appointmentID
LEFT JOIN Process pr ON a.appointmentID = pr.appointmentID
LEFT JOIN Billing b ON pr.processID = b.processID
WHERE a.doctorID = ?
AND c.startTime <= NOW()
ORDER BY c.startTime DESC;

-- Mark appointment as completed
UPDATE Appointment
SET status = 'Completed'
WHERE appointmentID = ?;

-- Cancel appointment
UPDATE Appointment
SET status = 'Cancelled'
WHERE appointmentID = ?;
```

Doctor - Patients Page



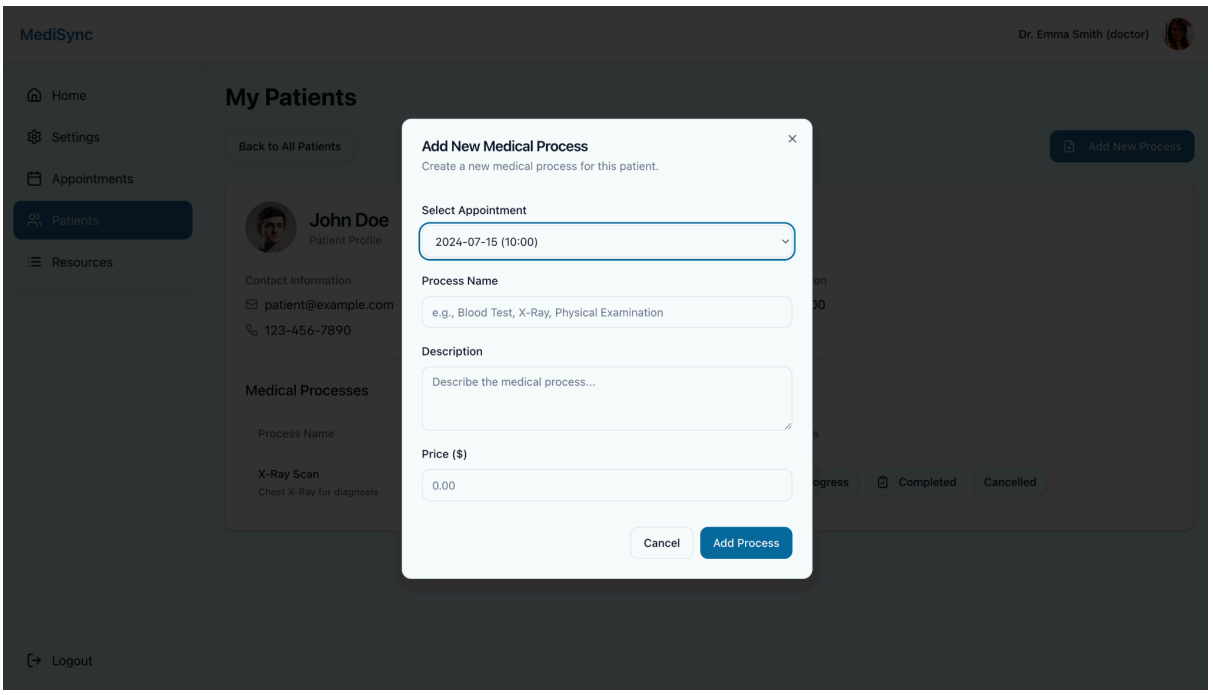

```
-- Get list of patients for a doctor
SELECT
    p.patientID,
    u.name,
    p.email,
    p.phoneNumber
FROM Patients p
JOIN User u ON p.patientID = u.userID
JOIN DoctorPatient dp ON p.patientID = dp.patientID
WHERE dp.doctorID = ?
ORDER BY u.name;
```

Doctor - Patient Details Page




```
-- Get patient details
SELECT
    p.patientID, u.name, p.email, p.phoneNumber, p.Balance
FROM Patients p
JOIN User u ON p.patientID = u.userID
WHERE p.patientID = ?;
-- Get medical processes for a specific patient
SELECT
    pr.processID,
    pr.processName,
    pr.processDescription,
    pr.status,
    c.startTime AS date,
    b.amount AS price
FROM Process pr
JOIN Appointment a ON pr.appointmentID = a.appointmentID
JOIN Contain c ON a.appointmentID = c.appointmentID
LEFT JOIN Billing b ON pr.processID = b.processID
WHERE a.patientID = ?
AND a.doctorID = ?
ORDER BY c.startTime DESC;
-- Update process status
UPDATE Process
SET status = ?  -- 'Scheduled', 'In Progress', 'Completed', 'Cancelled'
WHERE processID = ?;
```

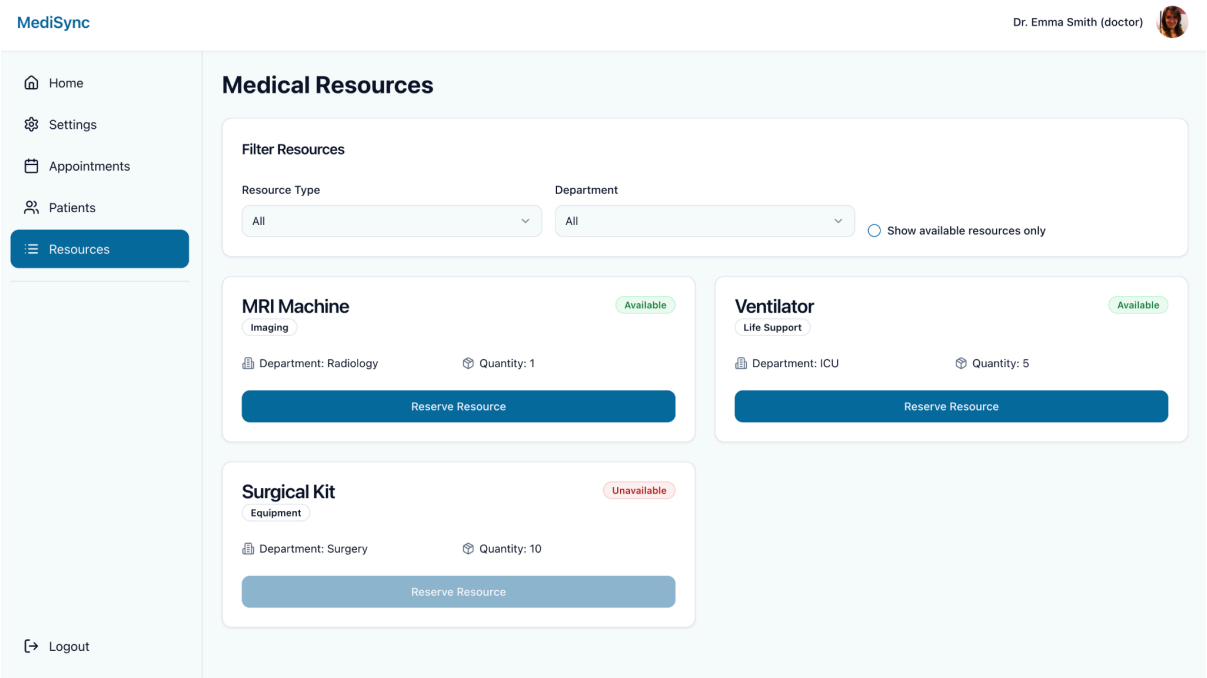
Doctor - Process Adding Page




```
-- Get appointments for a patient with a specific doctor
SELECT
    a.appointmentID, c.startTime
FROM Appointment a
JOIN Contain c ON a.appointmentID = c.appointmentID
WHERE a.patientID = ?
AND a.doctorID = ?
ORDER BY c.startTime DESC;

-- Add new medical process
INSERT INTO Process (
    processName,  processDescription, status, appointmentID
)
VALUES (?, ?, 'Scheduled', ?);

-- Create billing record for the new process
INSERT INTO Billing (
    billingDate, amount, paymentStatus, processID
)
VALUES (NOW(), ?, 'Pending', LAST_INSERT_ID());

-- Update patient statistics
UPDATE PatientStatistics
SET totalProcesses = totalProcesses + 1
WHERE patientID = ?
```

AND reportDate = CURRENT_DATE();

Doctor - Medical Resources Page



1. List All Medical Resources

```
SELECT
   MR.resourceID,
   MR.name,
   MR.availability
FROM MedicalResources MR;
```

2. Filter by Resource Type (Name)

```
SELECT
   MR.resourceID,
   MR.name,
   MR.availability
FROM MedicalResources MR
WHERE MR.name ILIKE '%Ventilator%';  -- or '%MRI%' etc.
```

3. Filter by Department

```
SELECT
   MR.resourceID,
   MR.name,
   MR.availability,
   D.deptName
FROM MedicalResources MR
JOIN Request R ON MR.resourceID = R.resourceID
JOIN Doctors Doc ON R.doctorID = Doc.employeeID
JOIN Dept D ON Doc.deptName = D.deptName
WHERE D.deptName = 'Radiology';
```

4. Show Only Available Resources

```
SELECT
   MR.resourceID,
   MR.name,
   MR.availability
FROM MedicalResources MR
WHERE MR.availability = 'Available';
```

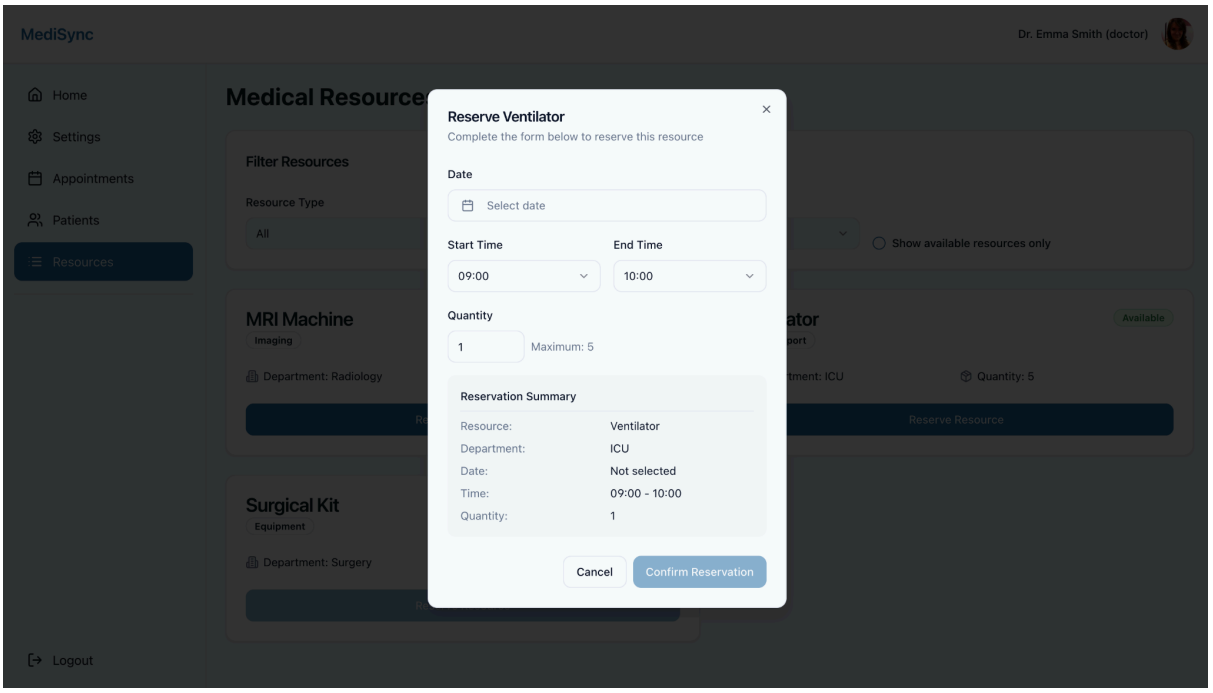
5. Reserve Resource

```
INSERT INTO Request (doctorID, resourceID, status)
VALUES (2, 3, 'Pending');
```

6. Update Resource Availability After Approval

```
UPDATE MedicalResources
SET availability = 'In Use'
WHERE resourceID = ?;
```

Doctor - Resource Reservation Page



Pre-fill Resource Info

```
SELECT
   resourceID,
   name,
   availability
FROM MedicalResources
WHERE name = 'Ventilator';
```

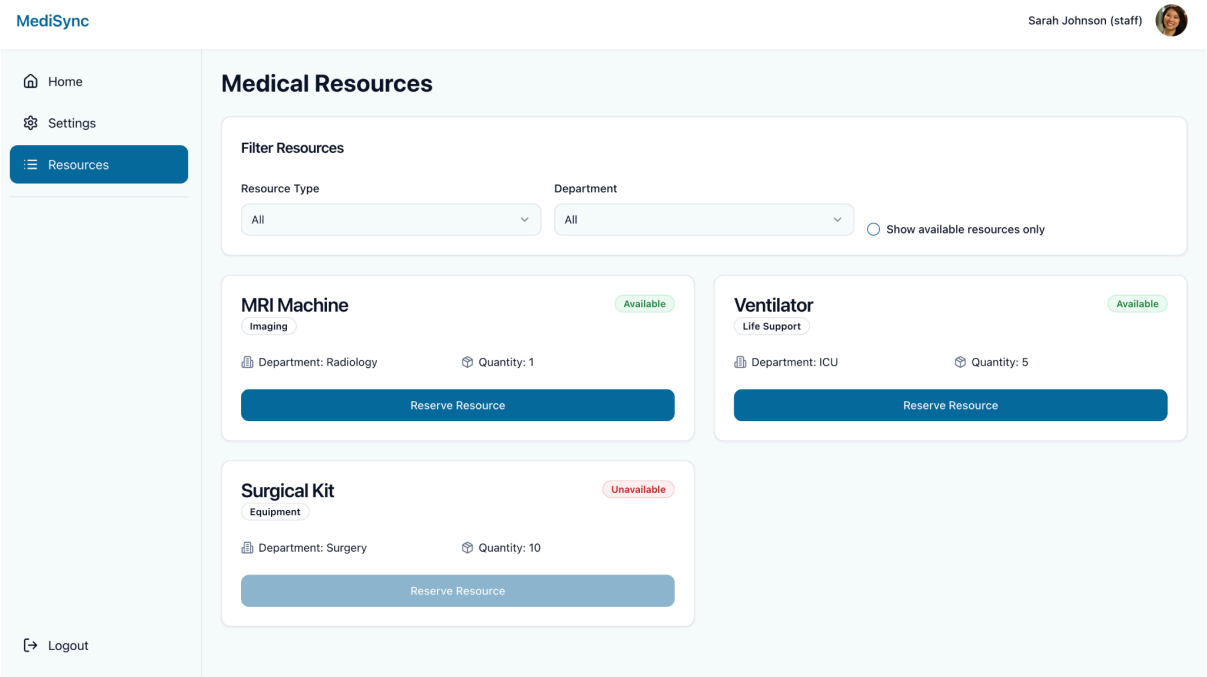
Check if Doctor Already Requested This Resource

```
SELECT *
FROM Request
WHERE doctorID = ? AND resourceID = ?;
```

Submit a Reservation Request

```
INSERT INTO Request (doctorID, resourceID, status)
VALUES (3, 2, 'Pending');
```

Staff - Medical Resources Page



List All Medical Resources

```
SELECT
   resourceID,
   name,
   availability,
   quantity
FROM MedicalResources;
```

Filter by Resource Type (Name)

```
SELECT
   resourceID,
   name,
   availability,
   quantity
FROM MedicalResources
WHERE name LIKE '%Ventilator%';
```

Show Only Available Resources

```
SELECT
   resourceID,
   name,
   availability,
   quantity
FROM MedicalResources
```

```
WHERE availability = 'Available';
```

Filter by Department

```
SELECT
    resourceID,
    name,
    availability,
    quantity,
    deptName
FROM MedicalResources
WHERE deptName = 'Radiology';
```

4. Show Only Available Resources

```
SELECT
    MR.resourceID,
    MR.name,
    MR.availability
FROM MedicalResources MR
WHERE MR.availability = 'Available';
```

Admin - Reports and Analytics Page

Total Patients Count

```
SELECT COUNT(*) as totalPatients,
      (COUNT(*) -
       (SELECT COUNT(*) FROM Patients
        WHERE patientID IN
        (SELECT patientID FROM PatientStatistics
         WHERE reportDate BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2 MONTH)
         AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)))) /
      (SELECT COUNT(*) FROM Patients
       WHERE patientID IN
       (SELECT patientID FROM PatientStatistics
        WHERE reportDate BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2 MONTH)
        AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH))) * 100 as percentChange
FROM Patients
WHERE patientID IN (SELECT patientID FROM PatientStatistics
                    WHERE reportDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH));
```

Total Appointments

```
SELECT COUNT(*) as totalAppointments,
      (COUNT(*) -
       (SELECT COUNT(*) FROM Appointment
        WHERE appointmentID IN
        (SELECT appointmentID FROM Contain
         WHERE startTime BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2 MONTH)
         AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)))) /
```

```
      (SELECT COUNT(*) FROM Appointment
       WHERE appointmentID IN
       (SELECT appointmentID FROM Contain
        WHERE startTime BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2 MONTH)
        AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH))) * 100 as percentChange
FROM Appointment
WHERE appointmentID IN (SELECT appointmentID FROM Contain
                        WHERE startTime > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH));
```

Total Revenue

```
SELECT SUM(b.amount) as totalRevenue,
      (SUM(b.amount) -
       (SELECT SUM(b.amount) FROM Billing b
        WHERE b.billingDate BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2
MONTH)
        AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH))) /
      (SELECT SUM(b.amount) FROM Billing b
       WHERE b.billingDate BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2
MONTH)
       AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)) * 100 as percentChange
FROM Billing b
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)
AND b.paymentStatus = 'Paid';
```

Medical Processes

```
SELECT COUNT(*) as totalProcesses,
      (COUNT(*) -
       (SELECT COUNT(*) FROM Process
        WHERE processID IN
        (SELECT processID FROM Billing
         WHERE billingDate BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2 MONTH)
         AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)))) /
      (SELECT COUNT(*) FROM Process
       WHERE processID IN
       (SELECT processID FROM Billing
        WHERE billingDate BETWEEN DATE_SUB(CURRENT_DATE, INTERVAL 2 MONTH)
        AND DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH))) * 100 as percentChange
FROM Process
WHERE processID IN (SELECT processID FROM Billing
                    WHERE billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH));
```

Appointment Trends (Chart Data)

```
SELECT
   DATE_FORMAT(s.startTime, '%Y-%m-%d') as appointment_date,
   COUNT(*) as appointment_count
```

```
FROM Appointment a
JOIN Contain c ON a.appointmentID = c.appointmentID
JOIN Slots s ON c.doctorID = s.doctorID
        AND c.slotID = s.slotID
        AND c.startTime = s.startTime
        AND c.endTime = s.endTime
WHERE s.startTime > DATE_SUB(CURRENT_DATE, INTERVAL 12 MONTH)
GROUP BY DATE_FORMAT(s.startTime, '%Y-%m-%d')
ORDER BY appointment_date;
```

Doctor Performance Data

```
SELECT
   d.employeeID,
   u.name as doctorName,
   d.specialization,
   COUNT(a.appointmentID) as appointmentCount,
   AVG(a.rating) as averageRating,
   SUM(b.amount) as totalRevenue,
   (SELECT COUNT(*)
    FROM Prescriptions p
    WHERE p.doctorID = d.employeeID
    AND p.appointmentID IN (
       SELECT appointmentID
       FROM Contain
       WHERE startTime > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)
    )) as prescriptionCount
FROM Doctors d
JOIN Employee e ON d.employeeID = e.employeeID
JOIN User u ON e.employeeID = u.userID
LEFT JOIN Appointment a ON d.employeeID = a.doctorID
LEFT JOIN Process pr ON a.appointmentID = pr.appointmentID
LEFT JOIN Billing b ON pr.processID = b.processID
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)
  OR b.billingDate IS NULL
GROUP BY d.employeeID, u.name, d.specialization
ORDER BY totalRevenue DESC;
```

Revenue Breakdown by Department

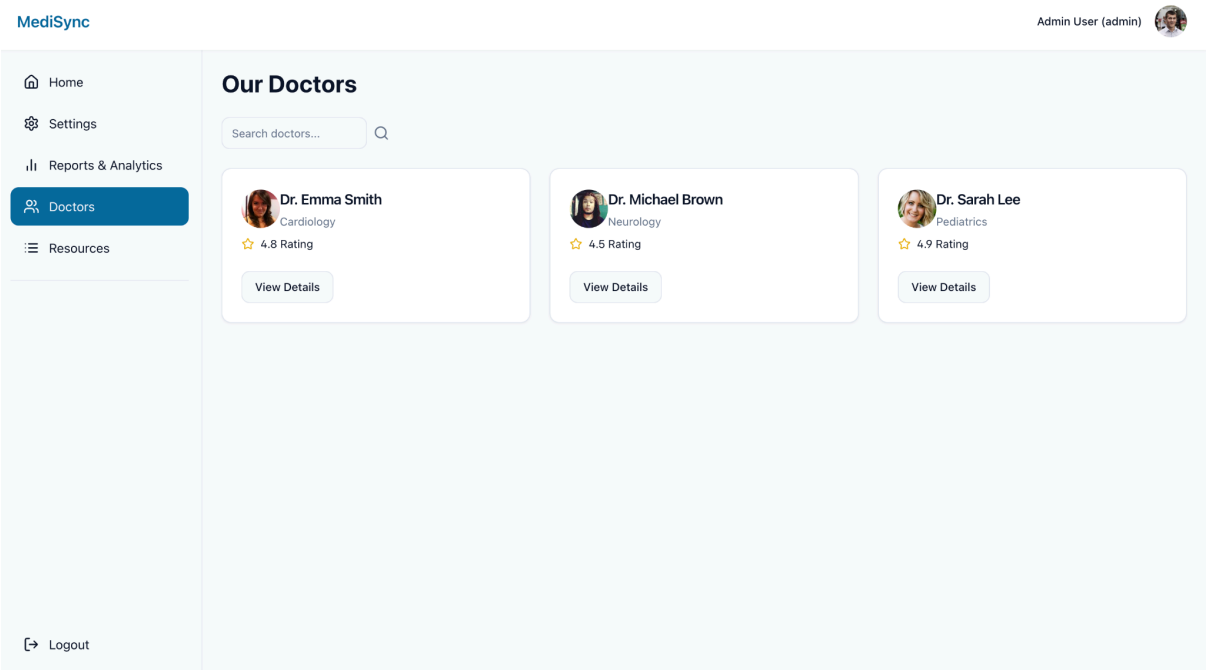
```
SELECT
   d.deptName,
   SUM(b.amount) as totalRevenue,
   COUNT(DISTINCT a.appointmentID) as appointmentCount,
   COUNT(DISTINCT a.patientID) as patientCount,
   SUM(b.amount) / COUNT(DISTINCT a.appointmentID) as
averageRevenuePerAppointment
FROM Doctors doc
```

```
JOIN Dept d ON doc.deptName = d.deptName
JOIN Appointment a ON doc.employeeID = a.doctorID
JOIN Process pr ON a.appointmentID = pr.appointmentID
JOIN Billing b ON pr.processID = b.processID
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)
GROUP BY d.deptName
ORDER BY totalRevenue DESC;
```

Filter by Time Period (Monthly dropdown)

```
-- This would modify the WHERE clauses in the above queries
-- For example, to filter for the last week:
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 WEEK)

-- For the last month:
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 MONTH)

-- For the last quarter:
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 3 MONTH)

-- For the last year:
WHERE b.billingDate > DATE_SUB(CURRENT_DATE, INTERVAL 1 YEAR)
```

Admin - Doctor Listing Page



Fetching All Doctors with Basic Information

```
SELECT d.employeeID, u.name, d.specialization, AVG(a.rating) as avgRating
FROM Doctors d
JOIN Employee e ON d.employeeID = e.employeeID
JOIN User u ON e.employeeID = u.userID
LEFT JOIN Appointment a ON d.employeeID = a.doctorID
GROUP BY d.employeeID, u.name, d.specialization
ORDER BY u.name;
```

Search Functionality for Doctors

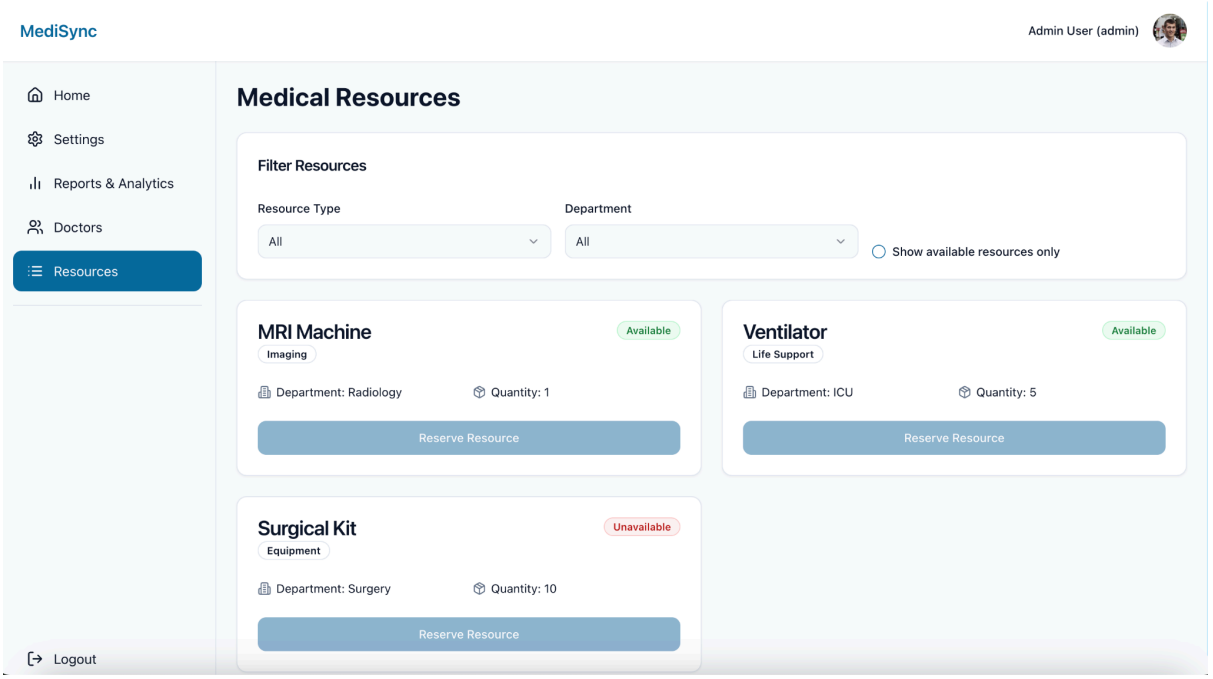
```
SELECT d.employeeID, u.name, d.specialization, AVG(a.rating) as avgRating
FROM Doctors d
JOIN Employee e ON d.employeeID = e.employeeID
JOIN User u ON e.employeeID = u.userID
LEFT JOIN Appointment a ON d.employeeID = a.doctorID
WHERE u.name LIKE ? OR d.specialization LIKE ?
GROUP BY d.employeeID, u.name, d.specialization
ORDER BY u.name;
```

Getting Doctor Details (for "View Details" button)

```
SELECT d.employeeID, u.name, d.specialization, d.doctorLocation, d.deptName,
    AVG(a.rating) as avgRating, COUNT(a.appointmentID) as totalAppointments,
    ds.prescriptionCount, ds.totalRevenue
FROM Doctors d
JOIN Employee e ON d.employeeID = e.employeeID
```

```
JOIN User u ON e.employeeID = u.userID
LEFT JOIN Appointment a ON d.employeeID = a.doctorID
LEFT JOIN DoctorStatistics ds ON d.employeeID = ds.doctorID
WHERE d.employeeID = ? -- Selected doctor's ID
GROUP BY d.employeeID, u.name, d.specialization, d.doctorLocation, d.deptName,
        ds.prescriptionCount, ds.totalRevenue;
```

Admin - Medical Resources Page



Fetching All Medical Resources

```
SELECT mr.resourceID, mr.name, mr.availability,
    eq.usageCount, eq.lastUsedDate, eq.totalRequests
FROM MedicalResources mr
LEFT JOIN EquipmentStatistics eq ON mr.resourceID = eq.equipmentID;
```

Filtering Resources by Type

```
SELECT mr.resourceID, mr.name, mr.availability
FROM MedicalResources mr
WHERE mr.name LIKE '%Machine%' -- For filtering by type (e.g., MRI Machine)
ORDER BY mr.name;
```

Filtering Resources by Department

```
SELECT mr.resourceID, mr.name, mr.availability
FROM MedicalResources mr
JOIN Request req ON mr.resourceID = req.resourceID
JOIN Doctors d ON req.doctorID = d.employeeID
WHERE d.deptName = 'Radiology'; -- Replace with the selected department
```

Showing Only Available Resources

```
SELECT resourceID, name, availability
FROM MedicalResources
WHERE availability = 'Available';
```

Getting Resource Quantity Information

```
SELECT mr.name, COUNT(*) as quantity
FROM MedicalResources mr
GROUP BY mr.name;
```

Resource Reservation (When "Reserve Resource" button is clicked)

```
-- First check availability
SELECT availability
FROM MedicalResources
WHERE resourceID = ?;

-- Then update status if available
UPDATE MedicalResources
SET availability = 'In Use'
WHERE resourceID = ? AND availability = 'Available';

-- Then insert a new request entry
INSERT INTO Request (doctorID, resourceID, status)
VALUES (?, ?, 'Approved');

-- Update equipment statistics
UPDATE EquipmentStatistics
SET usageCount = usageCount + 1,
   lastUsedDate = CURRENT_DATE,
   totalRequests = totalRequests + 1
WHERE equipmentID = ?;
```

Adding a New Medical Resource (Admin functionality)

```
INSERT INTO MedicalResources (name, availability)
VALUES (?, 'Available');

-- Initialize equipment statistics
INSERT INTO EquipmentStatistics (usageCount, lastUsedDate, totalRequests,
equipmentID)
VALUES (0, NULL, 0, LAST_INSERT_ID());
```

Getting Resource Details with Department Information

```
SELECT mr.resourceID, mr.name, mr.availability, d.deptName
FROM MedicalResources mr
JOIN Request req ON mr.resourceID = req.resourceID
JOIN Doctors doc ON req.doctorID = doc.employeeID
JOIN Dept d ON doc.deptName = d.deptName
WHERE mr.resourceID = ?;
```

3.Implementation Plan

The implementation of the Hospital Appointment Management System will be carried out using a modern web-based architecture. The backend of the system will be developed using FastAPI, a high-performance Python framework that allows for the efficient creation of RESTful APIs. The frontend will be built with React.js, providing a responsive and dynamic user interface for different user roles including patients, doctors, staff, and administrators. The system will use PostgreSQL as the relational database management system due to its stability, support for advanced SQL features such as views, triggers, and constraints, and compatibility with raw SQL queries, which is a requirement for this project.

For the development environment, standard personal computing hardware will be used, including machines with at least 8 GB of RAM, Intel or Apple Silicon processors, and modern operating systems such as Windows 10/11, macOS, or Linux distributions. All backend operations interacting with the database will be executed using manually written raw SQL queries, without relying on any ORM features. The SQL statements will be embedded within the FastAPI routes and executed using PostgreSQL's native query interface via Python.

Development tasks are divided into three core components: database setup, backend API development, and frontend user interface design. The database schema will be implemented directly in PostgreSQL using SQL scripts. Backend tasks include writing routes for user authentication, appointment handling, resource management, and administrative reports, all using raw SQL. The frontend tasks involve designing and implementing interactive pages such as login/sign-up, appointment booking, dashboards, and analytics views using React. The system will be tested locally using tools like Postman for backend endpoints and browser-based testing for the frontend. Version control and will be managed using GitHub.