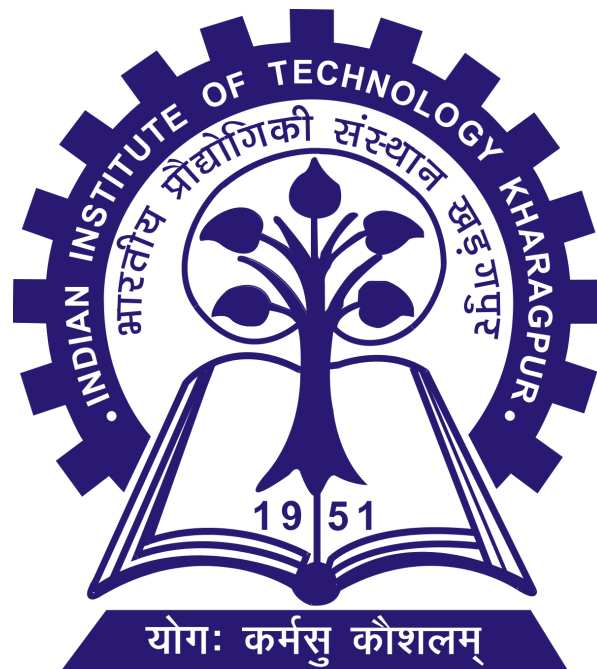


CS39202

Database Management System Laboratory

Assignment - 4: Web Application Development
Hospital Management System



20CS10011 – Ashwani Kumar Kamal

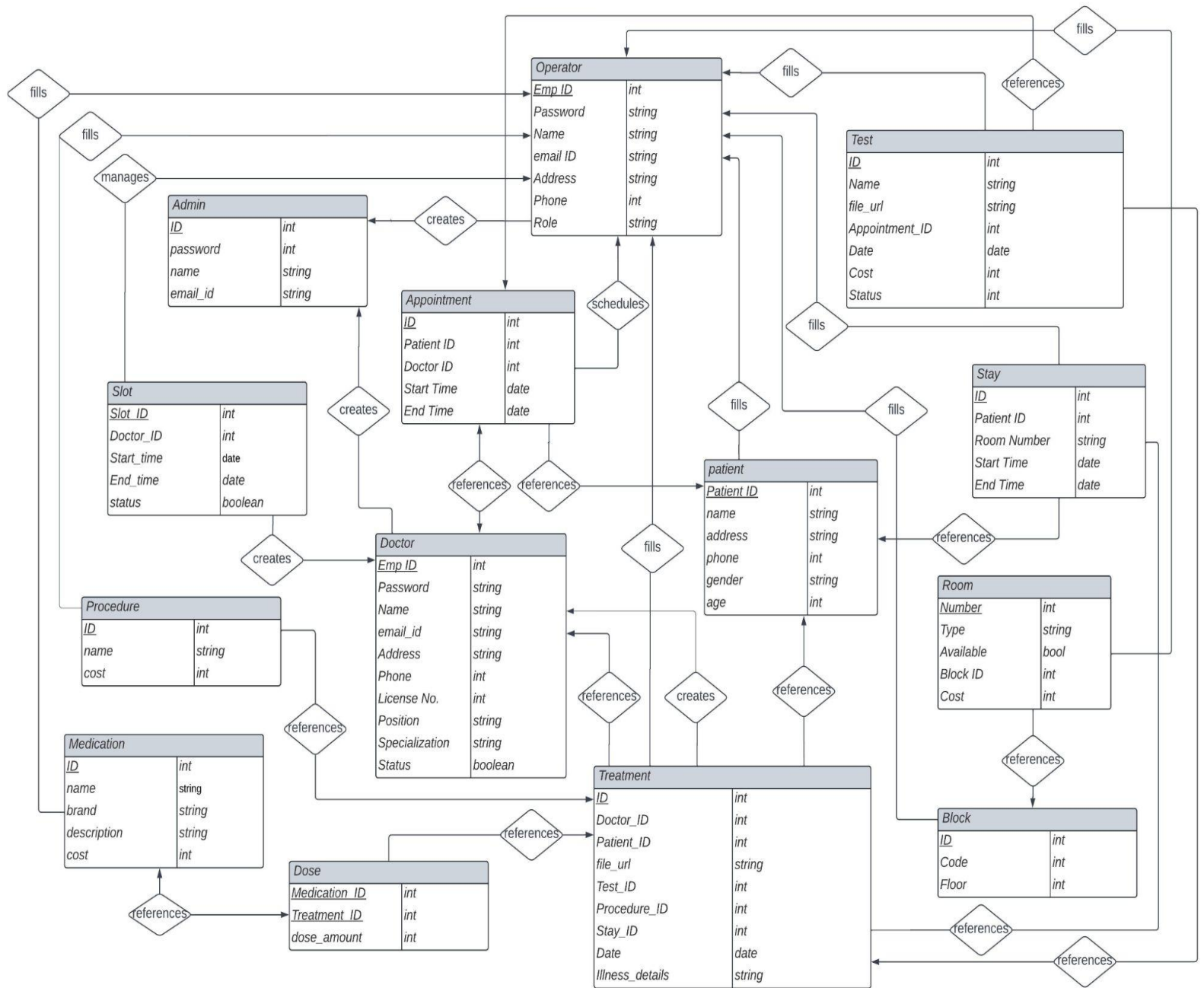
20CS30061 – Shiladitya De

20CS10086 – Archit Mangrulkar

20CS30051 – Sourabh Soumyakanta Das

20CS30023 – Hardik Pravin Soni

Entity-Relationship Diagram



[Link to the Diagram](#)

Relational Table Definitions

Entity Table Schemas

- Patient (ID, Name, address, phone, gender, age)
- Doctor (Emp_ID, password, name, email, address, phone, license no., position, specialization, status)
- Operator (Emp_ID, password, email, name, address, phone, role)
- Admin (ID, email, password, name)
- Appointment (ID, Patient_ID, Doctor_ID, start_time, end_time)
- Slot (Slot_ID, Doctor_ID, start time, end time, status)
- Test (ID, Name, File_url, Appointment_ID, Cost, Date)
- Treatment (ID, Doctor_ID, Patient_ID, Illness_details, Test_ID, Procedure_ID, file_url, Stay_ID, Date)
- Procedure (ID, Name, Cost)
- Medication (ID, Name, Brand, Description, cost)
- Room (Number, Type, Available, Block_ID, Cost)
- Block (ID, Floor, Code)
- Stay (ID, Patient_ID, Room, start_time, end_time)
- Dose (Medication_ID, Dose_amount, Treatment_ID)

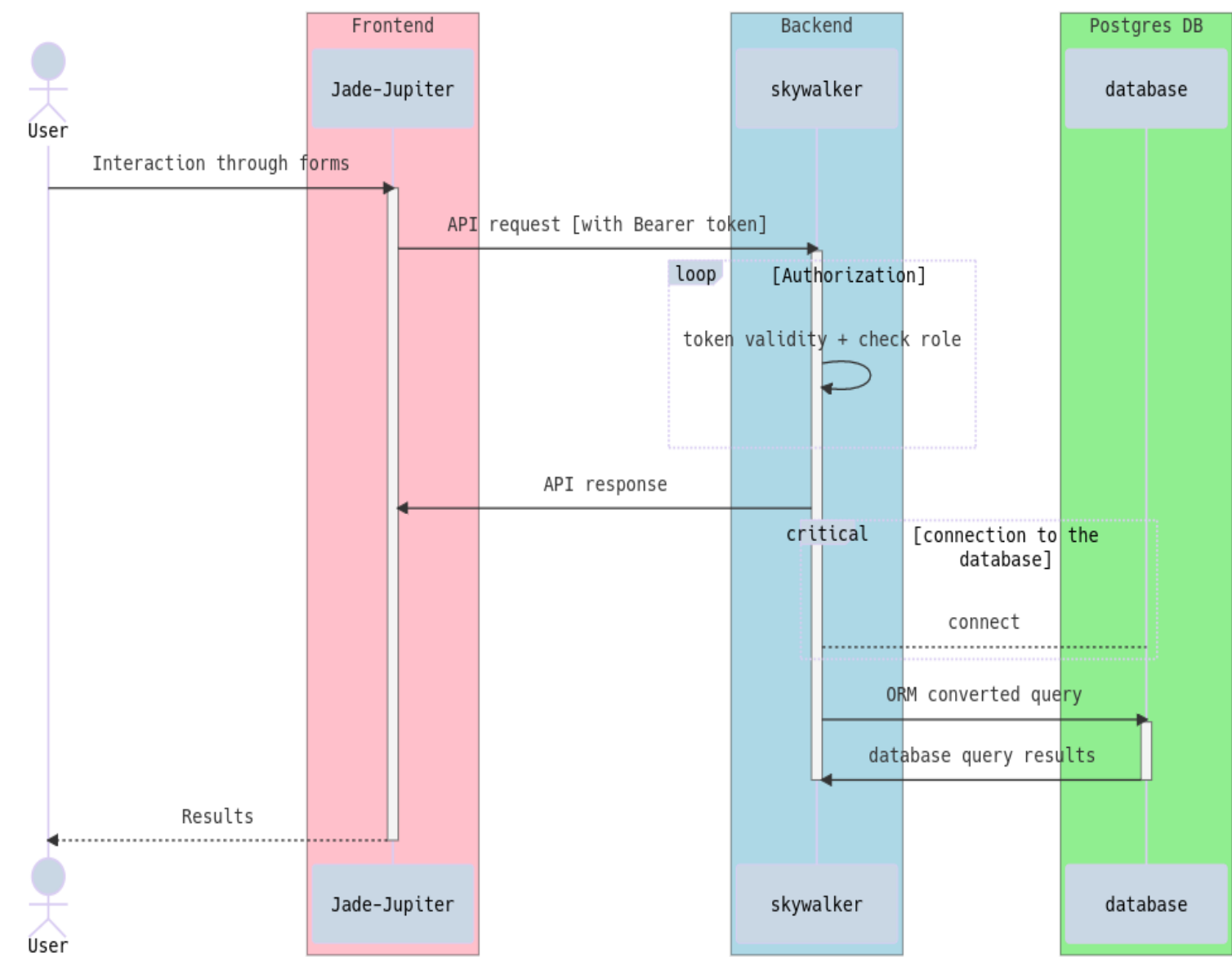
Relational Table Schemas

Relation	Participating Entities	Schema
Creates	Operator, Admin	<u>Treatment.Emp_ID</u>
Creates	Doctor, Admin	<u>Doctor.Emp_ID</u>
Creates	Doctor, Slot	<u>Slot.Doctor_ID</u>
Creates	Doctor, Treatment	<u>Treatment.ID</u>
References	Medication, Dose	<u>Medication.ID</u> , <u>Dose.Medication_ID</u>
References	Procedure, Treatment	<u>Procedure.ID</u>
References	Dose, Treatment	<u>Treatment.ID</u>
References	Doctor, Treatment	<u>Doctor.Emp_ID</u>
References	Patient, Treatment	<u>Patient.Patient_ID</u>
References	Patient, Stay	<u>Patient.Patient_ID</u>
References	Room, Block	<u>Block.ID</u>
References	Doctor, Appointment	<u>Appointment.ID</u>
References	Patient, Appointment	<u>Patient.Patient_ID</u>
References	Test, Operator	<u>Operator.Emp_ID</u>
References	Treatment, Stay	<u>Stay.ID</u>
References	Treatment, Test	<u>Treatment.ID</u>
fills	Operator, Procedure	<u>Procedure.ID</u>
fills	Operator, Medication	<u>Medication.ID</u>
fills	Operator, Room	<u>Room.Number</u>
fills	Operator, Test	<u>Test.ID</u>
fills	Operator, Treatment	<u>Treatment.ID</u>
fills	Operator, Stay	<u>Stay.ID</u>

fills	Operator, Block	<u>Block.ID</u>
fills	Operator, Patient	<u>Patient.Patient_ID</u>
Schedules	Appointment, Operator	<u>Appointment.ID</u>
manages	Operator, Slot	<u>Slot.Doctor_ID</u>

Website Architecture

(Jade Jupiter : Frontend , Skywalker: Backend)



Language Specification

Frontend:

1. Language Used: Javascript (JSX Elements)
2. Library Used : React (v16.13.1)
3. Styling Library Used: Bootstrap 5.0 and Custom CSS, SASS (Syntactically Awesome Stylesheet), icon libraries like fontawesome, alerts, pdf generators (like react-pdf)

Backend:

1. Language Used: Javascript (NodeJS v16.14.1)
2. Libraries Used:
 - i. Base Framework: Express, http-status
 - ii. Encrypting Password: bcrypt (blowfish encryption)
 - iii. Token Handling: jsonwebtoken
 - iv. Env Variables Handling: dotenv
 - v. Database Handling: pg, sequelize
 - vi. Santizing Inputs (preventing SQL injections): xss-clean
 - vii. Access-Control-Allow-Origin: cors
 - viii. App handling: nodemon
 - ix. file storage handling (for file storage): multer
 - x. Managing http Headers: helmet
 - xi. logger: winston, morgan
3. Database Used: Postgres

Website Functionalities

Features and Roles of Users

1. Front-Desk Operators

- a. Can **Discharge Patients**, also accounting for its Admit Date and Discharge Date with a Downloadable Invoice

PATIENT ID	PATIENT NAME	ADMIT DATE	DISCHARGE DATE	PHONE	DOWNLOAD INVOICE
1	Lionel Messi	12:22:22 PM, 12/03/2023	12:50:05 PM, 12/03/2023	(555) 555-1111	Download
3	Ashwani Kumar Kamal	10:29:37 PM, 08/03/2023	10:33:10 PM, 08/03/2023	+91123456789	Download
2	Christiano Ronaldo	08:36:24 PM, 08/03/2023	08:38:16 PM, 08/03/2023	(555) 555-2222	Download
1	Lionel Messi	10:52:14 PM, 06/03/2023	10:52:31 PM, 06/03/2023	(555) 555-1111	Download
1	Lionel Messi	10:52:14 PM, 06/03/2023	10:52:31 PM, 06/03/2023	(555) 555-1111	Download

front desk operators can discharge patients

- b. Can **add/update the details of a new Patient or Existing One**(As the Case may be), also have the search bar to help do the same

Global Hospitals

Your Profile
Patient Discharge
Patient Info
Patient Admission
Patients on Treatment
Manage Appointments
Doctors List
All Patients List

SignOut

Add / Update Patient Details

Enter Patient ID of patient

Patient Information

Patient Name

Patient ID (Ignore For New Registrations)

Age

Gender

Phone

Address

Address

front desk operators can add patient details

c. **Administer Incoming Patients**, filling the Admission Form allocating them Rooms

Global Hospitals

Your Profile
Patient Discharge
Patient Info
Patient Admission
Patients on Treatment
Manage Appointments
Doctors List
All Patients List

SignOut

Patient Admission

Patient Admission Form

Patient ID

Room Number

Patients List

PATIENT ID	PATIENT NAME	GENDER	AGE	PHONE
1	Lionel Messi	Male	34	(555) 5
2	Christiano Ronaldo	Male	37	(555) 5
3	Ashwani Kumar Kamal	Male	21	+91123

Available Rooms

ROOM NUMBER	ROOM TYPE	COST
23	Emergency	500
14	ICU	1000
15	General Ward	500

front desk operators can admit patients

d. Can **View the List of Patients** with Details like Name, Admission and Discharge Date and their Room for Stay

ID	NAME	ADMISSION DATE	DISCHARGE DATE	STAY ID	ROOM NUMBER
1	Lionel Messi	06/03/2023, 10:52 PM	06/03/2023, 10:52 PM	1	12
1	Lionel Messi	06/03/2023, 10:52 PM	06/03/2023, 11:22 PM	2	23
1	Lionel Messi	07/03/2023, 08:30 PM	07/03/2023, 08:30 PM	3	12
3	Ashwani Kumar Kamal	08/03/2023, 08:30 PM	08/03/2023, 08:33 PM	4	23
3	Ashwani Kumar Kamal	08/03/2023, 08:34 PM	08/03/2023, 08:34 PM	5	14
2	Christiano Ronaldo	08/03/2023, 08:36 PM	08/03/2023, 08:38 PM	6	14
3	Ashwani Kumar Kamal	08/03/2023, 10:29 PM	08/03/2023, 10:29 PM	7	14
3	Ashwani Kumar Kamal	08/03/2023, 10:29 PM	08/03/2023, 10:33 PM	8	14
1	Lionel Messi	09/03/2023, 10:24 PM	11/03/2023, 08:14 PM	9	14
1	Lionel Messi	12/03/2023, 01:33 AM	12/03/2023, 02:09 AM	10	14
1	Lionel Messi	12/03/2023, 12:22 PM	12/03/2023, 12:50 PM	11	14
2	Christiano Ronaldo	12/03/2023, 03:46 PM	12/03/2023, 03:47 PM	12	15
3	Ashwani Kumar Kamal	12/03/2023, 11:38 PM	Not Yet Discharged	13	14

front desk operators can view list of all patients

e. **Manage Appointments** wherein using the Forms he/she can search for Available Doctors, see to it that Emergency Slots are created in cases of Dire Emergency

SLOT ID	DOCTOR ID	DATE	START TIME	END TIME	STATUS
1	1	16/03/2023	08:25 AM	08:45 AM	Booked
2	1	17/03/2023	01:25 AM	02:00 AM	Booked
11	1	16/03/2023	02:43 AM	02:53 AM	Available
12	2	18/03/2023	03:40 AM	03:45 AM	Available
13	2	18/03/2023	03:44 AM	03:50 AM	Available
14	2	20/03/2023	10:53 AM	10:55 AM	Available

front desk operators can add slots (emergency) and create appointments

- f. Set the **Appointment between a Patient and a Doctor**, allocate them a Slot, both the Patient and the Doctor are notified accordingly

SLOT ID	DOCTOR ID	DATE	START TIME	END TIME	STATUS
1	1	16/03/2023	08:25 AM	08:45 AM	Booked
2	1	17/03/2023	01:25 AM	02:00 AM	Booked
11	1	16/03/2023	02:43 AM	02:53 AM	Available
12	2	18/03/2023	03:40 AM	03:45 AM	Available
13	2	18/03/2023	03:44 AM	03:50 AM	Available
14	2	20/03/2023	10:53 AM	10:55 AM	Available

front desk operators can add slots (emergency) and create appointments

- g. Can **View the List of Doctors** with details of their Specialization and Position at the Institution

DOCTOR ID	DOCTOR NAME	SPECIALIZATION	POSITION
1	doc	general	head
2	Dr. Barry Parker	Cardiology	Assistant Surgeon
3	Dr. Lombard Diesel	Ontology	Assistant Surgeon
4	LeBron James	Cardiology	Surgeon
5	Kobe Bryant	Oncology	Physician
6	Dr. Sourabh Soumyakanta Das	Orthopaedics	Head Surgeon
7	Shiladitya De	Heart	Assistant

front desk operators can view list of all doctors

2. Data Entry Operators

a. **Add data of the Patient's Tests** Referenced by their ID's adding their Test ID, Results or Peculiar Details (if any) with cost and date of test with a link to the test report(if any)

The screenshot shows the 'Patient Tests' form within the 'Global Hospitals' application. The left sidebar contains a menu with options: Your Profile, Patient Tests (highlighted), Patient Treatments, Patient Doses, Add Procedures, Add Medications, Add Rooms & Blocks, Show Medications, Patients on Treatment, Doctors List, and All Patients List. At the bottom of the sidebar is a 'SignOut' button. The main form area is titled 'Patient Tests' and 'Add Patient Test Details'. It includes input fields for Patient Name (with placeholder 'Enter your first name'), Patient ID (with value '35'), Test Name (with placeholder 'Enter test name'), and Test ID (with value '35'). There is a large text area for 'Test Results / Details' with the placeholder 'Enter the test results'. Below this are fields for Appointment ID (value '35'), Cost (value '35'), and Date (placeholder 'dd/mm/yyyy'). An 'Upload File' section contains a file icon and a 'Choose File' link. At the bottom of the form is an 'Add' button.

data entry operators can add patient's tests

b. **Add data of the Patient's Treatments** Referenced by their IDs adding their Doctor's ID, with Procedures Performed with Stay ID, Date of Procedure and a Report File for their Ongoing Treatment

The screenshot shows the 'Patient Treatments' form within the 'Global Hospitals' application. The left sidebar is identical to the previous form, with 'Patient Treatments' highlighted. The main form area is titled 'Patient Treatments' and 'Add Patient Treatment Details'. It includes input fields for Patient Name (with placeholder 'Enter your first name'), Patient ID (with value '35'), Doctor Name (with placeholder 'Enter doctor's name'), and Doctor ID (with value '35'). There is a large text area for 'Illness Details' with the placeholder 'Enter the illness details'. Below this are fields for Test ID (value '35'), Procedure ID (value '35'), Stay ID (value '35'), and Procedure Date (placeholder 'dd/mm/yyyy'). An 'Upload File' section contains a file icon and a 'Choose File' link. At the bottom of the form is an 'Add' button.

data entry operators can add patient's treatments

- c. **Add data on the Patient's Doses** that are administered with their name, ID, Medication ID, their Respective Dosages and Unit administered

The screenshot shows the 'Patient Doses' form in the Global Hospitals application. The left sidebar contains a menu with options: Your Profile, Patient Tests, Patient Treatments, Patient Doses (selected), Add Procedures, Add Medications, Add Rooms & Blocks, Show Medications, Patients on Treatment, Doctors List, and All Patients List. At the bottom of the sidebar is a 'SignOut' button. The main content area is titled 'Patient Doses' and contains a form titled 'Add Patient Dosage Details'. The form has four input fields: 'Patient Name' (placeholder: 'Enter your first name'), 'Patient ID' (value: '35'), 'Medication ID' (value: '35'), and 'Dosage' (value: '6'). There is also a 'Treatment ID' field with a value of '35'. An 'Add' button is located at the bottom left of the form.

data entry operators can add patient's doses

- d. **Add procedures with their Respective Costs** adding that the Hospital is able to perform

The screenshot shows the 'Add Procedures' form and the 'All Procedures' table in the Global Hospitals application. The left sidebar is identical to the previous screenshot, with 'Add Procedures' selected in the menu. The main content area is titled 'Add Procedures' and contains a form titled 'Add Procedure Details'. The form has two input fields: 'Procedure Name' (placeholder: 'Enter procedure name') and 'Cost' (value: '10000'). An 'Add' button is located at the bottom left of the form. Below the form is a table titled 'All Procedures' with the following data:

PROCEDURE ID	PROCEDURE NAME	PROCEDURE COST
1	bypass surgery	10000
2	Root Canal Treatment	15000

data entry operators can add procedures

e. **Add Medicines, their brand, cost** and with a brief description as recorded in the Hospital's Inventory

Global Hospitals

Your Profile

Patient Tests

Patient Treatments

Patient Doses

Add Procedures

Add Medications

Add Rooms & Blocks

Show Medications

Patients on Treatment

Doctors List

All Patients List

SignOut

Add Medications

Add Medication Details

Medication Name

Enter medication name

Medication Brand

Enter medication brand

Description

Enter medication description

Medication Cost

35

Add

data entry operators can add medication details

f. **Add Rooms and Blocks** as and when needed to the Hospital's Infirmary

Global Hospitals

Your Profile

Patient Tests

Patient Treatments

Patient Doses

Add Procedures

Add Medications

Add Rooms & Blocks

Show Medications

Patients on Treatment

Doctors List

All Patients List

SignOut

Add Rooms

Add Room Details

Room No.

0

Type

ICU

Block ID

0

Cost

0

Add

All Rooms

ROOM NUMBER	ROOM TYPE	COST	AVAILABILITY
12	ICU	1000	Booked
23	Emergency	500	Available
15	General Ward	500	Available
14	ICU	1000	Booked

Add Blocks

Add Block Details

Floor

35

Code

35

Add

All Blocks

BLOCK ID	BLOCK FLOOR	BLOCK CODE
1	1	1
2	1	2
3	2	15
4	2	3

data entry operators can add rooms and blocks

g. View and Monitor the **list of Patients on Treatment**, the list of doctors and all the patients we have had this far

ID	NAME	ADMISSION DATE	DISCHARGE DATE	STAY ID	ROOM NUMBER
1	Lionel Messi	06/03/2023, 10:52 PM	06/03/2023, 10:52 PM	1	12
1	Lionel Messi	06/03/2023, 10:52 PM	06/03/2023, 11:22 PM	2	23
1	Lionel Messi	07/03/2023, 08:30 PM	07/03/2023, 08:30 PM	3	12
3	Ashwani Kumar Kamal	08/03/2023, 08:30 PM	08/03/2023, 08:33 PM	4	23
3	Ashwani Kumar Kamal	08/03/2023, 08:34 PM	08/03/2023, 08:34 PM	5	14
2	Christiano Ronaldo	08/03/2023, 08:36 PM	08/03/2023, 08:38 PM	6	14
3	Ashwani Kumar Kamal	08/03/2023, 10:29 PM	08/03/2023, 10:29 PM	7	14
3	Ashwani Kumar Kamal	08/03/2023, 10:29 PM	08/03/2023, 10:33 PM	8	14
1	Lionel Messi	09/03/2023, 10:24 PM	11/03/2023, 08:14 PM	9	14
1	Lionel Messi	12/03/2023, 01:33 AM	12/03/2023, 02:09 AM	10	14
1	Lionel Messi	12/03/2023, 12:22 PM	12/03/2023, 12:50 PM	11	14
2	Christiano Ronaldo	12/03/2023, 03:46 PM	12/03/2023, 03:47 PM	12	15
3	Ashwani Kumar Kamal	12/03/2023, 11:38 PM	Not Yet Discharged	13	14

data entry operators can view patients list

3. Doctors

a. Doctor can **query its respective Patient's Information**, can record tests, prescribe treatments and administer drug information for a Patient referencing its Patient_ID

Enter Patient ID of patient

Q 1 Search Patient

Lionel Messi - 01/03/2023

General Information:
Name: Lionel Messi
Gender: Male
Age: 34
Phone: (555) 555-1111

Treatment Details:
Treatment ID: 2
Treatment Date: 01/03/2023
Illness Details: fever
Room Details: 12
Files: [Treatment File](#)
Procedure Name: bypass surgery

Test Details:
Test Name: lipid profile
Test Report: [Test File](#)

Medication Details:
[Get Medication Details](#)

Lionel Messi - 21/03/2023

doctor can query patient's info

Global Hospitals

Your Profile
Patient Query
Add Medications
Add Treatments
Add Slots
Treatm... & Appoint...
On Treatment
Show Medicines
All Tests List
SignOut

Lionel Messi - 01/03/2023

General Information:
Name: Lionel Messi
Gender: Male
Age: 34
Phone: (555) 555-1111

Treatment Details:
Treatment ID: 2
Treatment Date: 01/03/2023
Illness Details: fever
Room Details: 12
Files: [Treatment File](#)
Procedure Name: bypass s...

Test Details:
Test Name: lipid profile
Test Report: [Test File](#)

Medication Details:
[Get Medication Details](#)

Medication List of the Patient

MEDICATION ID	MEDICATION NAME	MEDICATION BRAND	DOSE AMOUNT
1	paracetamol	Rx	6
1	paracetamol	Rx	10

Close

Lionel Messi - 21/03/2023
Lionel Messi - 13/03/2023

doctor can access the medication details of patient

- b. **Add Slots wherein he/she is free**, get details of his/her free slots and help the Front-Desk Operators to add Patients for his/her slots if the case may be

Global Hospitals

Your Profile
Patient Query
Add Medications
Add Treatments
Add Slots
Treatm... & Appoint...
On Treatment
Show Medicines
All Tests List
SignOut

Add Slot

Add Slot Details

Date: dd/mm/yyyy Start Time: --:-- Start Time End Time: --:-- End Time

[Add](#)

Get Slot Details

Date: dd/mm/yyyy

[Get All Slots](#)

Available Slots

SLOT ID	DATE	START TIME	END TIME	BOOKING STATUS
1	16/03/2023	08:25 AM	08:45 AM	Booked
2	17/03/2023	01:25 AM	02:00 AM	Booked
11	16/03/2023	02:43 AM	02:53 AM	Available
5	25/03/2023	02:00 AM	02:15 AM	Booked
6	16/03/2023	02:14 AM	02:20 AM	Booked

doctor can add slots where he is free

c. Can **View the List of Patients he/she has cured**, and the patients he/she has an appointment with

PATIENT ID	PATIENT NAME	TREATMENT ID	ILLNESS DETAILS	PROCEDURE NAME	TREATMENT DATE	ROOM NUMBER
1	Lionel Messi	2	fever	bypass surgery	01/03/2023	12
2	Christiano Ronaldo	3	Fever	bypass surgery	09/03/2023	14
1	Lionel Messi	8	Headache	bypass surgery	21/03/2023	14
1	Lionel Messi	10	blood cancer	bypass surgery	13/03/2023	12

PATIENT ID	PATIENT NAME	APPOINTMENT ID	START TIME	END TIME
1	Lionel Messi	2	25/03/2023, 02:00 AM	25/03/2023, 02:15 AM
1	Lionel Messi	3	16/03/2023, 02:14 AM	16/03/2023, 02:20 AM
3	Ashwani Kumar Kamal	13	23/03/2023, 10:10 PM	23/03/2023, 10:30 PM

doctor has access to the list of patients he has cured/has appointment with

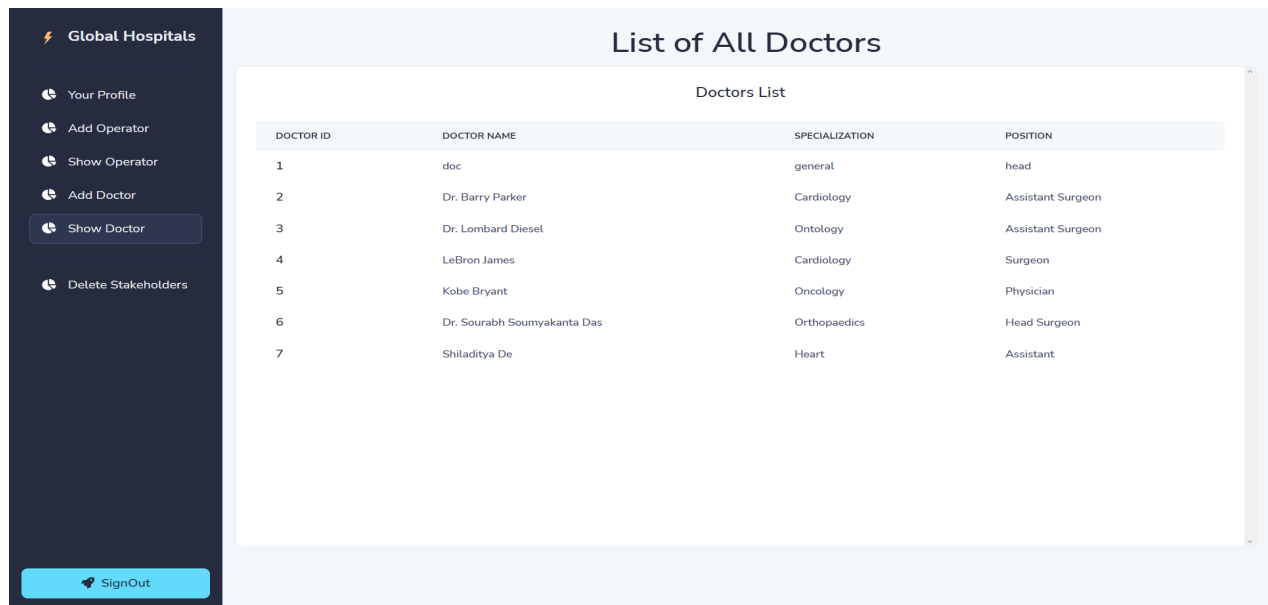
d. Also has the **list of all medicines** that we offer to confide with for future reference

MEDICATION ID	MEDICATION NAME	DESCRIPTION	BRAND	COST
1	paracetamol	Rx	Fever	10
2	Rantac	Ranbaxy	For mild Gastric Problems	20
3	Chloroquinone	Chlor	For Malaria	150

doctor can view list of all medicines

4. Database Administration

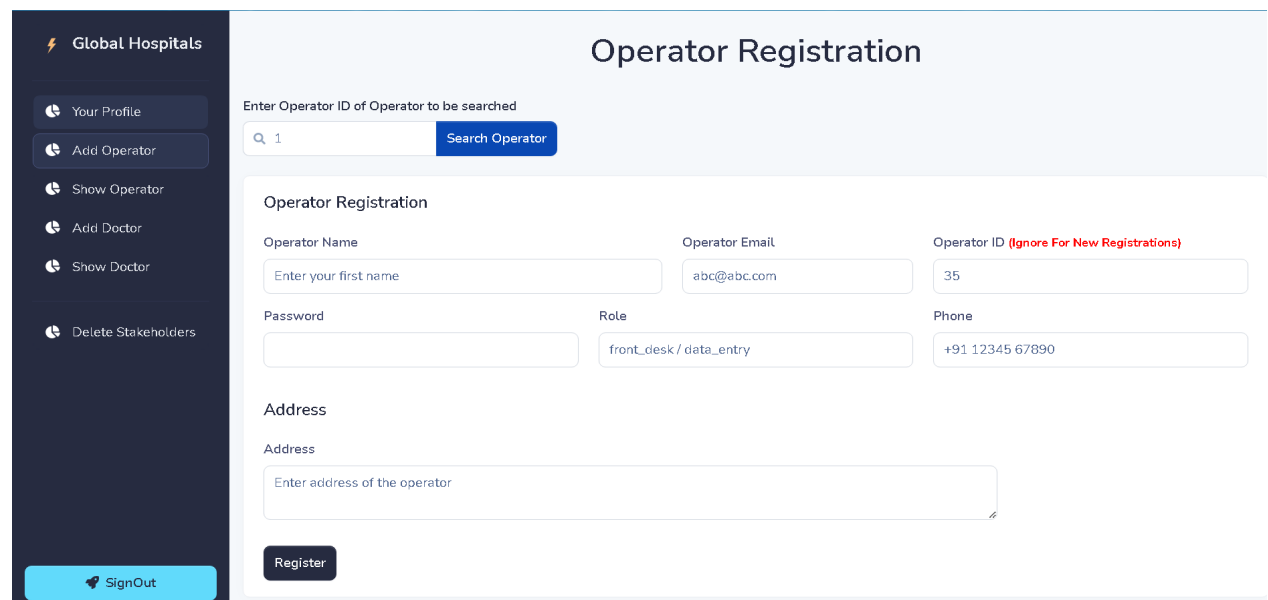
- a. The **Database admin** can view and access the entire list of stakeholders in the Institution.



DOCTOR ID	DOCTOR NAME	SPECIALIZATION	POSITION
1	doc	general	head
2	Dr. Barry Parker	Cardiology	Assistant Surgeon
3	Dr. Lombard Diesel	Oncology	Assistant Surgeon
4	LeBron James	Cardiology	Surgeon
5	Kobe Bryant	Oncology	Physician
6	Dr. Sourabh Soumyakanta Das	Orthopaedics	Head Surgeon
7	Shiladitya De	Heart	Assistant

admin can view operators, doctors

- b. He/She can **add/delete an Operator** (Front-Desk/Data Entry) and Register him/her in the Institution System.



Operator Registration

Enter Operator ID of Operator to be searched

1 Search Operator

Operator Registration

Operator Name: Enter your first name

Operator Email: abc@abc.com

Operator ID (Ignore For New Registrations): 35

Password:

Role: front_desk / data_entry

Phone: +91 12345 67890

Address: Enter address of the operator

Register

admin has access to add operators

c. The Same goes for the Doctors, **he/she can add a Doctor** to the Institution System.

The screenshot shows the 'Doctor Registration' page of the 'Global Hospitals' system. On the left is a dark sidebar with navigation links: 'Your Profile', 'Add Operator', 'Show Operator', 'Add Doctor' (highlighted), 'Show Doctor', and 'Delete Stakeholders'. At the bottom of the sidebar is a 'SignOut' button. The main content area has a light blue header with the title 'Doctor Registration'. Below the header is a search bar with the text 'Enter Doctor ID of Doctor to be searched', a search input containing '1', and a 'Search Doctor' button. The registration form itself contains several fields: 'Doctor Name' (with a sub-label 'Enter your first name'), 'Doctor ID' (with a sub-label '(Ignore For New Registrations)' and a value '-1'), 'Password', 'Email ID' (with a value 'abc@abc.com'), 'Phone' (with a value '+91 12345 67890'), 'Licence No.', 'Specialization', and 'Position'. There is also an 'Address' section with a sub-label 'Address' and a text area 'Enter address of the Doctor'. A 'Register' button is located at the bottom of the form.

admin has access to add doctors

d. We have also implemented a **feature to remove the stakeholders** of the Institution from its Database as the case may be, searching them by their Respective ID's.

The screenshot shows the 'Remove Stakeholders' page of the 'Global Hospitals' system. The sidebar is identical to the previous screenshot, but the 'Delete Stakeholders' link is now highlighted. The main content area has a light blue header with the title 'Remove Stakeholders'. Below the header are two search sections. The first section is for doctors, with the text 'Enter Doctor ID of Doctor to be Deleted', a search input containing '999', and a red 'Remove Doctor' button. The second section is for operators, with the text 'Enter Operator ID of Operator to be Deleted', a search input containing '999', and a red 'Remove Operator' button.

admin has access to delete operators & doctors

Bonus Features

1. We have **Calendar based Appointments** for the Users and we have a calendar widget implemented whenever we take an input of a date
2. We have made provisions for **Slot addition and Appointments** between the User and the Patients
3. **Custom Invoice can be downloaded** and provided to the Patient by the Front-Desk Operator
4. We have **File Storage and Download options**, we offer to upload and download files from our System
5. When a User fills a **Contact us form** we have a **mail facility working in the backend** for the same
6. The Same goes for the **Emergency Slot Creation** and **Appointment Email facility**

Backend Implementation

1. All models have been created as per the **ER diagram**.
2. The respective **API calls** are made
3. **Role based login** is added
4. **Role based access to API** is also implemented, e.g Doctors cannot add new patient details, front-desk operators cannot create or modify slots, etc
5. **Prevention of SQL injection attacks** has been implemented using xss-clean library to sanitize the inputs
6. **File storage** has been done in local storage using multer library.

Triggers and Procedures

Triggers:

1. On setting an appointment, the corresponding slot gets automatically changed to “Booked” (in the database the status changes to “false”).
2. On admitting the patient, the room gets automatically booked.
3. **[Note]** We removed the trigger which takes place when we remove a doctor , then corresponding all entries in tables which have referenced it will get deleted if we use the “*ON DELETE CASCADE*” trigger and we will lose all patient data.

Procedures:

Procedures have been called for different functionalities. These are as follows:

1. We have used a procedure in the slot controller to check if the date of two datetimes are the same.

```
(Sequelize.fn('DATE', Sequelize.col('starttime'))  
(Sequelize.fn('DATE', quedate))
```

2. We have another procedure to get the value of the column value.

```
Sequelize.col('starttime')
```

Appendix

Queries Implemented

1. Register User/ Login User

```
SELECT *, 'doctor' AS type FROM Doctor WHERE Doctor.email = email LIMIT 1;
```

```
SELECT *, 'admin' AS type FROM Admin WHERE Admin.email = email LIMIT 1;
```

```
SELECT *, 'operator' AS type FROM Operator WHERE Operator.email = email LIMIT 1;
```

Then, if atleast one table returns a row, we give an error, else we encrypt the password and add the entry into the Admin database.

```
INSERT INTO Admin VALUES (id, email, encryptedPassword, name);
```

For login, if atleast one table returns a row, we verify the password and if successful, we store the details and go to their relevant dashboard, else we give an error of invalid credentials.

2. Create Appointments

```
SELECT * FROM Slot WHERE Slot.id = slot_id AND Slot.doctor_id = doctor_id AND Slot.status = true LIMIT 1; (store in slot)
```

If slot not empty,

```
INSERT INTO Appointment VALUES (id, patient_id, doctor_id, name, room, slot.starttime, slot.endtime);
```

```
UPDATE Slot SET Slot.status = false WHERE Slot.id = slot_id;
```

3. Get all Appointments

```
SELECT * FROM Appointment;
```

4. Get doctor specific Appointments

```
SELECT * FROM Appointment WHERE Appointment.doctor_id = doctor_id;
```

5. Add Blocks

```
INSERT INTO Block VALUES (id, floor, code);
```

6. Get all Blocks

```
SELECT * FROM Blocks;
```

7. Register Doctor

```
SELECT * FROM Doctor WHERE Doctor.email = email;
```

If this returns a row, we give an error that the user already exists, else we insert into the Doctor table.

```
INSERT INTO Doctor VALUES (id, email, encryptedPassword, name, address, phone, license, position, specialization);
```

8. Get Doctor details

```
SELECT * FROM Doctor WHERE Doctor.id = id AND Doctor.status = true LIMIT 1;
```

The above query is used if id is provided for a specific doctor, else we return details of all doctors.

```
SELECT * FROM Doctor WHERE Doctor.status = true;
```

9. Delete Doctor

```
UPDATE Doctor SET Doctor.status = false WHERE Doctor.id = id;
```

10. Create Dose

```
INSERT INTO Dose VALUES (medication_id, dose_amount, treatment_id);
```

11. Create Medication

```
INSERT INTO Medication VALUES (id, name, brand, description, cost);
```

12. Get all Medications

```
SELECT * FROM Medication;
```

13. Register Operators

```
SELECT * FROM Operator WHERE Operator.email = email;
```

If this returns a row, we give an error that the user already exists, else we insert into the Operator table.

```
INSERT INTO Operator VALUES (id, email, encryptedPassword, name, address, phone, role);
```

14.Get Operator details

```
SELECT * FROM Operator WHERE Operator.id = id LIMIT 1;
```

The above query is used if id is provided for a specific operator, else we return details of all operators.

```
SELECT * FROM Operator;
```

15.Delete Operator

```
DELETE FROM Operator WHERE Operator.id = id;
```

16.Add Patients

```
INSERT INTO Patient VALUES (id, name, address, gender, age, phone);
```

17.Get details of Patients

```
SELECT * FROM Patient WHERE Patient.id = id LIMIT 1;
```

The above query is used if id is provided for a specific patient, else we return details of all patients.

```
SELECT * FROM Patient;
```

More detailed query:

```
SELECT Patient.id AS patient_id, Patient.name AS patient_name, Patient.age, Patient.gender, Patient.phone, Treatment.id as treatment_id, Treatment.date, Treatment.illness_details, Stay.room, Treatment.file_url, Procedure.name AS procedure_name, Test.name, Test.file_url AS test_file_url FROM Patient, Treatment, Stay, Procedure, Test WHERE Patient.id = Treatment.patient_id AND Treatment.patient_id = patient_id AND Treatment.doctor_id = doctor_id AND Treatment.procedure_id = Procedure.id AND Treatment.test_id = Test.id AND Treatment.stay_id = Stay.id;
```

18.Get details of Patients treated by a specific doctor

```
SELECT Patient.id as patient_id, Patient.name, Treatment.id, Treatment.date, Procedure.name AS procedure_name, Stay.room, Treatment.illness_details FROM
```

Patient, Procedure, Treatment, Stay WHERE Treatment.patient_id = Patient.id AND Treatment.stay_id = Stay.id AND Treatment.procedure_id = Procedure.id AND Treatment.doctor_id = doctor_id;

19. Get details of Patients having appointment with a specific doctor

SELECT Patient.id as patient_id, Patient.name, Appointment.id, Appointment.starttime, Appointment.endtime FROM Patient, Appointment WHERE Appointment.patient_id = Patient.id AND Appointment.doctor_id = doctor_id;

20. Get Medication details based on Treatment id

SELECT Medication.name, Medication.id, Dose.dose_amount, Medication.brand, Medication.description FROM Dose, Medication WHERE Dose.medication_id = Medication.id AND Dose.treatment_id = id;

21. Add Procedures

INSERT INTO Procedure VALUES (id, name, cost);

22. Get Procedure list

SELECT * FROM Procedure;

23. Add Rooms

INSERT INTO Room VALUES (room_number, type, cost, block_id);

24. Get all rooms

SELECT * FROM Room WHERE Room.available = true; *(for free rooms)*

SELECT * FROM Room; *(for all)*

25. Add Slots

INSERT INTO Slot VALUES (id, doctor_id, starttime, endtime, true);

26. Get Slots

SELECT * FROM Slot WHERE Slot.doctor_id = doctor_id;

The above query is used if id is provided for a specific doctor, else we return details of all slots.


```
SELECT * FROM Slot;
```

Below query is for obtaining slots on a particular day.

```
SELECT * FROM Slot WHERE Slot.doctor_id = doctor_id AND CONVERT(DATE, Slot.starttime) = que_date;
```

27.Create Stay

```
INSERT INTO Stay VALUES (id, patient_id, room, cur_time, NULL);
```

```
UPDATE Room SET Room.available = false WHERE Room.room_number = room;
```

28.Discharge Stay

```
SELECT * FROM Stay WHERE Stay.patient_id = id AND Stay.endtime IS NULL; (store as stay)
```

```
UPDATE Room SET Room.available = true WHERE Room.room_number = stay.room;
```

```
UPDATE Stay SET Stay.endtime = cur_time WHERE Stay.id = stay.id;
```

29.Get discharged patient details

```
SELECT Treatment.id, Patient.id AS patient_id, Patient.name, Stay.starttime, Stay.endtime, Patient.phone FROM Treatment, Stay, Patient WHERE Stay.starttime < Stay.endtime AND Stay.patient_id = Patient.id AND Treatment.stay_id = Stay.id;
```

30.Get admitted patient details

```
SELECT Patient.id, Patient.name, Patient.gender, Patient.age, Patient.phone, Stay.starttime, Stay.endtime, Stay.room, Stay.id AS stay_id FROM Stay, Patient WHERE Stay.patient_id = Patient.id;
```

31.Create Test

```
INSERT INTO Test VALUES (id, name, file_url, appointment_id, cost, date);
```

32.Get all Tests of a patient

```
SELECT * FROM Test WHERE Test.appointment_id IN (SELECT Appointment.id FROM Appointment WHERE Appointment.patient_id = id);
```

33.Create Treatments

```
INSERT INTO Treatment VALUES (id, patient_id, doctor_id, file_url, illness_details,  
test_id, procedure_id, stay_id, date);
```

34. Get Treatment done by a specific doctor

```
SELECT * FROM Treatment WHERE Treatment.doctor_id = id;
```

Future Work

1. Adding Chat Feature to communicate with the authorities.
2. Adding automatic schedulers.
3. Weekly mail to the doctors regarding the appointments of the upcoming week.
4. Migrating the functionalities into an app and a GUI application.
5. Hosting the frontend as well as the backend (Normal as well as Docker Image).
6. Add OAuth2.0 Authentication and Authorization in the server instead of jwt.
7. Calendar Based Appointment using fullcalendar.js (similar to google calendar)