Healthcare Monitoring System

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INTRODUCTION

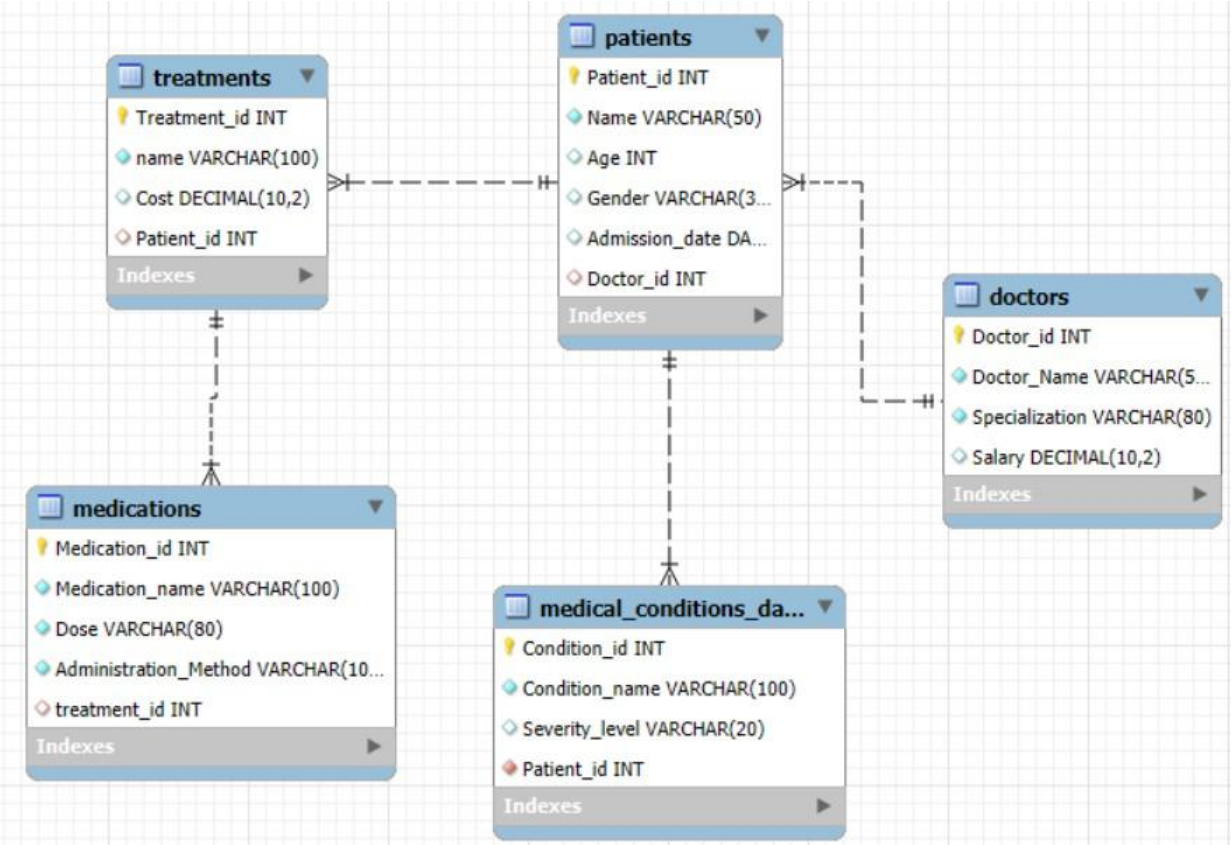
The **Healthcare Patient Monitoring System** is designed to efficiently track and manage vital patient information, including medical history, ongoing treatments, and doctor assignments. This system is an SQL-based project that simulates a real-world hospital environment, focusing on storing and retrieving data related to patients, doctors, treatments, medications, and medical conditions.

The primary goal of the system is to provide healthcare professionals with quick access to essential patient information, enabling better decision-making and improved patient care. By maintaining structured records of patient details, treatment plans, and doctor assignments, the system ensures that critical healthcare data is well-organized and readily available.

From a technical perspective, the project includes the creation of relational tables, views, and queries that streamline data management. The project leverages SQL to perform data manipulation and query operations such as filtering, sorting, aggregating, and combining data to gain insights. It also employs advanced SQL concepts like subqueries, joins, and views to enhance the functionality of the database.

Additionally, the project is relevant to my **Statistics** background, as it involves data analysis, pattern identification, and insights generation from medical and patient data. Statistical concepts are naturally integrated into the project's queries, enabling the analysis of healthcare trends, patient demographics, treatment costs, and doctor-patient relationships. This project not only strengthens my technical SQL skills but also demonstrates how statistical thinking can improve healthcare data analysis and decision-making.

ER DIAGRAM


treatments
Treatment_id INT
name VARCHAR(100)
Cost DECIMAL(10,2)
Patient_id INT
Indexes
patients
Patient_id INT
Name VARCHAR(50)
Age INT
Gender VARCHAR(3...
Admission_date DA...
Doctor_id INT
Indexes
doctors
Doctor_id INT
Doctor_Name VARCHAR(5...
Specialization VARCHAR(80)
Salary DECIMAL(10,2)
Indexes
medications
Medication_id INT
Medication_name VARCHAR(100)
Dose VARCHAR(80)
Administration_Method VARCHAR(10...
treatment_id INT
Indexes
medical_conditions_da...
Condition_id INT
Condition_name VARCHAR(100)
Severity_level VARCHAR(20)
Patient_id INT
Indexes

Databases :

```
Create Database Hospital_data

Use Hospital_data

Show databases;
```

	Database
▶	hospital_data
	information_schema

Tables in Hospital_data Database :

```
show tables;
```

	Tables_in_hospital_data
▶	doctors
	medical_conditions_data
	medications
	patient_health
	patients
	treatments

1. DATA DEFINITION LANGUAGE (DDL):

1. Creating Tables :

A) Patients

```
Create table Patients(Patient_id int primary key,Name varchar(50) not null,Age int check (age>0),Gender
varchar(30),Admission_date date,Doctor_id int);

Desc patients;
```

	Field	Type	Null	Key	Default	Extra
▶	Patient_id	int	NO	PRI	NULL	
	Name	varchar(50)	NO		NULL	
	Age	int	YES		NULL	
	Gender	varchar(30)	YES		NULL	
	Admission_date	date	YES		NULL	
	Doctor_id	int	YES		NULL	

B) Doctors

Create table Doctors(Doctor_id Int primary key,Doctor_Name varchar(50) not null,Specialization varchar(80) not null,Salary Decimal(10,2) check (salary>0));

Desc Doctors;

Field	Type	Null	Key	Default	Extra
Doctor_id	int	NO	PRI	NULL	
Doctor_Name	varchar(50)	NO		NULL	
Specialization	varchar(80)	NO		NULL	
Salary	decimal(10,2)	YES		NULL	

C) Treatments

Create table Treatments(Treatment_id Int Primary key not null,name varchar(100) not null,Cost decimal(10,2),Patient_id int);

Desc Treatments;

Field	Type	Null	Key	Default	Extra
Treatment_id	int	NO	PRI	NULL	
name	varchar(100)	NO		NULL	
Cost	decimal(10,2)	YES		NULL	
Patient_id	int	YES	MUL	NULL	

D) Medications

Create table Medications(Medication_id int Primary key not null,Medication_name varchar(100) not null,Dose varchar(80) not null,Administration_Method varchar(100) not null,treatment_id int,foreign key(treatment_id) references treatments(treatment_id));

Desc Medications;

Field	Type	Null	Key	Default	Extra
Medication_id	int	NO	PRI	NULL	
Medication_name	varchar(100)	NO		NULL	
Dose	varchar(80)	NO		NULL	
Administration_Method	varchar(100)	NO		NULL	
treatment_id	int	YES	MUL	NULL	

E) Medical_Conditions_data

```
Create table medical_conditions_data(
condition_id int not null auto_increment Primary key,condition_name varchar(100) not null,
severity_level varchar(20),patient_id int not null,
foreign key (patient_id) references patients(patient_id));
desc medical_conditions_data;
```

Field	Type	Null	Key	Default	Extra
Condition_id	int	NO	PRI	NULL	auto_increment
Condition_name	varchar(100)	NO		NULL	
Severity_level	varchar(20)	YES		NULL	
Patient_id	int	NO	MUL	NULL	

E) Patient_Health

```
create table Patient_Health(Status_id int primary key,Petient_id int not null,Heart_rate Int,BP int
check(BP>0));
Desc  Patient_Health;
```

Field	Type	Null	Key	Default	Extra
Status_id	int	NO	PRI	NULL	
Petient_id	int	NO		NULL	
Heart_rate	int	YES		NULL	
BP	int	YES		NULL	

2. Alter table :

- **Alter Table : Add column**

```
alter table patients add column discharge_date date not null;
```

Field	Type	Null	Key	Default	Extra
Patient_id	int	NO	PRI	NULL	
Name	varchar(50)	NO		NULL	
Age	int	YES		NULL	
Gender	varchar(30)	YES		NULL	
Admission_date	date	YES		NULL	
Doctor_id	int	YES		NULL	
discharge_date	date	NO		NULL	

- **Alter Table : Modify Column**

```
alter table Doctors  modify  Doctor_name  varchar(80) ;
```

	Field	Type	Null	Key	Default	Extra
▶	Doctor_id	int	NO	PRI	NULL	
	Doctor_name	varchar(80)	YES		NULL	
	Specialization	varchar(80)	NO		NULL	
	Salary	decimal(10,2)	YES		NULL	

- **Alter Table : Rename column**

```
alter  table Treatments  rename column name to Treatment_name;
```

	Field	Type	Null	Key	Default	Extra
▶	Treatment_id	int	NO	PRI	NULL	
	Treatment_name	varchar(100)	NO		NULL	
	Cost	decimal(10,2)	YES		NULL	
	Patient_id	int	YES		NULL	

- **Alter Table : Drop column**

```
alter table Medications drop column Administration_Method;
```

	Field	Type	Null	Key	Default	Extra
▶	Medication_id	int	NO	PRI	NULL	
	Medication_name	varchar(100)	NO		NULL	
	Dose	varchar(80)	NO		NULL	
	treatment_id	int	YES	MUL	NULL	

- **Alter Table : Rename table**

```
alter table Medical_Conditions_data  rename  Medical_conditions;
```

	Tables_in_hospital_data
▶	doctors
	medical_conditions
	medications
	patient_health
	patients
	treatments

3. Truncate table :

```
Truncate  Patient_Health;
```

Status_id	Petient_id	Heart_rate	BP
NULL	NULL	NULL	NULL

4. DropTable :

```
Drop  table  Patient_Health;
```

2. DATA MANIPULATION LANGUAGE (DML):

1. Insert into table :

```
Insert into Doctors(Doctor_id,Doctor_Name,Specialization,Salary) values (6,'Dr.Anushree Patil','Cardiology',120000.00);

select*from doctors;
```

Doctor_id	Doctor_name	Specialization	Salary
2	Dr.Sameer Shaikh	Neurology	185000.00
3	Dr.Sushant Davis	Orthopedics	100000.00
4	Dr.Aradhya Patel	Oral surgery dentist	100000.00
5	Dr.Manas Devkar	General Practitioner	100000.00
6	Dr.Anushree Patil	Cardiology	120000.00

2. Update intoTable :

Q. Update Patient Doctor and Discharge date.

```
update patients

set doctor_id =1, discharge_date = '2024-01-20'

where patient_id = 101;
```

Patient_id	Name	Age	Gender	Admission_date	Doctor_id	discharge_date
101	Raj Kumar	45	Male	2024-01-08	1	2024-01-20
102	Riya Patil	33	Female	2024-02-20	2	2024-02-28
103	Priyanka More	40	Female	2024-02-25	3	2024-03-02
104	Rajani Bapat	28	Female	2024-03-01	3	2024-03-16
105	Pooja Mane	39	Female	2024-03-11	5	2024-03-20
106	Kumar Sharma	55	Male	2024-03-19	1	2024-03-30
107	Alisha Patil	49	Female	2024-03-31	4	2024-04-04
108	Shyam Devan	58	Male	2024-04-04	5	2024-04-16
109	Karishma Sutar	24	Female	2024-04-03	4	2024-04-19

3. Delete from table :

Q.Delete record having doctor_id 6.

```
Delete from Doctors where doctor_id=6;
```

Doctor_id	Doctor_name	Specialization	Salary
2	Dr.Sameer Shaikh	Neurology	185000.00
3	Dr.Sushant Davis	Orthopedics	100000.00
4	Dr.Aradhya Patel	Oral surgery dentist	100000.00
5	Dr.Manas Devkar	General Practitioner	100000.00

3.DATA QUERY LANGUAGE (DQL) :

1. Select Query:

a) Select Query for entire data.

```
Select*from Patients;
```

Patient_id	Name	Age	Gender	Admission_date	Doctor_id	discharge_date
101	Raj Kumar	45	Male	2024-01-08	1	2024-01-20
102	Riya Patil	33	Female	2024-02-20	2	2024-02-28
103	Priyanka More	40	Female	2024-02-25	3	2024-03-02
104	Rajani Bapat	28	Female	2024-03-01	3	2024-03-16
105	Pooja Mane	39	Female	2024-03-11	5	2024-03-20
106	Kumar Sharma	55	Male	2024-03-19	1	2024-03-30
107	Alisha Patil	49	Female	2024-03-31	4	2024-04-04
108	Shyam Devan	58	Male	2024-04-04	5	2024-04-16
109	Karishma Sutar	24	Female	2024-04-03	4	2024-04-19

b) Select specific data i.e Medication name and dose from table.

```
Select medication_name,dose from Medications;
```

medication_name	dose
Aspirin	120 mg
Ibuprofen	400mg
Celecoxib	200 mg
Hyaluronic acid	80 mg
Acetaminophen	500 mg
Clopidogrel	75 mg
Acetaminophen	500 mg
Atorvastatin	70 mg
Amoxicillin	500 mg

c) Select query with changing Column name.

```
Select treatment_name as treatment_for_Patients from treatments;
```

treatment_for_Patients
Heart Surgery
MRI Scan for Headache
Knee replacement
Joint Injection
Routine physical exam
Angioplasty
Tooth Extraction
Health Screening
Dental emplants

2. Order by

a) List of doctors in ascending order by salary.

```
Select*from doctors order by salary;
```

Doctor_id	Doctor_name	Specialization	Salary
3	Dr.Sushant Davis	Orthopedics	100000.00
4	Dr.Aradhya Patel	Oral surgery dentist	100000.00
5	Dr.Manas Devkar	General Practitioner	100000.00
2	Dr.Sameer Shaikh	Neurology	185000.00

b) List of doctors in descending order by salary.

```
Select*from doctors order by salary desc;
```

Doctor_id	Doctor_name	Specialization	Salary
2	Dr.Sameer Shaikh	Neurology	185000.00
3	Dr.Sushant Davis	Orthopedics	100000.00
4	Dr.Aradhya Patel	Oral surgery dentist	100000.00
5	Dr.Manas Devkar	General Practitioner	100000.00

3. Limit Query

Display top 5 most expensive treatments.

```
Select*from Treatments order by cost desc limit
```

Treatment_id	Treatment_name	Cost	Patient_id
201	Heart Surgery	90000.00	101
206	Angioplasty	82000.00	106
203	Knee replacement	65000.00	103
202	MRI Scan for Headache	25000.00	102
209	Dental emplants	25000.00	109

4. Distinct Query

Display Unique Gender from Patients.

```
Select distinct gender from patients;
```

gender
Male
Female

5. Where Clause:

1) With Comparison Operator

Find patients who were discharged on before March 31, 2024.

```
select * from patients
where  discharge_date <'2024-03-31';
```

Patient_id	Name	Age	Gender	Admission_date	Doctor_id	discharge_date
101	Raj Kumar	45	Male	2024-01-08	1	2024-01-20
102	Riya Patil	33	Female	2024-02-20	2	2024-02-28
103	Priyanka More	40	Female	2024-02-25	3	2024-03-02
104	Rajani Bapat	28	Female	2024-03-01	3	2024-03-16
105	Pooja Mane	39	Female	2024-03-11	5	2024-03-20
106	Kumar Sharma	55	Male	2024-03-19	1	2024-03-30

2) Logical Operator

- **Using AND Operator**

Find patients who are older than 35 and are female.

```
select * from  patients
where age >35 and gender = 'female';
```

Patient_id	Name	Age	Gender	Admission_date	Doctor_id	discharge_date
103	Priyanka More	40	Female	2024-02-25	3	2024-03-02
105	Pooja Mane	39	Female	2024-03-11	5	2024-03-20
107	Alisha Patil	49	Female	2024-03-31	4	2024-04-04

- **Using AND/OR Operator**

Find doctors who specialize in either 'Cardiology' or 'Neurology'.

```
Select * from doctors
where salary>=100000 and specialization = 'cardiology' or specialization = 'neurology';
```

Doctor_id	Doctor_name	Specialization	Salary
2	Dr.Sameer Shaikh	Neurology	185000.00
6	Dr.Anushree Patil	Cardiology	120000.00

- **Using NOT Operator**

Find patients id,treatment and cost who are not treated by treatment id with 203 & 204.

```
select patient_id,treatment_name,cost from treatments
where not treatment_id = 203 and 204;
```

patient_id	treatment_name	cost
101	Heart Surgery	90000.00
102	MRI Scan for Headache	25000.00
104	Joint Injection	18000.00
105	Routine physical exam	8000.00
106	Angioplasty	82000.00
107	Tooth Extraction	12000.00
108	Health Screening	12000.00
109	Dental emplants	25000.00

- **Using Not null**

Display details of medical_conditions where severity is not null.

```
Select*from Medical_conditions WHERE Severity_level is not null;
```

condition_id	condition_name	severity_level	patient_id
21	Heart Disease	Severe	101
22	Heart Disease	Severe	101
23	Chronic Headache	Moderate	102
24	Osteoarthritis	Severe	103
25	Osteoarthritis	Severe	103
26	Joint Pain	Mild	104
27	General Checkup	Mild	105
28	Coronary Artery Disease	Severe	106
29	Tooth Decay	Moderate	107
30	Health Checkup	Mild	108
31	Tooth Loss	Severe	109

➢ Using BETWEEN operator

Find treatments with costs between 10,000 and 50,000.

```
select*from treatments where cost between10000 and 50000;
```

Treatment_id	Treatment_name	Cost	Patient_id
202	MRI Scan for Headache	25000.00	102
204	Joint Injection	18000.00	104
207	Tooth Extraction	12000.00	107
208	Health Screening	12000.00	108
209	Dental emplants	25000.00	109

➢ Using IN operator

Find medical conditions that have either 'Severe' or 'Moderate' severity and are related to treatments with IDs 201, 203, or 206.

```
select*from medical_conditions

where severity_level in('severe','Moderate') and patient_id in(201,203,206);
```

condition_id	condition_name	severity_level	patient_id
21	Heart Disease	Severe	101
22	Heart Disease	Severe	101
24	Osteoarthritis	Severe	103
25	Osteoarthritis	Severe	103
28	Coronary Artery Disease	Severe	106

➢ Using ANY operator

Find treatments and cost having cost higher than any treatment costing less than 10,000.

```
Select treatment_name, cost

from treatments

where cost >any (select cost from treatments where cost >10000);
```

treatment_name	cost
Heart Surgery	90000.00
MRI Scan for Headache	25000.00
Knee replacement	65000.00
Joint Injection	18000.00
Angioplasty	82000.00
Dental emplants	25000.00

➢ Using ALL operator

Find doctors whose salary is greater than the salary of all doctors with a specialization in 'General Practitioner.

```
select doctor_name, specialization, salary from doctors
where salary >all (select salary from doctors where specialization = 'general practitioner');
select doctor_name, specialization, salary
```

	doctor_name	specialization	salary
▶	Dr.Sameer Shaikh	Neurology	185000.00
	Dr.Anushree Patil	Cardiology	120000.00

6. Aggregate Functions:

➢ Count Function:

Find the total number of patients admitted.

```
Select count(*) as total_number_petients from patients;
```

	total_number_petients
▶	9

➢ Average Function with round function:

Find the average cost of all treatments upto two decimal places.

```
Select  round(avg(cost) ,2)as  average_treatment_cost
from treatments;
```

	average_treatment_cost
▶	37444.44

➢ Sum Function :

Display total Salary Paid to All Doctors.

```
Select sum(salary) as total_doctor_salary
from doctors;
```

	total_doctor_salary
▶	605000.00

➢ **Max, Min Function:**

Find the highest and lowest salary of doctors.

```
Select max(salary) as highest_salary, min(salary) as lowest_salary
from doctors;
```

highest_salary	lowest_salary
185000.00	100000.00

7. Group by clause :

To display Total_treatment_fee for each doctor.

```
Select patient_id,sum(cost) as total_treatment_fee
from treatments
group by patient_id;
```

patient_id	total_treatment_fee
101	90000.00
102	25000.00
103	65000.00
104	18000.00
105	8000.00
106	82000.00
107	12000.00
108	12000.00
109	25000.00

Display gender wise Total Number_of_Patients.

```
Select gender,count(patient_id) as number_of_patients
from patients
group by gender;
```

gender	number_of_patients
Male	3
Female	6

How many medical conditions are there for each severity level, and which patient has the earliest ID within each severity group.

```
select severity_level,count(condition_id) as number_of_conditions,min(patient_id) as earliest_patient
from medical_conditions
group by severity_level;
```

	severity_level	number_of_conditions	earliest_patient
▶	Severe	6	101
	Moderate	2	102
	Mild	3	104

8. Having Clause:

Find Doctors with Total Treatment Costs Exceeding 50,000.

```
select patient_id, sum(cost) as total_treatment_cost
from treatments
group by patient_id
having total_treatment_cost > 50000;
```

	patient_id	total_treatment_cost
▶	101	90000.00
	103	65000.00
	106	82000.00

9. Like Operator :

find treatments with names that have exactly 4 characters followed by the word 'scan'.

```
select * from treatments
where treatment_name like '____scan%';
```

	Treatment_id	Treatment_name	Cost	Patient_id
▶	202	MRI Scan for Headache	25000.00	102
*	NULL	NULL	NULL	NULL

Find medical conditions that include 'disease' in their names.

```
select * from medical_conditions
where condition_name like '%disease%';
```

condition_id	condition_name	severity_level	patient_id
21	Heart Disease	Severe	101
22	Heart Disease	Severe	101
28	Coronary Artery Disease	Severe	106
NULL	NULL	NULL	NULL

10. Union :

Union of Doctors and Patients (similar column types).

```
select name as individual_name, 'patient' as role, doctor_id
from patients
union
select doctor_name as individual_name, 'doctor' asrole,doctor_id
from doctors;
```

individual_name	role	doctor_id
Raj Kumar	patient	1
Riya Patil	patient	2
Priyanka More	patient	3
Rajani Bapat	patient	3
Pooja Mane	patient	5
Kumar Sharma	patient	1
Alisha Patil	patient	4
Shyam Devan	patient	5
Karishma Sutar	patient	4
Dr.Sameer Shaikh	doctor	2
Dr.Sushant Davis	doctor	3
Dr.Aradhya Patel	doctor	4
Dr.Manas Devkar	doctor	5
Dr.Anushree Patil	doctor	6

11. Joins :

1. To fetch all doctor id,Doctor name their specialization and patients id and name of patient which they are treated .

```
select  d.doctor_id, d.doctor_name, d.specialization, p.patient_id, p.name as patient_name
from patients p right join doctors d on p.doctor_id = d.doctor_id;
```

doctor_id	doctor_name	specialization	patient_id	patient_name
2	Dr.Sameer Shaikh	Neurology	102	Riya Patil
3	Dr.Sushant Davis	Orthopedics	104	Rajani Bapat
3	Dr.Sushant Davis	Orthopedics	103	Priyanka More
4	Dr.Aradhya Patel	Oral surgery dentist	109	Karishma Sutar
4	Dr.Aradhya Patel	Oral surgery dentist	107	Alisha Patil
5	Dr.Manas Devkar	General Practitioner	108	Shyam Devan
5	Dr.Manas Devkar	General Practitioner	105	Pooja Mane
6	Dr.Anushree Patil	Cardiology	NULL	NULL

2. Showing the number of patients per doctor, and the total cost of treatments for each doctor.

```
Select d.doctor_name,
count(p.patient_id) as number_of_patients,
sum(t.cost) as total_treatment_cost
from patients p
inner  join  treatments t on p.patient_id = t.patient_id
inner join doctors d on p.doctor_id = d.doctor_id
group by d.doctor_name;
```

doctor_name	number_of_patients	total_treatment_cost
Dr.Sameer Shaikh	1	25000.00
Dr.Sushant Davis	2	83000.00
Dr.Manas Devkar	2	20000.00
Dr.Aradhya Patel	2	37000.00

3. Display Patient Name, Doctor Name, Doctor Specialization, and Admission Date.

```
Select  p.name as patient_name, admission_date
d.doctor_name,specialization
from patients p
 join  doctors d
 on p.doctor_id = d.doctor_id;
```

	patient_nae	doctor_name	specialization	admission_date
▶	Riya Patil	Dr.Sameer Shaikh	Neurology	2024-02-20
	Priyanka More	Dr.Sushant Davis	Orthopedics	2024-02-25
	Rajani Bapat	Dr.Sushant Davis	Orthopedics	2024-03-01
	Pooja Mane	Dr.Manas Devkar	General Practitioner	2024-03-11
	Alisha Patil	Dr.Aradhya Patel	Oral surgery dentist	2024-03-31
	Shyam Devan	Dr.Manas Devkar	General Practitioner	2024-04-04
	Karishma Sutar	Dr.Aradhya Patel	Oral surgery dentist	2024-04-03

4. Display Patient Name, Treatment Name, Treatment Cost, and Doctor Name.

```
Select  p.name as patient_name,
 t.treatment_name, cost, d.doctor_name
from patients p
 join  treatments t
 on p.patient_id = t.patient_id
join  doctors d
on p.doctor_id = d.doctor_id;
```

	patient_name	treatment_name	cost	doctor_name
▶	Riya Patil	MRI Scan for Headache	25000.00	Dr.Sameer Shaikh
	Priyanka More	Knee replacement	65000.00	Dr.Sushant Davis
	Rajani Bapat	Joint Injection	18000.00	Dr.Sushant Davis
	Pooja Mane	Routine physical exam	8000.00	Dr.Manas Devkar
	Alisha Patil	Tooth Extraction	12000.00	Dr.Aradhya Patel
	Shyam Devan	Health Screening	12000.00	Dr.Manas Devkar
	Karishma Sutar	Dental emplants	25000.00	Dr.Aradhya Patel

5. Display all patients and their treatment names
(also show patients without treatment).

```
Select  p.name as patient_name,
t.treatment_name
from patients p
left join  treatments t
 on p.patient_id = t.patient_id;
```

patient_name	treatment_name
Raj Kumar	Heart Surgery
Riya Patil	MRI Scan for Headache
Priyanka More	Knee replacement
Rajani Bapat	Joint Injection
Pooja Mane	Routine physical exam
Kumar Sharma	Angioplasty
Alisha Patil	Tooth Extraction
Shyam Devan	Health Screening
Karishma Sutar	Dental emplants

12. Subqueries:

1.Single row Subqueries:

Find Treatment name and high cost that Cost More Than the Average Cost of All Treatments. Find

```
select Treatment_name,cost as High_Cost from treatments
where cost>(select avg(cost) from treatments) order by cost desc;
```

Treatment_name	High_Cost
Heart Surgery	90000.00
Angioplasty	82000.00
Knee replacement	65000.00

The doctor names whose salary is greater than the average salary.

```
select doctor_name from doctors
where salary>(select avg(salary) from doctors);
```

doctor_name
Dr.Sameer Shaikh

Display Patient_name,Gender,Admission date and discharge date who treated by Dr.sameer shaikh.

```
select name as patient_name, gender, admission_date, discharge_date
from patients
where doctor_id = (select doctor_id from doctors where doctor_name = 'sameer shaikh');
```

patient_name	gender	admission_date	discharge_date
Riya Patil	Female	2024-02-20	2024-02-28

2. Multiple row subquery:

List of Doctors name with their specialization who are treating more than 1 patients.

```
select doctor_name,specialization
from doctors
where doctor_id in (select doctor_id from patients group by doctor_id having count(patient_id) >1);
```

doctor_name	specialization
Dr.Sushant Davis	Orthopedics
Dr.Aradhya Patel	Oral surgery dentist
Dr.Manas Devkar	General Practitioner

3. Multiple column subquery :

Display Highest-paid doctor for each specialization.

```
select doctor_name, specialization, salary
from doctors where(specialization, salary)
in( select specialization, max(salary) from doctors group by specialization );
```

doctor_name	specialization	salary
Dr.Sameer Shaikh	Neurology	185000.00
Dr.Sushant Davis	Orthopedics	100000.00
Dr.Aradhya Patel	Oral surgery dentist	100000.00
Dr.Manas Devkar	General Practitioner	100000.00
Dr.Anushree Patil	Cardiology	120000.00

13. Window Functions:

1. Rank patients by admission date for each doctor.

```
select doctor_id, name, admission_date,
Row_Number() Over (PARTITION BY doctor_id  order by admission_date) as admission_rank
from patients;
```

Doctor_id	Name	Admission_date	Admission_Rank
1	Raj Kumar	2024-01-08	1
1	Kumar Sharma	2024-03-19	2
2	Riya Patil	2024-02-20	1
3	Priyanka More	2024-02-25	1
3	Rajani Bapat	2024-03-01	2
4	Alisha Patil	2024-03-31	1
4	Karishma Sutar	2024-04-03	2
5	Pooja Mane	2024-03-11	1
5	Shyam Devan	2024-04-04	2

2. Show each doctor with their salary and average salary of all doctors.

```
select doctor_name, salary,
Avg(salary) Over () as Avg_doctor_salary
from doctors;
```

Doctor_Name	Salary	Avg_Doctor_Salary
Dr.Sameer Shaikh	185000.00	121000.000000
Dr.Sushant Davis	100000.00	121000.000000
Dr.Aradhya Patel	100000.00	121000.000000
Dr.Manas Devkar	100000.00	121000.000000
Dr.Anushree Patil	120000.00	121000.000000

CONCLUSION

The ***Healthcare Monitoring System*** project successfully demonstrates the use of SQL to design and manage a structured database for monitoring patient health records, doctor assignments, treatments, medications, and medical conditions. By implementing well-defined relational tables and relationships, the system ensures accurate storage, retrieval, and management of critical healthcare data in a simulated real-world hospital environment.

The project effectively utilizes core and advanced SQL concepts, including DDL, DML, joins, subqueries, aggregate functions, and window functions, to generate meaningful insights such as patient demographics, treatment costs, doctor workload, and medical condition severity. These insights support efficient decision-making and highlight the importance of data organization in healthcare systems.

Overall, this project strengthens practical SQL skills while integrating statistical thinking for data analysis and trend identification. It showcases how database-driven solutions can enhance healthcare data management, improve operational efficiency, and support better patient care outcomes, making it a strong foundation for real-world healthcare analytics applications.

The ***Healthcare Monitoring System*** can be further enhanced and expanded to support advanced healthcare operations and real-time decision-making. In the future, the system can be integrated with a user-friendly front-end application or web interface to allow doctors, nurses, and administrators to access and update patient information more efficiently.