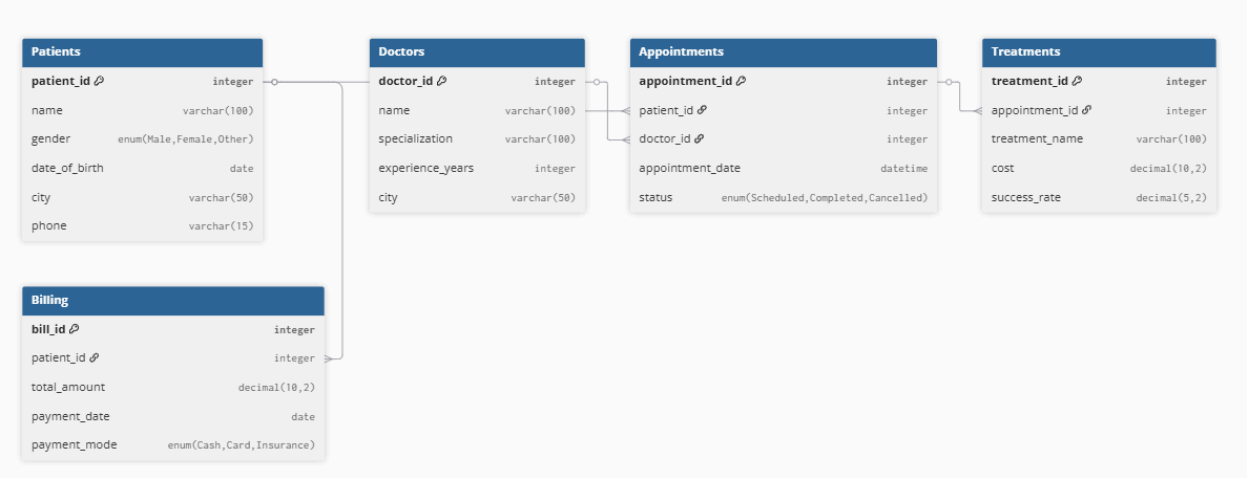
📘 Day 5: Healthcare Domain

🎯 Business Context

A hospital management system tracks **patients, doctors, appointments, treatments, and billing.**

Analysts use SQL to optimize scheduling, analyze treatment effectiveness, and monitor revenue.

🛠️ Database Schema: HealthcareDB



1️⃣ Patients

```
CREATE TABLE Patients (
    patient_id INT PRIMARY KEY,
    name VARCHAR(100),
    gender ENUM('Male', 'Female', 'Other'),
    date_of_birth DATE,
    city VARCHAR(50),
    phone VARCHAR(15)
);
```

2️⃣ Doctors

```
CREATE TABLE Doctors (
    doctor_id INT PRIMARY KEY,
    name VARCHAR(100),
    specialization VARCHAR(100),
    experience_years INT,
    city VARCHAR(50)
);
```

3️⃣ Appointments

```
CREATE TABLE Appointments (
    appointment_id INT PRIMARY KEY,
    patient_id INT,
    doctor_id INT,
    appointment_date DATETIME,
    status ENUM('Scheduled', 'Completed', 'Cancelled'),
    FOREIGN KEY (patient_id) REFERENCES Patients(patient_id),
    FOREIGN KEY (doctor_id) REFERENCES Doctors(doctor_id)
);
```

4️⃣ Treatments

```
CREATE TABLE Treatments (
    treatment_id INT PRIMARY KEY,
    appointment_id INT,
    treatment_name VARCHAR(100),
    cost DECIMAL(10,2),
    success_rate DECIMAL(5,2),
    FOREIGN KEY (appointment_id) REFERENCES Appointments(appointment_i
d)
```

```
);
```

5️⃣ Billing

```
CREATE TABLE Billing (
    bill_id INT PRIMARY KEY,
    patient_id INT,
    total_amount DECIMAL(10,2),
    payment_date DATE,
    payment_mode ENUM('Cash', 'Card', 'Insurance'),
    FOREIGN KEY (patient_id) REFERENCES Patients(patient_id)
);
```

🧮 Sample Data

```
INSERT INTO Patients VALUES
(1, 'Amit Sharma', 'Male', '1990-04-12', 'Delhi', '9876543210'),
(2, 'Priya Singh', 'Female', '1988-09-20', 'Mumbai', '9821456789'),
(3, 'Rahul Verma', 'Male', '1975-11-02', 'Chennai', '9812345678'),
(4, 'Neha Gupta', 'Female', '1995-02-14', 'Bangalore', '9798567890'),
(5, 'Ravi Patel', 'Male', '1983-07-30', 'Ahmedabad', '9789654321');

INSERT INTO Doctors VALUES
(1, 'Dr. Mehta', 'Cardiology', 15, 'Delhi'),
(2, 'Dr. Nair', 'Orthopedics', 10, 'Mumbai'),
(3, 'Dr. Rao', 'Neurology', 12, 'Chennai'),
(4, 'Dr. Das', 'Pediatrics', 8, 'Bangalore'),
(5, 'Dr. Shah', 'Dermatology', 6, 'Ahmedabad');

INSERT INTO Appointments VALUES
(1, 1, 1, '2024-09-10 10:00:00', 'Completed'),
(2, 2, 2, '2024-09-11 11:00:00', 'Completed'),
```

```
(3, 3, 3, '2024-09-12 09:30:00', 'Cancelled'),
(4, 4, 4, '2024-09-13 14:00:00', 'Completed'),
(5, 5, 5, '2024-09-14 16:30:00', 'Scheduled'),
(6, 1, 3, '2024-10-01 10:30:00', 'Completed');

INSERT INTO Treatments VALUES
(1, 1, 'Angioplasty', 25000.00, 95.0),
(2, 2, 'Knee Replacement', 40000.00, 90.0),
(3, 4, 'Vaccination', 500.00, 100.0),
(4, 6, 'Brain MRI', 8000.00, 85.0);

INSERT INTO Billing VALUES
(1, 1, 25000.00, '2024-09-10', 'Insurance'),
(2, 2, 40000.00, '2024-09-11', 'Card'),
(3, 4, 500.00, '2024-09-13', 'Cash'),
(4, 1, 8000.00, '2024-10-01', 'Insurance');
```

🧠 5 SQL Questions

🟢 (Easy)

Q1: List all doctors along with the number of appointments they have completed.

✅ *Hint:* Use `GROUP BY` on `doctor_id` and filter `status = 'Completed'`.

🟡 (Medium)

Q2: Retrieve patient names and their total billed amount.

✅ *Hint:* Use `SUM(total_amount)` grouped by `patient_id`.

🟠 (Hard)

Q3: Find doctors who have treated patients from a **different city** than their own.

✅ *Hint:* Join `Doctors → Appointments → Patients` and compare `city` fields.

🔵 (Difficult)

Q4: Identify patients who have **multiple completed treatments** with an **average success rate > 90%**.

✅ *Hint:* Use aggregation on `Treatments` joined with `Appointments`.

🔴 (Expert)

Q5: Determine the top 2 doctors by **total revenue generated** through completed treatments,

including doctor name, specialization, and total revenue.

✅ *Hint:* Join `Doctors`, `Appointments`, and `Treatments`, sum cost, and order descending.

⚡ Optimization / Real-World Tips

- Index `(appointment_date)` and `(doctor_id, patient_id)` in Appointments for faster joins.
- Use **materialized views** for treatment summaries.
- In production, **denormalize billing and appointment details** for analytics dashboards.