Relational Model for Each Table

1. Patients Table

Relational Schema:

- **Primary Key**: `PatientID`
- **Attributes**:
  - `PatientID` (INT, AUTO_INCREMENT, PRIMARY KEY)
  - `Name` (VARCHAR(100), NOT NULL)
  - `DateOfBirth` (DATE, NOT NULL)
  - `PhoneNumber` (VARCHAR(15), NOT NULL)
  - `EmailAddress` (VARCHAR(100))
  - `InsuranceProvider` (VARCHAR(100))
  - `Address` (TEXT)
  - `Gender` (ENUM)
  - `EmergencyContactName` (VARCHAR(100))
  - `EmergencyContactPhone` (VARCHAR(15))
  - `CreatedAt` (DATETIME)
  - `UpdatedAt` (DATETIME)

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2. Appointments Table

Relational Schema:

- **Primary Key**: `AppointmentID`
- **Foreign Key**: `PatientID` → `Patients(PatientID)`
- **Attributes**:
  - `AppointmentID` (INT, AUTO_INCREMENT, PRIMARY KEY)
  - `PatientID` (INT, FOREIGN KEY REFERENCES `Patients(PatientID)`)
  - `DoctorName` (VARCHAR(100), NOT NULL)
  - `AppointmentDate` (DATE, NOT NULL)
  - `AppointmentTime` (TIME, NOT NULL)
  - `Notes` (TEXT)
  - `AppointmentType` (ENUM)
  - `Status` (ENUM)
  - `CreatedAt` (DATETIME)
  - `UpdatedAt` (DATETIME)

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3. MedicalRecords Table

Relational Schema:

- **Primary Key**: `RecordID`
- **Foreign Key**: `PatientID` → `Patients(PatientID)`
- **Attributes**:
  - `RecordID` (INT, AUTO_INCREMENT, PRIMARY KEY)
  - `PatientID` (INT, FOREIGN KEY REFERENCES `Patients(PatientID)`)
  - `Diagnosis` (TEXT, NOT NULL)
  - `TreatmentPlan` (TEXT)
  - `Prescriptions` (TEXT)
  - `RecordDate` (DATE, NOT NULL)
  - `Allergies` (TEXT)
  - `CreatedAt` (DATETIME)
  - `UpdatedAt` (DATETIME)

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4. Billing Table

Relational Schema:

- **Primary Key**: `BillID`
- **Foreign Key**: `PatientID` → `Patients(PatientID)`
- **Attributes**:
  - `BillID` (INT, AUTO_INCREMENT, PRIMARY KEY)
  - `PatientID` (INT, FOREIGN KEY REFERENCES `Patients(PatientID)`)
  - `AmountDue` (DECIMAL(10,2), NOT NULL)
  - `DueDate` (DATE, NOT NULL)
  - `PaymentStatus` (ENUM)
  - `PaymentMethod` (ENUM)
  - `PaidDate` (DATETIME)
  - `CreatedAt` (DATETIME)
  - `UpdatedAt` (DATETIME)

Explanation of Relational Model

- **Primary Keys**: Each table has a unique primary key (e.g., `PatientID`, `AppointmentID`).
- **Foreign Keys**: `PatientID` in `Appointments`, `MedicalRecords`, and `Billing` ensures proper relationships.
- **Data Types**: Proper data types ensure efficient storage and retrieval of data.
- **Constraints**: `NOT NULL`, `AUTO_INCREMENT`, and `FOREIGN KEY` constraints ensure data integrity.