Logical Design

1) Data items/entities

Patient	Stores personal and medical information of patients
Healthcare Professionals	Stores professional details and specialisations of healthcare professionals (Nurses, doctors, consultants, therapists etc.)
Appointment Details	Details of patient appointments (times/dates, appointment reason etc.)
Treatment	Information about treatments, diagnostics, medications and procedures
Billing	Records of payments, invoices and insurance claims
Department	Information about departments, specialities and treatments offered within the clinic
Insurance Provider	Records/ information for insurance companies that are outside of the system and this is tied to the claims for billing purposes.

2) Data types/formats

INT for unique IDs	For unique IDs (both patients' and healthcare professionals')
VARCHAR	For text fields (e.g. names, addresses, e-mails etc.)
DATE / DATETIME	For dates and timestamps (appointment dates/times, medical record entry dates/times etc.)
DECIMAL(8,2)	For financial figures
CHAR(1)	For single character data, such as gender.

TEXT	For long descriptive fields (e.g. treatment descriptions etc.)
ENUM	For gender, status, consultation type etc.

3) Attributes of data items

Patient	PatientID (Primary Key, INT, auto-increment) FirstName (VARCHAR, 50) LastName (VARCHAR, 50) DateOfBirth (DATE) MaritalStatus (VARCHAR, 20) MedicalHistorySummary (TEXT) Gender (ENUM ('M', 'F','O') PhoneNumber (VARCHAR, 20) Email (VARCHAR, 100) EmergencyContactName and Phone (VARCHAR, 100) and (VARCHAR, 15) Address (VARCHAR, 255) NHSNumber (VARCHAR, 15) BloodType(VARCHAR, 3)
Healthcare Professionals	HealthcareProfessionalID (Primary Key, INT, auto-increment) FirstName (VARCHAR, 50) LastName (VARCHAR, 50) Specialisation (VARCHAR, 50) Qualifications (TEXT) PhoneNumber (VARCHAR, 15) Email (VARCHAR, 100) DepartmentID (INT) LicenceNumber (VARCHAR,30) YearsOfExperience (INT)
Appointment Details	AppointmentID (Primary Key, INT, auto-increment) PatientID (Foreign Key → Patient.PatientID) DoctorID (Foreign Key → Doctor.DoctorID) AppointmentDate (DATETIME) DurationMins (INT) Reason (VARCHAR, 255) Status (ENUM) ConsultationType(ENUM)

	Notes (TEXT)
Treatment	TreatmentID (Primary Key, INT, auto-increment) AppointmentID (Foreign Key → Appointment.AppointmentID) TreatmentType (VARCHAR, 50) Description (TEXT) Cost (DECIMAL(10,2) MedicalPrescribed (TEXT) FollowUpRequired (TINYINT) Outcome (TEXT)
Billing	BillID (Primary Key, INT, auto-increment) InvoiceNumber (VARCHAR, 30) PatientID (Foreign Key → Patient.PatientID) TreatmentID (Foreign Key → Treatment.TreatmentID) AmountPaid (DECIMAL 10,2) OutstandingBalance (DECIMAL 10,2) PaymentDate (DATE) PaymentMethod ENUM(...) DueDate (DATE) ClaimStatus ENUM (...)
Department	DepartmentID (Primary Key, INT, auto-increment) DepartmentName (VARCHAR, 50) Location (VARCHAR, 100)
Insurance Provider	InsuranceID (Primary Key, INT, auto-increment) ProviderName (VARCHAR, 100) ContactNumber (VARCHAR, 20) PolicyDetails (TEXT)

4) Relationships and associations of data

- **Patient ↔ Appointment:** One-to-Many (One patient can have multiple appointments)
- **Patient ↔ Treatment:** One-to-Many (One patient can receive multiple treatments)
- **HealthcareProfessional ↔ Appointment:** One-to-Many (One professional can have multiple appointments)

- **HealthcareProfessional ↔ Department:** One-to-One or One-to-Many (One professional generally belongs to one department, but may belong to many)
- **Appointment ↔ Treatment:** One-to-Many (Each appointment can have multiple treatments)
- **Treatment ↔ BloodTransfusion:** One-to-One (only some treatments are transfusions)
- **Patient ↔ Billing:** One-to-Many (Each patient can have multiple bills)
- **Treatment ↔ Billing:** One-to-One or One-to-Many (Depending on multiple bill entries)
- **Billing ↔ Insurance Provider** → Many-to-One (numorous claims controlled by one provider).