ER Modelling Exercise – Hospital

Consider the following requirements for inpatients at a hospital: All patients admitted to the hospital are given a unique patient number. The patient's name, address, age, and sex are recorded. Private patients are allocated a private room, identified by the room number. Private rooms are of different types, e.g., standard, deluxe, palatial, etc. NHS patients are allocated a bed in a ward, beds being identified by the ward name and bed number. Wards are of different types, e.g., paediatric, cancer, etc, with a named sister in charge of each one. Each patient is allocated to a named consultant who supervises the medical care of the patient. The consultant decides on the treatments to be given to the patient. A treatment is any medical procedure performed on the patient. Each treatment is given a unique treatment number, and a description of the treatment and the date it is performed are recorded. Design an E-R diagram for the above database. Derive a corresponding relational scheme from your E-R diagram. The E-R diagram must show attributes, keys, cardinalities, and constraints.

The relational scheme must be in third-normal form, with primary and foreign keys clearly indicated.

Entities:

1. **Patient**
    - Attributes:
        - PatientID (Primary Key)
        - Name
        - Address
        - Age
        - Sex
2. **Consultant**
    - Attributes:
        - ConsultantID (Primary Key)
        - Name
        - Specialty
3. **Room**
    - Attributes:
        - RoomNumber (Primary Key)
4. **Ward**
    - Attributes:
        - WardName (Primary Key)
        - WardType (e.g., paediatric, cancer)
        - SisterInCharge

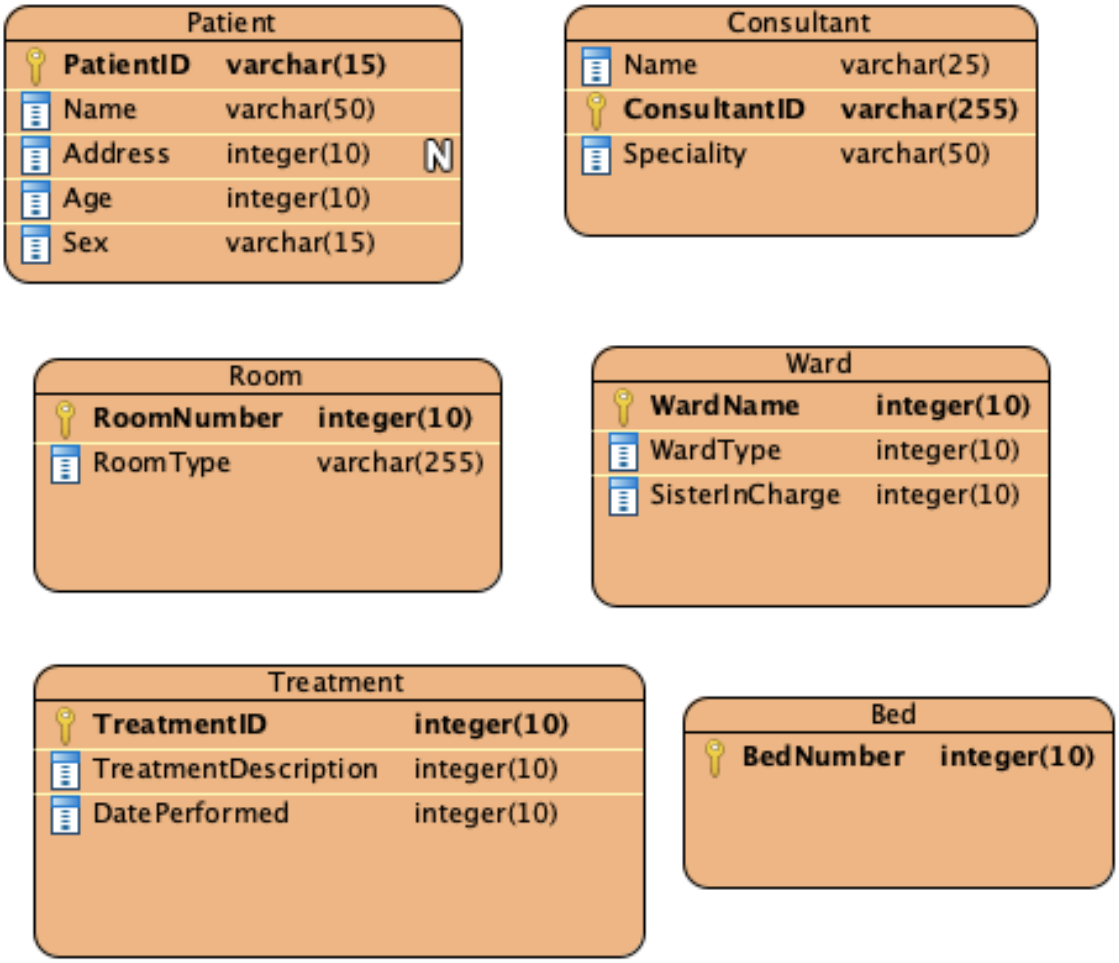
5. **Bed**
    - Attributes:
        - BedNumber (Primary Key)
        - WardName (Foreign Key references Ward)
6. **Treatment**
    - Attributes:
        - TreatmentID (Primary Key)
        - TreatmentDescription
        - DatePerformed

Relational Schema in 3NF:

1. **Patient (PatientID, Name, Address, Age, Sex, ConsultantID, RoomNumber, WardName, BedNumber)**
    - PatientID is the primary key.
    - ConsultantID is a foreign key referencing Consultant(ConsultantID).
    - RoomNumber is a foreign key referencing Room(RoomNumber) (optional for NHS patients).
    - WardName, BedNumber are foreign keys referencing Bed(WardName, BedNumber) (optional for private patients).
2. **Consultant (ConsultantID, Name, Specialty)**
    - ConsultantID is the primary key.
3. **Room (RoomNumber, RoomType)**
    - RoomNumber is the primary key.
4. **Ward (WardName, WardType, SisterInCharge)**
    - WardName is the primary key.
5. **Bed (BedNumber, WardName)**
    - Composite primary key: (BedNumber, WardName).
    - WardName is a foreign key referencing Ward(WardName).
6. **Treatment (TreatmentID, TreatmentDescription, DatePerformed, PatientID)**
    - TreatmentID is the primary key.
    - PatientID is a foreign key referencing Patient(PatientID).

ER Diagram:

- **Patient** --(Assigned To)-- **Consultant**
- **Patient** --(Occupies)-- **Room** (for private patients)
- **Patient** --(Occupies)-- **Bed** --(Part of)-- **Ward** (for NHS patients)
- **Patient** --(Receives)-- **Treatment**


Patient
PatientID varchar(15)
Name varchar(50)
Address integer(10) N
Age integer(10)
Sex varchar(15)
Consultant
Name varchar(25)
ConsultantID varchar(255)
Speciality varchar(50)
Room
RoomNumber integer(10)
RoomType varchar(255)
Ward
WardName integer(10)
WardType integer(10)
SisterInCharge integer(10)
Treatment
TreatmentID integer(10)
TreatmentDescription integer(10)
DatePerformed integer(10)
Bed
BedNumber integer(10)