# Hospital Administration Database Design Document

## Version 1.0 Revision 1

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## Purpose

The purpose of this Database Design Documentation (DBDD) is to help the hospital administrator and other stakeholders track nurse assignments to their respective wards, nurse interactions with their patients, patient admissions by their doctors, treatments administered by doctors to their patients, bed assignments for each patient, and the items charged to patients during their stay. This would allow the administrator to access periodic reports of insights that would be related to the hospital's efficiency and administration.

## Narrative

The hospital administrator wants to create a database to track nurse assignments to their wards and nurse interactions with their patients, patient admissions by their doctors and treatments administered by doctors to their patients, bed assignments for each patient and items charged to patients during their stay. Administrator wants to record each nurse's name and address, phone and alternate phone, email and the medical specialties he or she is certified. Some nurses supervise one or more other nurses. No nurse is supervised by more than one nurse, and some nurses are unsupervised.

Each ward at the hospital has a designated number, descriptive name, physical location and phone number. Each ward has at least one nurse assigned to it. A nurse is assigned to at least one ward and rotates assignments among other wards. The assignment is tracked by the specific date and the hours worked in the assigned ward by each nurse on that date.

In addition to nurse assignments, each ward also has a charge nurse. The charge nurse is the custodian of the medical records for the ward. Not all nurses act in this capacity, but those that do are in charge of only one ward, and a ward only has one charge nurse.

A ward consists of hospital beds. The beds are inventoried to a specific ward. Information on beds including their size (small, large, extra-large) and their type (elevated electrically or manually). Most of the beds are large and manual (this is the default setting).

When a patient is admitted to the hospital they are assigned to a specific bed. Not all beds are available for use all the time, and a bed may not be assigned to more than one patient.

Information on patients is recorded: name, gender, dob, address, phone, alternate phone, email.

The date the patient is admitted to the hospital, the admitting doctor, the date the patient is discharged, and discharging doctor are also tracked.

Some doctors admit patients while others do not. Doctor information tracked: name, address, phone, alternate phone, email and their medical specialties.

The hospital tracks the treatments administered to patients and the treating doctor. Treat¬ments are tracked by name, description, and charge. The hospital also tracks the date and time of each treatment administered and the results. Some doctors treat patients while others do not.

A given patient may receive no treatments or may receive many, and some patients may receive their treatments from more than one doctor. Some treatments have yet to be used while others have been used often.

In addition to treatments, patients incur other charges for items used during their stay. The hospital tracks these charges as “items” and stores information on what items have been charged to which patients, based on date and quantity. Information that is to be stored for each item includes the item name and charge. All patients incur at least one charge for consumable items

used during their stay. Some items are used often while items may be new or unusual in nature and might rarely or never be charged to any patients.

Lastly, the hospital tracks nurse patient care. Each nurse patient care interaction is an event. There are several types of events: wellness check, medication, food service, assistance, treatment admin, and “other.” Given the number of shifts and ward rotations, a patient will typically be seen by more than one nurse during their stay, and a nurse most likely will interact with the same patient over several events during a single shift.

**Actors/Roles**

Nurses: Nurses interact with patients and are assigned to at least one ward. Some nurses supervise other nurses.

Wards: A ward consists of hospital beds and has at least one nurse assigned to it.

Beds: Beds are inventoried to a specific ward and may be assigned to no more than one patient at a time once admitted. These may be different sizes (small, large, or extra large) or different types (elevated electrically or manually). Most are large and manual.

Patients: Patients are assigned a bed once admitted. They may receive none or many treatments (including from more than one doctor).

Physicians: Doctors may admit patients to the hospital and treat patients, though not all do either though.

Items: Items are charges for everything else besides treatments incurred during a patient's stay. These are stored by the charge, item name, date, and quantity.

Treatments: Treatments are administered to patients by physicians. These are tracked by date and time, name, description, and charge.

**Entities**

- Nurses
- Wards
- Beds
- Patients
- Physicians
- Items
- Treatments

**Entities (w/Nested Attributes)**

- Nurses
  - Employee No.
  - Name (First Name, Last Name)
  - Phone
  - Address (street, city, state, zip)
  - AltPhone
  - Email
  - (Certifications)
- Wards
  - Ward Name
  - Location
  - Phone
- Beds
  - Bed No.
  - Size
  - Type
- Patients
  - Patient No.
  - Name (First Name, Last Name)
  - Gender
  - Date of Birth
  - [Age]
  - Admit Date
  - Discharge Date
- Physicians
  - Doctor ID
  - Name (First Name, Last Name)
  - Phone
  - Address (street, city, state, zip)
  - Email
  - AltPhone
  - (Specialty)
- Items
  - Item No.
  - Name
  - Charge
- Treatments
  - Treatment No.
  - Name
  - Description
  - Charge

**Business Rules**

Nurses: A nurse is assigned to at least one ward and rotates assignments among other wards. Some nurses supervise one or more other nurses and nurses may have 0-1 supervisors.

Wards: Each ward only has one charge nurse (custodian of medical records), but can have many non-charge nurses assigned. A ward consists of hospital beds.

Beds: A bed may not be assigned to more than 1 patient. Not all are available for use all the time and these come in three sizes and two types.

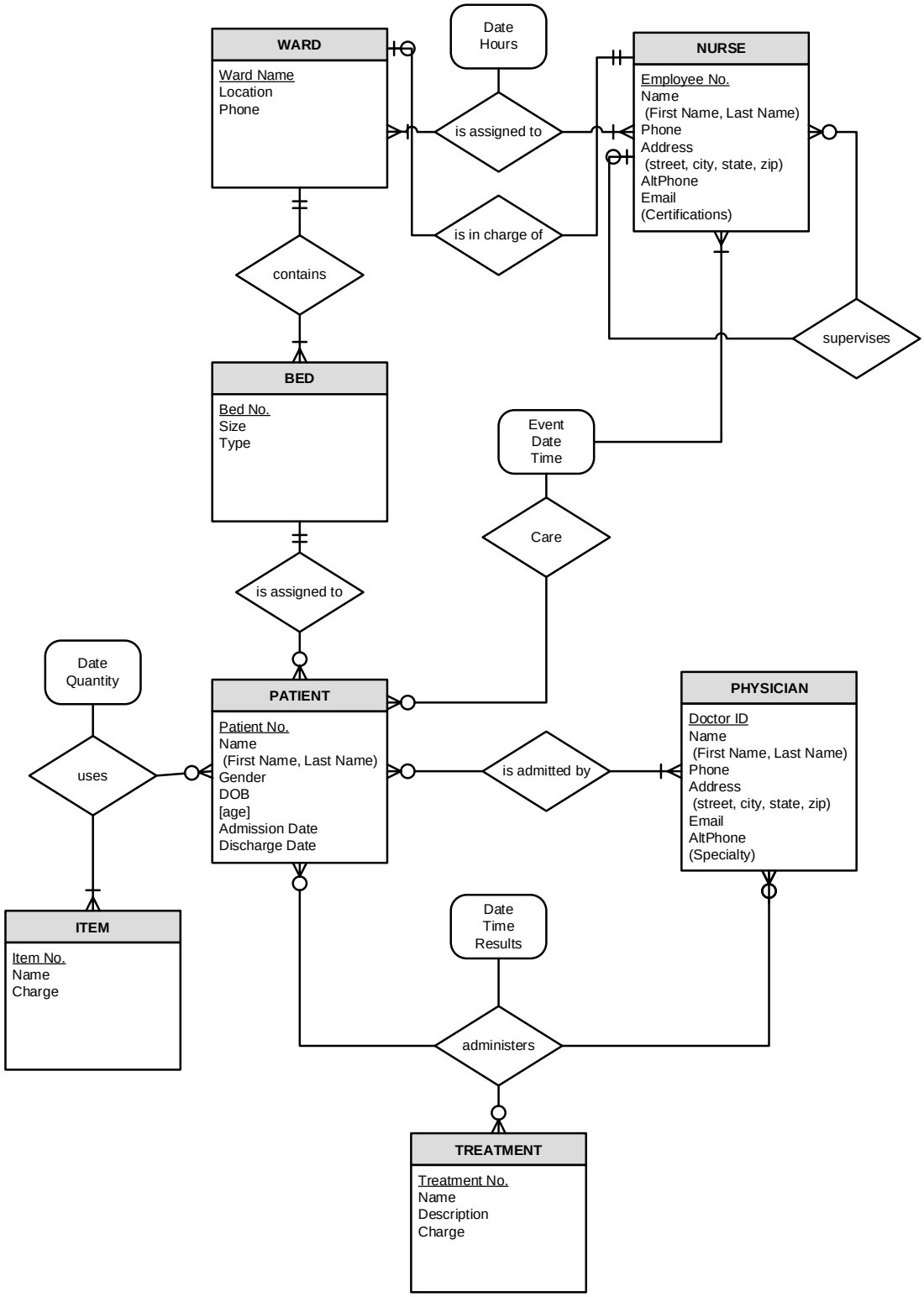
Patients: Patients are assigned to a specific bed once admitted to the hospital. They may receive one, many, or no treatments.

Physicians: Some doctors treat patients while others do not. Some doctors admit patients while others do not. They may administer more than one treatment to a patient, and this can be done by different doctors.

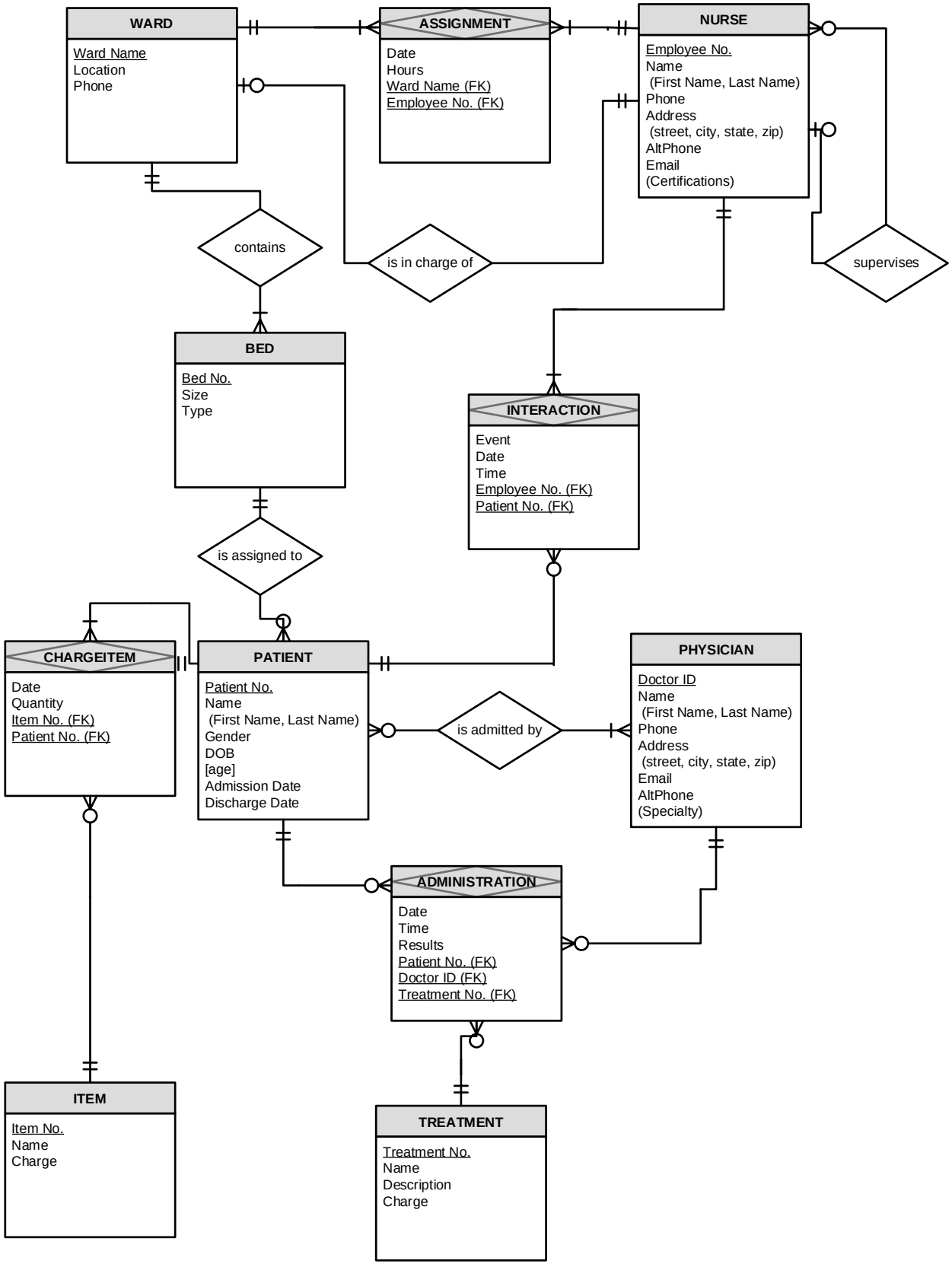
Items: All patients incur at least one charge for consumable items during their stay.

Treatments: A patient may receive no treatments or many, and some may receive their treatments from more than one doctor.

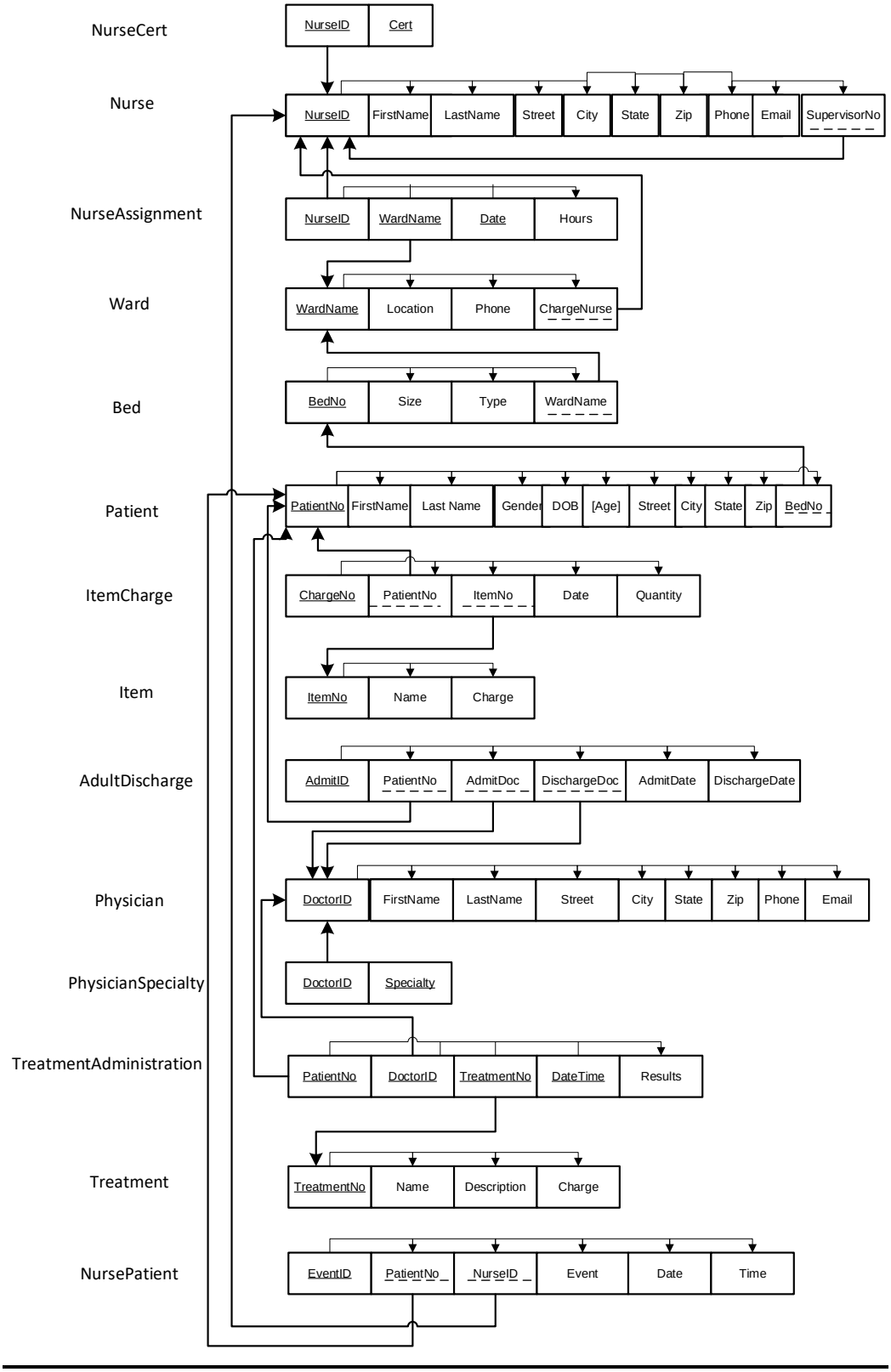
**ERD**


WARD
Ward Name
Location
Phone
Date
Hours
is assigned to
NURSE
Employee No.
Name
(First Name, Last Name)
Phone
Address
(street, city, state, zip)
AltPhone
Email
(Certifications)
is in charge of
contains
supervises
BED
Bed No.
Size
Type
Event
Date
Time
Care
is assigned to
Date
Quantity
PATIENT
Patient No.
Name
(First Name, Last Name)
Gender
DOB
[age]
Admission Date
Discharge Date
uses
is admitted by
PHYSICIAN
Doctor ID
Name
(First Name, Last Name)
Phone
Address
(street, city, state, zip)
Email
AltPhone
(Specialty)
ITEM
Item No.
Name
Charge
Date
Time
Results
administers
TREATMENT
Treatment No.
Name
Description
Charge

**EERD**


WARD
Ward Name
Location
Phone
ASSIGNMENT
Date
Hours
Ward Name (FK)
Employee No. (FK)
NURSE
Employee No.
Name
(First Name, Last Name)
Phone
Address
(street, city, state, zip)
AltPhone
Email
(Certifications)
contains
is in charge of
supervises
BED
Bed No.
Size
Type
INTERACTION
Event
Date
Time
Employee No. (FK)
Patient No. (FK)
is assigned to
CHARGEITEM
Date
Quantity
Item No. (FK)
Patient No. (FK)
PATIENT
Patient No.
Name
(First Name, Last Name)
Gender
DOB
[age]
Admission Date
Discharge Date
is admitted by
PHYSICIAN
Doctor ID
Name
(First Name, Last Name)
Phone
Address
(street, city, state, zip)
Email
AltPhone
(Specialty)
ADMINISTRATION
Date
Time
Results
Patient No. (FK)
Doctor ID (FK)
Treatment No. (FK)
ITEM
Item No.
Name
Charge
TREATMENT
Treatment No.
Name
Description
Charge

## Relational Schema



**See Data Dictionary in Next Few Pages**

Table: AdultDischarge

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| AdmitID | **PK;** Unique number to log event of patient being admitted | int | | Y | | | | | | Y |
| AdmitDate | Date the patient was admitted | date | | | | | | LIKE 'yyyy-MM-dd' | | |
| DischargeDate | Date the patient was discharged | date | | | | | | LIKE 'yyyy-MM-dd' | | |
| PatientNo | **FK** to Patient table; Number of the patient | int | | | | | | | | |
| AdmitDoc | **FK** to Physician table; Synonym for DoctorID; ID of the doctor that admitted the patient | int | | | | | | | | |
| DischargeDoc | **FK** to Physician table; Synonym for DoctorID; ID of the doctor that discharged the patient | int | | | | | | | | |

Table: Bed

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| BedNo | **PK;** Number of the bed | int | | Y | | | | | | Y |
| Size | Size of the bed | varchar | 15 | | | | | | | |
| Type | Type of the bed | varchar | 20 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| WardID | **FK** to Ward Table**;** Number of the ward | int | | | | | | | | |

Table: Item

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| ItemNo | **PK;** Number of the item | int | | Y | | | | | | Y |
| Name | Name of the item | varchar | 15 | | | | | | | |
| Charge | Amount charged per unit of the item | money | | | | | | | | |

Table: ItemCharge

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| ChargeNo | **PK;** Unique sequential charge number | int | | Y | | | | | | Y |
| Date | Date the item was charged | date | | | | | | >=GETDATE() | | Y |
| Quantity | Quantity of the item that was incurred | smallint | | | | | | | | Y |
| PatientNo | **FK** to Patient table; Number of the patient | int | | | | | | | | Y |
| ItemNo | **FK** to Item table**;** Number of the item being charged | int | | | | | | | | Y |

Table: Nurse

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| NurseID | **PK;** Unique sequential | int | | Y | | | | | | Y |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | employee nurse ID | | | | | | | | | |
| FirstName | First name of the nurse | nvarchar | 15 | | | | | | | |
| LastName | Last name of the nurse | nvarchar | 20 | | | | | | | |
| Street | Street of the nurse | varchar | 20 | | | | | | | |
| City | City of the nurse | varchar | 15 | | | | | | | |
| State | State of the nurse | char | 2 | | | | | LIKE '[A-Z][A-Z]' | | |
| Zip | Zip of the nurse | varchar | 10 | | | | | | | |
| Phone | Phone of the nurse | varchar | 20 | | | | | | Y | |
| Email | Email of the nurse | nvarchar | 20 | | | | | | | |
| SupervisorNo | **Recursive Key;** SupervisorNo is recursive to NurseID | int | | | | | | | | |

Table: NurseAssignment

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| NurseID | **CPK PK; FK** to Nurse table; Unique sequential employee nurse ID | int | | | | | | | | Y |
| WardID | **CPK PK; FK** to Ward table; Number of the ward the nurse was assigned to | varchar | 15 | | | | | | | Y |
| Date | **CPK PK;** Date the nurse was assigned to the ward | date | | | | | | LIKE 'yyyy-MM-dd' | | Y |
| Hours | Number of hours the nurse was | decimal | (4,2) | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | assigned to the ward | | | | | | | | | |

Table: NurseCert

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| NurseID | **CPK PK; FK** to Nurse table; Unique sequential employee nurse ID | int | | Y | | | | | | Y |
| Cert | **CPK PK;** Certified specialty of the nurse | varchar | 20 | | | | | | | |

Table: NursePatient

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| EventID | **PK;** Unique sequential event ID logging nurse-patient events | int | | Y | | | | | | Y |
| Event | Name of the event | varchar | 10 | | | | | | | |
| Date | Date of the event | date | | | | | | LIKE 'yyyy-MM-dd' | | |
| Time | Time of the event | time | | | | | | LIKE 'HH:MM:SS' | | |
| PatientNo | **FK** to Patient table; Number of the patient | int | | | | | | | | |
| NurseID | **FK** to Nurse table, Nurse ID of the nurse involved in the event | int | | | | | | | | |

Table: Patient

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| PatientNo | **PK;** Unique sequential patient number | int | | Y | | | | | | Y |
| FirstName | First name of the patient | nvarchar | 15 | | | | | | | |
| LastName | Last name of the patient | nvarchar | 20 | | | | | | | |
| Gender | Gender of the patient | char | 2 | | | | | | | |
| DOB | Date of birth of the patient | date | | | | | | | | |
| Age | Calculated derived field from DOB column of the age of the patient | tinyint | | | | | | | | |
| Street | Street of the nurse | varchar | 20 | | | | | | | |
| City | City of the nurse | varchar | 15 | | | | | | | |
| State | State of the nurse | char | 2 | | | | | LIKE '[A-Z][A-Z]' | | |
| Zip | Zip of the nurse | varchar | 10 | | | | | | | |
| BedNo | **FK** to Bed Table**;** Number of the bed | int | | | Y | | | | | Y |

Table: Physician

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| DoctorID | **PK;** Unique sequential doctor ID | int | | Y | | | | | | Y |
| FirstName | First name of the doctor | nvarchar | 15 | | | | | | | |
| LastName | Last name of the doctor | nvarchar | 20 | | | | | | | |
| Street | Street of the doctor | varchar | 20 | | | | | | | |
| City | City of the doctor | varchar | 15 | | | | | | | |
| State | State of the doctor | char | 2 | | | | | LIKE '[A-Z][A-Z]' | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Zip | Zip of the doctor | varchar | 10 | | | | | | | |
| Phone | Phone of the doctor | varchar | 20 | | | | | | | |
| Email | Email of the doctor | nvarchar | 20 | | | | | | | |

Table: Physician Specialty

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| DoctorID | **CPK PK; FK** to Physician table; Unique sequential doctor ID | int | | Y | | | | | | Y |
| Specialty | **CPK PK;** Specialty of the Doctor | varchar | 15 | | | | | | | Y |

Table: Treatment

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| TreatmentNo | **PK;** Unique number assigned to a treatment | int | | Y | | | | | | Y |
| Name | Name of the treatment | varchar | 10 | | | | | | | Y |
| Description | Description of the treatment | varchar | 25 | | | | | | | Y |
| Charge | Charge for the treament | money | | | | | | | | Y |

Table: TreatmentAdministration

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| PatientNo | **CPK PK; FK** to Patient table; Number of the patient receiving treatment | int | | Y | | | | | | Y |
| DoctorID | **CPK PK; FK** to Physician table; | int | | | | | | | | Y |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of the doctor administering treatment | | | | | | | | | |
| TreatmentNo | **CPK PK; FK** to Treatment table; Number of the treatment being administered | int | | | | | | | | Y |
| DateTime | **CPK PK;** Date and time in which the treatment was administered | datetime | | | | | | | | Y |
| Results | Results of the treatment | varchar | 15 | | | | | | | |

Table: Ward

| Column Name | Description | Data Type | Size | Identity | Unique | Default | Rule | Check | Allow Nulls | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| WardID | **PK;** Unique ID number of the ward | int | | Y | | | | | | Y |
| Location | Location of the Ward | nvarchar | 15 | | | | | | | |
| Phone | Phone of the ward | varchar | 15 | | | | | | | |
| Charge Nurse | **FK** to Nurse Table**;** Synonym for NurseID; Nurse that is in charge of the ward | int | | | Y | | | | | Y |