

CIS 761 - Final Project

West Valley Hospital Database System

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Introduction

West Valley Hospital (WVH) is a large hypothetical hospital located in western Kansas, United States (US) which needs a data storage management of their daily business activities. WVH employees around one hundred individuals and serve more than 600 hundreds patients daily mostly from the US States of Kansas, Oklahoma, Nebraska, and Colorado. For this project, we have assumed that WVH wants to keep track of the following functions for the month of March 2021:

- Medical diagnoses provided by their doctors and nurses along with the cost associated with the procedures.
- Information about the patients being checked in.

Review of the SQL component

About the data

The database used for this project is generated using '*mockaroo.com*' – an online resource to randomly generate dummy data. Hence, the table records are not real. Given below is the size of this database by the tables:

table_name	Size in MB	Rows
patient	0.22	750
checks_in	0.13	1000
employee	0.11	90
govern	0.09	650
patient	0.06	950
procedure__	0.03	900
room	0.02	100
supervisor	0.02	80

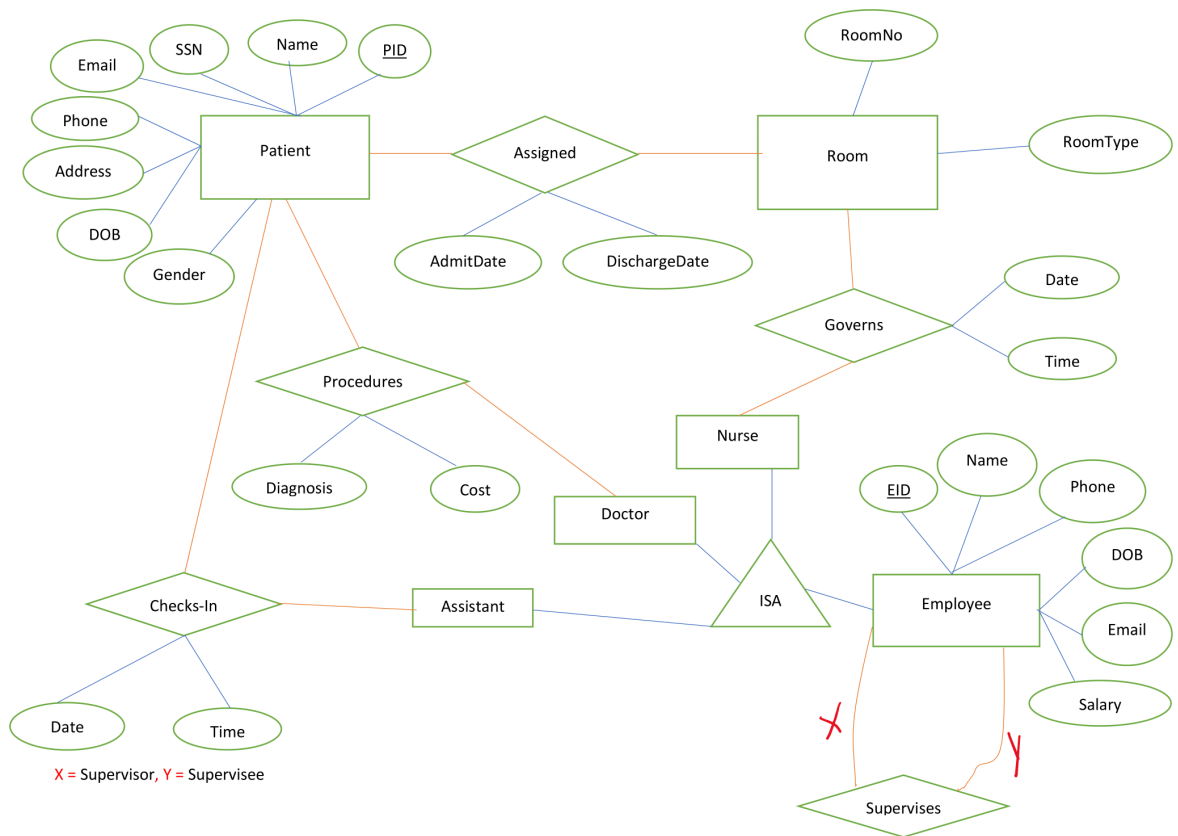
Constraints

The database modeling is based on considering the following constraints:

1. PID uniquely identifies a patient

2. Many patients check in for a day visit while some patients need to be admitted and each such patients are assigned to a room and sometime patient can be moved from one room to another thus, one room can host multiple patients
3. EID uniquely identifies an employee
4. An assistant checks-in a patient, a nurse can govern multiple rooms, and a medical diagnosis to a patient is administered by exactly one doctor (but a doctor can administer procedures to many patients)
5. Medical diagnosis has a name and balance resulted from the medical diagnosis
6. Some employees supervises other employees
7. Phone numbers and email address in this model are assumed unique
8. Salaries reported are per annum for Doctors and Nurses salary while assistants hourly salary is reported

E/R diagram



E/R Diagrams into Relations

1. Patient(PID, Name, SSN, Email, Phone, Address, DOB, Gender)

- PID is the primary key for the table: Patient
2. Employee(EID, Name, Phone, DOB, Email, Salary)
 - Employee.EID is the primary key for the table: Employee
 3. Room(RoomNo, RoomType)
 - RoomNo is the primary key for table: Room
 4. Checks-In(PID, EID, date, time)
 - Checks-in.PID is a foreign key referencing Patient.PID
 - Checks-in.EID is a foreign key referencing Employee.Assistant.EID
 5. Procedures(PID, EID, Diagnosis, Cost)
 - Procedures.PID is a foreign key referencing Patient.PID
 - Procedures.EID is a foreign key referencing Employee.Doctor.EID
 6. Supervises(EID.x, EID.y)
 - EID.x is a foreign key referencing Employee.EID who are supervisor
 - EID.y is a foreign key referencing Employee.EID who are supervisee
 7. Assigned(AdmitDate, DischargeDate, RoomNo)
 - PID is a foreign key referencing Patient.PID
 - EID is a foreign key referencing Employee.EID
 8. Govern(Date, Time, EID, RoomNo)
 - EID is a foreign key referencing Employee.EID
 - RoomNo is a foreign key referencing Room.RoomNo

Functional Dependencies

Specifications of non-functional dependencies for each relation stated above is listed in the order they appear above:

1. Patient
 - email \rightarrow name, address
2. Employee
 - email \rightarrow position, salary

3. Assigned

- $\text{pid, room_no} \rightarrow \text{admitDate, dischargeDate}$

4. Room

- $\text{room_no} \rightarrow \text{room_type}$

5. Procedures

- $\text{pid, doctor.eid} \rightarrow \text{diagnosis, cost}$

6. Supervisor

- $\text{supervisor.y} \rightarrow \text{supervisor.x}$

7. Governs

- $\text{room_no, date, time} \rightarrow \text{nurse.eid}$

8. Checks-In

- $\text{pid, date, time} \rightarrow \text{assistant.eid}$

Technical details and technologies used

As the database used in this project is not real, it was generated using an online database generator website named ‘mockaroo.com’. Since MySQL was used to run queries and produce the desired results, the tables for this database were created using the InnoDB storage engine.

Summary and Discussion

This project is first started with generating a database which closely tries to resemble about a basic day to day business and functional activities of a hospital. The system objective is to keep track of the daily functionalities of the hospital such as the check-in records for the patients, care and services provided by the medical staff and the cost associated with such services. The relationship between different entities is presented using an E/R diagram. The E/R diagram is then translated into relations and then to functional dependencies. Using this information on MySQL, tables are created, and the rows are inserted to populate the database. As the database got ready, some interesting information given in the ‘queries.sql’ file is extracted using SQL queries.

Through this project, I learnt how to construct a database system from designing an E/R diagram, creating a table, inserting values to being able to query through the database to be able to extract the desired output. Moreover, I also learnt to translate an E/R diagram into relations and then check for functional dependencies of each relations. Checking whether BCNF is violated is also something I enjoyed learning from this project. Being able to embed this database system to some user-friendly interface or a web interface would have been nice. Besides, I also think that working with a real database would have been easier to write and interpret the reports.