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CSCI 2215

3 – Assessment of Project

Please Note: TABLE NAMES are capitalized; *Column Names* are italicized.

a – How this design fulfills the requirements of the job?

The database stores data on the relationship between patients and donors. The tables create a relationship between donors → donor blood bags → patients. Moreover, all the primary tables - DONOR BLOOD BAG, PATIENT BLOOD BAG, PRICE, EMPLOYEES, EQUIPMENT - are related to BRANCH ensuring that the data for each branch can be obtained.

The EMPLOYEES table provide data for the employees with respect to the branch the employee is working for.

The DONOR, DONOR UNDERLYING CONDITION, and PATIENT table provide the medical profile of the donor and patients.

The DONOR, PATIENT, PATIENT BLOOD BAG, DONOR BLOOD BAG, and TRANSFUSION are connected and allow the organization to record the date and branch of the receival and transfer of the blood bags from donors to patients.

The EQUIPMENT tables (LAB EQUIPMENTS, STORAGE EQUIPMENTS, INCUBATORS, and DONATION EQUIPMENTS) record the number of equipment in inventory at each branch.

Additionally, the organization would be able to input data for the PRICE and BLOOD INVENTORY. Hence, allowing the blood bank to monitor the changes in price of blood with respect to the location of the branch. The blood inventory follows the status of the blood through the blood bank.

b – What issues you faced in creating your design?

Solved Issues:

1. The initial problem was that I addressed the transfusion of blood through the blood banks incorrectly. I assumed that I should create a donor → patient relationship where the donor would be donating blood to a patient. Instead, I realized that it should be a donor → donor blood bag → patient relationship where the donors would donate blood bags which would be received by patients. This would ensure that multiple donors are able to donate blood and we have unique blood bags to track. Additionally, we could find

if a particular patient received a contaminated blood bag. There are multiple measures to ensure that a patient does not receive such a blood bag, for instance, the blood is tested for several diseases. However, tracking blood bags may be necessary for a disease that may have been newly discovered and has not been tested for.

2. There was a data integrity issue where the EMPLOYEES table was not in the 3rd Normal Form in the first stages of the ER diagram. This is because managers, who are also employees, had separate columns detailing their name and SSN numbers in the table. The problem that would result is that if a manager's name were changed, there would be multiple instances where it would have to be changed. To avoid this, I initially built a separate MANAGER table but I failed to realize that since the *Manager SSN* would be a foreign key referencing the EMPLOYEES table, the names and data for the manager would coexist in both the tables. Therefore, resulting in update, insertion, and deletion anomalies. To resolve the issue, separate manager columns were removed and only the manager SSN was kept for each individual employee as that would make sure that there would only be a single update in the data for the manager.

3. In the first iterations of the ER diagram, a fundamental problem that I was facing was trying to develop tables that would **not** store aggregated values. This is because it is much more efficient to store historical data and query the database rather than updating the data constantly. The loss in data would result in loss in information that would be detrimental in determining the next steps for the company. An example of this problem was when I was building the inventory. I initially built it as such where the quantities in inventory would be updated daily and the quantities would replace the preexisting values in the database. A more effective method was to not store total quantities but rather query the database to find the quantities needed, depending on the conditions (*SELECT and WHERE* clauses).

   To resolve the issue, I added a BLOOD INVENTORY that would store the blood bag status of each individual blood bag as it is moved from *In Storage* to *Laboratory* to *Out of Storage*. I also developed several other tables to store the number of equipment at each branch.

4. A final problem I faced was regarding the donor underlying condition. I assumed that a donor would have a single condition, but this would break the 1st Normal Form if the donor has multiple conditions. Therefore, I developed a separate DONOR UNDERLYING CONDITION table to store boolean values for several diseases that would prevent a donor from donating blood.

c – What areas would you improve if you had more time?

1. Set a trigger that would send an email to a donor if a particular contagion is found in the donor's blood.

2. Remove the existing *CHECK* that is present in the DONOR UNDERLYING CONDITION table because the check is very computationally extensive on the database. Instead the trigger mentioned in 1**.** would be used.

3. Add more records for each of the tables. This would allow us to see any underlying problems in the database.

4. Test whether separate tables for storing data on transfusion is required. Currently, the PATIENT BLOOD BAG and TRANSFUSION tables contain similar data. However, PATIENT BLOOD BAG contains an additional two attributes: *Transfer Date Time* and *Branch ID*. According to the current model it is being assumed that two such tables would ensure an easier query search when trying to track a particular transfusion, donor blood bag → patient.

5. Add contact information of the donor and patient.

6. Add contact information and dependents of the employees.

7. Set a limit on the number of donations per year by a single donor. Set a trigger to inform the attendant when the number is exceeded.

8. Test (*CHECKS)* whether the blood group of the patient matches the blood group of the donor.

9. Set a limit on the number of days donated blood can be stored. Set a trigger to inform an attendant to dispose of the blood bag if the expiration date is exceeded.

d – Is your ER diagram in 3rd Normal Form? If so, why? If not, why not?

Yes, my ER diagram is in the 3rd Normal Form.

1st Normal Form:

The data domain for each attribute is atomic. The names of the employees are divided into *Employee First Name*, and *Employee Last Name*. The address is divided into *Street Address, City, State*, *Country*, and *Zip Code*. The patient and donor names are also divided into first and last name columns. Additionally, there is only a single value from that domain for each tuple. Each table has a single or composite primary key to uniquely identify each related data.

2nd Normal Form and 3rd Normal Form:

The tables with composite primary keys do not have partial dependencies. Therefore, ensuring that the ER diagram is in the 2nd Normal Form.

Additionally, there exists no table that consist of columns that are partially dependent on another column which is not a primary key. If such columns existed in a table, they were separated from the tables to exist independently as another table, hence ensuring 3rd Normal Form.

e – What grade do you think you deserve for this project?

100/100