

## **Hospital Network Management Database (Project Description)**

The project that our group decided to engage in and complete is the Hospital Database Management System. For this project, we aimed to intricately design as well as carefully implement a database that successfully manages a hospital network and its multitude of distinct locations.

While creating our database, we decided that the primary attributes of our design are that it allows for three different locations for the overarching hospital network with various branch specializations of healthcare and medicine (within the network's respective location) to treat patients in relevance to high quantity as well as their specific health condition. These branches have the designated healthcare providers, which is generally composed of a set number of doctors and nurses with their own specializations to practice for said branch. These doctors and nurses work in different specializations. Furthermore, these hospitals have affiliation with three pharmacies that bills the corresponding hospital in order for accurate payment (from the correct branch).

As part of creating our overall database design, we also produced an ER Diagram that guided our understanding of how the database's functionality would ultimately work. We created several entities and the corresponding relationships with their necessary attributes for diagram and the overall design of the database. The entities that were produced includes Hospital, Pharmacies, Patients, Doctors, Nurses, Billing, and Payment. These specific entities were utilized since our project outline was a guide in shaping what we needed to include. Moreover, the attributes for each of these entities were based upon what would be most appropriate for each of them. Specifically we included unique identifiers for each of the entities (Nurse\_ID to identify each unique individual nurse), ensured that certain entities had the correct foreign keys (e.g.: hospital\_ID is referenced by the Doctor entity) and created attributes that were appropriate for each of them (e.g.: payment\_amount in the Payment entity to know how of the bill was paid by the patient). The ER diagram represents several relationships between different entities in a hospital/patient database management system. The relationships are:

- A hospital can be associated with multiple pharmacies, and a pharmacy can supply medicines to multiple hospitals. This is a many-to-many (M:N) relationship between the Hospital and Pharmacy entities.
- Each patient can be admitted to one hospital and each hospital can have multiple patients. This is a one-to-many (1:M) relationship between the Patient and Hospital entities.
- Each patient can be attended to by multiple doctors, and each doctor can attend to multiple patients. This is a many-to-many (M:N) relationship between the Patient and Doctor entities. The "primary\_doctor" attribute specifies which doctor is the primary doctor for a patient.
- Each patient can be attended to by multiple nurses, and each nurse can attend to multiple patients. This is a many-to-many (M:N) relationship between the Patient and Nurse entities.
- Each doctor can work in only one hospital, but each hospital can have multiple doctors. This is a one-to-many (1:M) relationship between the Doctor and Hospital entities.
- Each nurse can work in only one hospital, but each hospital can have multiple nurses. This is a one-to-many (1:M) relationship between the Nurse and Hospital entities.
- Each patient has a single bill, and each bill corresponds to one patient. This is a one-to-one (1:1) relationship between the Patient and Bill entities.
- Each bill can have multiple payments, and each payment corresponds to one bill. This is a one-to-many (1:M) relationship between the Bill and Payment entities.

Once we completed the ER diagram, we began to work on the database's schema and find ways to improve on it for our next step in project completion. Finally, we implemented our conceptual Schema utilizing the SQL programming language queries in addition to the DBMS of SQLite, an exact reflection of the database schema with the exception of using the syntax of SQL. Our database schema includes all of the components that our ER Diagram included (all of the entities and their relationships between each other) as well as a few modifications that helped us to improve our schema and overall design. The tables, created through the use of 'CREATE TABLE', that are included in our database schema from the entities are Hospital, Pharmacies, Patients, Doctors, Nurses, Billing, and Payment because as mentioned before, these are integral to the functionality of the entire design. In regard to modifications made, we created additional tables for the Schema to help reflect some of the relationships between entities such as the hospital employees (Doctors and Nurses) and Patients (which individual Doctor/Nurse treat which Patient(s)) as well as the hospital branches (specific medical/health departments). Furthermore, the relationships we established between different entities' attributes are also congruent with those from the ER Diagram which is expressed as the foreign keys that are referenced within a given table or through the use of 'FOREIGN KEY *internal attribute name* REFERENCES *external attribute name*' (e.g.: billing\_ID exists as foreign key within the table of Payment). The additional relationships that we created includes the Hospital locations (locations table) being referenced by the Employees (Doctors and Nurses tables) which shows what Doctor/Nurse works for which hospital based upon their specialization in medicine and/or healthcare and thus allowing to track which Patients' and their conditions are being treated at a particular hospital location.

As a bonus, we created a website (unhosted) with a Flask backend (Python). It allows the user to make queries and output a corresponding table. It also features full error codes for invalid queries, and has buttons that can autofill preset queries. The instructions for running it are outlined in our GitHub repository.

GitHub link: <https://github.com/angelohoeung/comp3150-hospital-database>

#### Workload Distribution

Angelo Hoeung - database design/schema, user interface, complicated queries, project description document, database demonstration/walkthrough video

Hussam Waheed - database design/schema, user interface, complicated queries, project description document, project presentation slides/video

Elijah Sevilla-Garcia - database design/schema, user interface, complicated queries, project description document, project presentation slides/video