

MMAI5100 Group Project - Fall 2020

Project Objective:

Complete the conceptual, logical and physical design as well as the physical implementation of a relational database for a given business scenario.

Business Scenario:

Your team has been hired by Toronto Walk in Clinic (TWIC) to design and develop a database for their day-to-day operations. You have already interviewed the TWIC executives and selected operational employees from the clinic and based on various business constraints that have been communicated to you, decided that a relational database would best suit the business needs. After some deliberation you also have decided that PostgreSQL would be the most suitable DBMS for this implementation.

Your interviews have highlighted three main user stories for the operational database:

- HR Administrators want a system to be able to keep track of employees who work for the clinic
- Office Administrators as well as health care professionals want a system to help them keep track of patients who receive various services from the clinic
- Accounting and finance would like to keep track of suppliers (vendors) who provide the clinic with a variety of medical consumables (medical supplies like syringes and needles, gauze, medical gloves, masks and so on...) and drugs/medications along with the present supply inventory levels in the clinic.

Your team has made the following notes about the TWIC operations:

Interview notes with HR

- An employee can be a medical employee or non-medical employee.
- Medical employees are doctors as well as nurses while non-medical employees are everyone else who works at the clinic (receptionists, cleaning staff, IT personnel, etc).
- Each employee will have a unique employee identification number.
- The database will store each employee's name, address, phone, e-mail, job title, date of birth, gender as well as skills and credentials.
- The clinic wants to store each employee's position detail history (job title, start and end date).
For example, if and when an employee is promoted and his/her title changes, the old title along with the time span when that title was applicable must be kept in the database.
- An employee can have many skills but must have at least one skill. You are free to define the employee skills as you wish.
- An employee can have many credentials but must have at least one credential. Degrees, diplomas, and certifications are examples of credentials but you are free to expand the categories if you wish.
- Medical employees' alma maters will be recorded (a medical employee may have graduated from multiple schools).
- Medical employees may have specialties. While it is unusual to have multiple specialties, a medical employee does not have to have a specialty. You are free to define medical specialties.

Interview notes with office admins, medical doctors and nurses

- Patients can only be day patients as the clinic does not have overnight facilities.
- Each patient will have a unique patient identification number.

- The database will store each patient's name, address, phone number, e-mail, date of birth, gender, OHIP number (if applicable), next of kin, basic medical details like patient's family doctor's name and contact info (if any), as well as patient's known allergies and other important medical details (e.g. previous surgeries or treatments that may have been administered outside the clinic).
- Patients can book appointments with medical employees.
- Each appointment will have a unique id, and track date and time of the appointment.
- Scheduled vs. actual appointment dates and times will be tracked. The clinic administration thinks this data might be helpful for resource allocation in the future.
- For each appointment, the patient's complaints as well as related medical employee notes, diagnosis details (e.g. diagnosis itself or supporting information like required medical imaging) and treatment details (e.g. prescribed drugs) will be recorded. Each appointment must address one or more complaints and each complaint will have a start date and an end date. Start date is the date when a patient first mentions about an ailment. End date is the date when a complaint is resolved. Chronic or untreatable conditions will not have an end date. It is possible that patients may book several appointments for the same complaint over time.

Interview notes with accounting and finance

- The clinic wants to track medical consumable and medication use per complaint and is hoping to use this data in the future to better forecast its consumable and medication needs. Note that medication that may have been administered to the patient during a visit is not a consumable and medication use may need to be separately tracked (or you need a way to differentiate between consumables and medication).
- Each patient may be covered by one or more medical insurance providers. Each insurance will have an insurance provider name, insurance provider contact info (phone and e-mail) and an insurance policy number.
- The clinic has EDI links to all major insurance companies and keeps track of patient's insurance claims.
- Each complaint may lead to one or more insurance claims. Each insurance claim will have a unique claim id, procedure name (what the medical employee did to address the complaint), insurance code, insurance partner, date submitted, amount submitted and amount covered. Each claim must be linked to a single insurance while each insurance may be linked to one or many insurance claims over its lifetime. Naturally, patients who do not have insurance will not have a claim.
- OHIP claims from the Provincial Government is currently being tracked in a separate database and they are out of scope for this database. The clinic will have a separate project to integrate OHIP claims into this database later on.
- Patients with no OHIP coverage or external insurance (who have to pay for the services they receive) are also out of scope for this project.
- Vendors will have unique vendor ids.
- Vendor name, address, phone and e-mail along with a contact person will be required for each vendor.
- Vendors can supply drugs/medication or medical consumables or both.
- Each vendor can supply one or more consumables or one or more medication.
- Vendors have exclusivity agreements. Each consumable or medication can only be supplied by one and only one vendor.

TWIC wants to keep track of its consumable and medication supplies and prefers to have a process in place to deduct the consumables and medication used each day from its supplies daily (It's OK to show

this process for a couple of consumables or medication. It can be a manual process run by the DBA or an automated process that gets executed daily by the DBMS).

When the consumable or medication supply inventory levels fall below a certain level for a given consumable or medication, a purchase order will be issued to order to replenish inventory levels. Purchase orders will also be issued daily after the supply levels have been recalculated. Each purchase order will have a unique identifier, a vendor name, a contact name, an order date along with a list of consumables or medication along with quantities. (Again, it's OK to show this process for a couple of consumables or medication. It can be a manual process run by the DBA or an automated process that gets executed daily by the DBMS. You are free to set the order quantities to a pre-set number or order the exact quantities used up that particular day). Currently purchase orders are not sent electronically and the admin assistant will just fax the order sheets manually every day. The database need to produce the contents of the order sheets (this could simply be a query or a set of queries).

In addition to the daily purchase orders, you should create the following queries that will be used for various reports by the administration:

- List all employees (Employee ID, name) along with their employment history (all positions held including current position)
- List all patient appointments for a given medical employee (you pick a sample employee) in a given week (you pick a sample week)
- List all medication used for a given complaint (you pick a sample complaint)
- List all consumables used for a given complaint (you pick a sample complaint)
- List the insurance claim amount submitted and amount covered for an appointment of a given patient (you pick a sample patient)

Deliverables:

- Prepare an E-R or an EER diagram to show the conceptual design for TWIC
- Convert your conceptual diagram into a logical data model for a relational data management technology implementation (transform your E-R or EER diagram into relations)
- Prepare a physical data model showing the data types for PostgreSQL DBMS implementation
- Implement your design in PostgreSQL using Structured Query Language on our database server. A single SQL implementation is sufficient as the final deliverable (i.e. each group member does not have to duplicate the SQL code). Make sure you have sufficient sample data in the database (a few medical and non-medical employees, patients, appointments, etc.) so that the requirements can be tested and the queries will run.

For your diagrams, you can use an online or desktop tool to create them or draw by hand, take a photo and insert the photo into your answer. If you are using a tool please pick a tool that has similar notation to the one we used in class. In any case, please make sure your relationship cardinalities are clearly visible.

For details that are not clearly stated in the case you are allowed to make assumptions. Nevertheless, if and when you make any assumptions, please state them clearly.

Finally, please note that there are numerous ways this database can be designed and constructed. If you are torn between multiple design options, go for the simplest design and justify your selection.