Details

Data Project #1: Building knowledgebase on Covid-19.

Abstract:

The ongoing COVID-19 outbreak is a world-shaking pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The outbreak has also been declared Public Health Emergency of International Concern by World Health Organization (WHO). As we can notice, more than 35 million cases have been reported worldwide and about 1 million deaths, it is important to have a computational resources and data provided by federal agencies in order to store the data, carry out operations on data and for data enhancement. So, in the wake of COVID-19, a Canadian organization named HalifaxData5408 has signed an agreement with three different organizations to do the same. I, Information Specialist in HalifaxData5408, is the in charge of this entire operation. The existing information from sources is partly computerized via database only in Patient, Doctor, Hospital, Blood Bank, Financial Services, Emergency Services, Plasma Collection Center, and COVID-19 Center. However, this report outlines one complete database design to build comprehensive understanding on COVID-19.

Introduction:

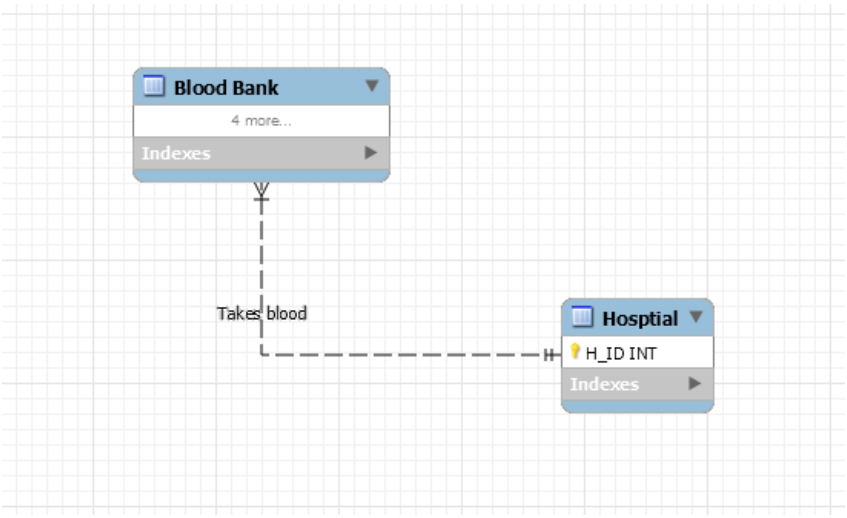
A. *Entity Relationship Model (ERM)*

1) *ER Diagram*

In the ER diagram, we can view the entities- Country, Province, City, Routes, COVID-19 Centers, Hospital, COVID-19 Patient, Doctor, Building, Owner, Appointment, Address, Specialty, Bill, Emergency Services, COVID-19 Financial Assistance, Blood Bank, External Medical Sources, and Medical Records. Among these various entities, different types of relationship exists which connects all the entities together. Example: Doctor and patient are connected via Appointment. In another words, Patients books an appointment in the building which belongs to Hospital and this will assign a Doctor to a Patient. In similar way, other entities are connected via relationships in a meaningful way.

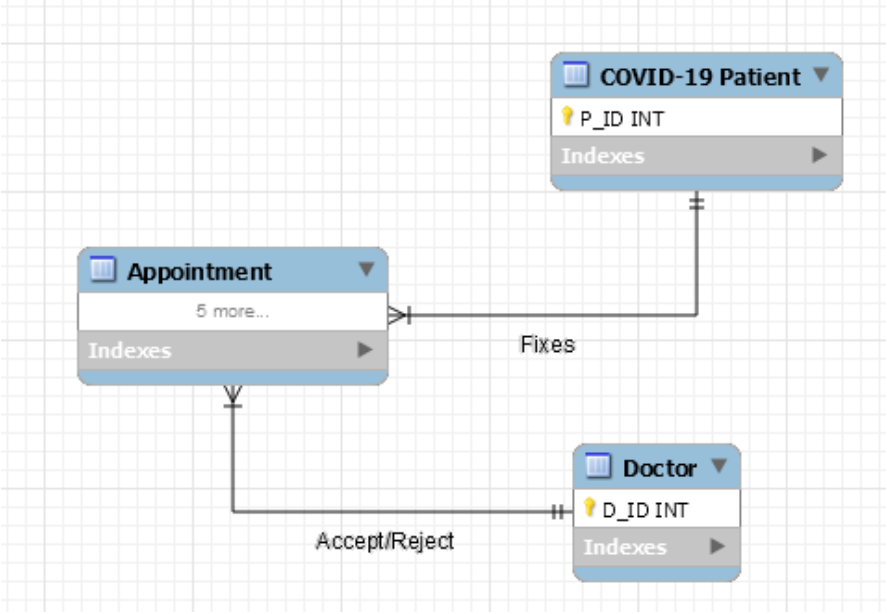
2) *Cardinalities*

Binary Relationship



In the ER diagram, binary relationship exist. A Hospital takes blood from one of the blood banks in the city during emergency in order to cure COVID-19 patient. So it's a one to many, non-identifying relationship named "takes blood" from Hospital to Blood Bank.

Ternary Relationship



In the ER diagram, ternary relationship exists. Example, patients books a meeting in Appointment entity, which is connected to the doctor. In other words, doctor is connected to the Appointment via "Accept/Reject" relationship one to many, patient fixes the appointment in order to consult a doctor.

B. Relationship Model

In the Figure 1, the entire ER diagram can be converted to a Relational Model. The attribute(s) of a relationship which are considered as a primary key of the table is underlined and those which represent foreign keys are indicated by (FK) beside it.

i) COVID-19 Patient (CP_ID, CP_NAME, CP_AGE, CP_GENDER, DATE_OF_BIRTH, CP_PHONE_NUMBER, CP_ADDRESS, CC_ID (FK), H_ID (FK), FA_ID (FK))

Here, in this table basic details of the patient is provided.

- The primary key of COVID-19 Center table, CC_ID, goes as foreign key to the COVID-19 Patient table. COVID-19 Center keeps the data of the patients diagnosed with the coronavirus visiting the center and treating them, this is a free service provided by the city officials to the public. The relationship defined from COVID-19 Center table to COVID-19 Patient table is One-to-Many (1: n) and labelled as "Accommodate". This means a single COVID-19 Center can accommodate multiple patients at the same time.
- The primary key of Hospital table, H_ID, goes as foreign key to the COVID-19 Patient table. The relationship defined Hospital table to COVID-19 Patient table is One-to-Many (1: n) and labelled as "Admits". This means a single Hospital can admit more than one patient at the same time.
- The primary key of COVID-19 Financial Assistance table, FA_ID, goes as foreign key to the COVID-19 Patient table. The relationship defined COVID-19 Financial Assistance table to COVID-19 Patient table is One-to-Many (1: n) and labelled as "Availed by". Many patients affected by virus can avail (only once) the financial leisure provided by the government authorities.

ii) City_Patient (CITY_NAME(FK), CP_ID(FK)

iii)

iv) City(CITY_NAME, CITY_PROVINCE, CITY_PERCENTAGE_AFFECTED, CITY_PERCENTAGE_RECOVERED, CITY_INFO, PROVINCE_NAME(FK))

v) Province (PROVINCE_ID, PROVINCE_NAME, PROVINCE_PERCENTAGE_AFFECTED, PROVINCE_INFO, PROVINCE_PERCENTAGE_RECOVERED, CITY_NAME(FK))

vi) COVID-19 Center (CC_ID, CC_ADDRESS, CC_AVAILABLE_BEDS, CC_OCCUPIES_BEDS, CC_STATUS, CC_INFO, CITY_NAME (FK), PROVINCE_NAME (FK))

vii) Hospital (H_ID, H_NAME, H_ADDRESS, H_PHONE_NUMBER, H_INFO)

viii) COVID-19 Financial Assistance(FA_ID, FA_ELIGIBILITY, FA_INFO, CITY_NAME(FK))

ix) Medical Record (MR_ID, DATE_OF_EXAMINATION, CONDITION, CP_ID(FK))

- The primary key of COVID-19 Patient table, CP_ID, goes as foreign key to the Medical Record table. The relationship defined COVID-19 Patient table to Medical Record is One-to-Many (1: n) and labelled as “Receives”. A patient receives several Medical Reports during the treatment and final report after discharging from the hospital.

x) Appointment (A_ID, A_TIME, A_DATE, A_PURPOSE, CP_ID(FK), B_ID(FK), D_ID(FK))

xi) Country (COUNTRY_ID, COUNTRY_NAME, TOTAL_DEATHS, PRESENT_POPULATION)

xii)

xiii) Hospital_has_Doctor(Hospital_H_ID(FK), Doctor_D_ID(FK))

xiv) Hospital_Speciality (H_ID(FK), S_ID(FK))

xv) Plasma Collection Center (P_ID, P_TYPE, P_HEALTH_AUTHORITY, P_INFO, CITY_NAME(FK))

xvi) City_Emergency Services(CITY_NAME(FK), ES_ID(FK))

xvii) Patient_Emergency Services (CP_ID(FK), ES_ID(FK))

xviii) Bill (B_ID, B_DATE, B_PURPOSE, B_AMOUNT, H_ID(FK) , CP_ID(FK))

xix) Blood Bank (BANK_ID, BANK_NAME, BANK_LOCATION, BANK_INFO, H_ID(FK))

xx) Doctor(D_ID, D_NAME, D_DEPARTMENT, D_SALARY, D_GENDER, D_INFO, D_ADDRESS)

xxi) Address(STREET_ADDRESS, CITY, ZIP CODE, COUNTRY, D_ID(FK), CP_ID (FK))

xxii) Emergency Services(ES_ID, ES_NAME, ES_COMMUNITY)

xxiii) External Medical Sources(TP_INSTRUMENTS, TP_SERVICES, TP_INFORMATION, H_ID(FK))

xxiv) Routes (ROUTE_ID, ROUTE_NAME, ROUTE_ADDRESS, ROUTE_STATUS, ROUTE_INFO, CITY_NAME(FK))

xxv) Specialty (S_ID, S_NAME, S_INFO, D_ID(FK))

xxvi) Owner (OWNER_ID, OWNER_INFO)

xxvii) Building (B_ID, B_NAME, B_ADDRESS, H_ID(FK), OWNER_ID(FK))

Figure 1: