INFO 6210 Data Mgt and Database Design Document

Group 6

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Database Topic

COVID-19 hospitalization management system

Database Purpose

With the massive amount of COVID-19 patients occupying hospital beds, the purpose of the database is to collect health information of inpatients, improve prognosis, modify treatment strategies, and adjust admission standards in order to manage COVID-19 patients more efficiently. This database will be used by both physicians and hospital administrative staff.

Business Problems Addressed

● Provide patients' information to physicians to give appropriate treatments and further reduce the COVID-19 death rate.
● Allow medical care providers to record and compare different treatment results, which helps to further improve treatment strategies.
● Ensure that physicians can identify the severity of the disease through clinical symptoms and examinations and further adjust admission standards to better control the number of COVID-19 inpatients.
● Allow administrative staff to collect patients' treatment-related information and generate descriptive patient reports.
● Ensure that administrative staff are able to find available beds immediately for COVID-19 patients.
● Supply information to improve the scheduling of admission and discharge, and to allocate scarce medical resources more fairly for COVID-19.
● Permit administrative staff to track the geographical distribution of COVID-19 patients to prevent the spread.

Business Rules

● Assume all patients have already been hospitalized.
● Assume each patient has only one current address.
● Assume there can be one or more patients in each address.
● Assume each patient is treated by one or more physicians.
● Assume each physician treats zero or more patients.
● Assume each patient has one or more treatments.

- Assume each treatment is given to zero or more patients.
- Assume each physician can perform zero or more treatments.
- Assume each treatment is performed by zero or more physicians.
- Assume each patient must occupy one bed per admission.
- Assume each bed is occupied by zero or one patient.
- Assume each patient has zero or more medical conditions in his or her medical history.
- Assume each medical condition is shown in zero or more patients' medical history.
- Assume each patient has been admitted once or more.
- Assume each admission record is assigned to only one patient.
- Assume each patient takes zero or more examinations.
- Assume each examination has been taken by zero or more patients.
- Assume each patient has one or more clinical symptoms.
- Assume a clinical symptom is shown in zero or more patients.
- AdmissionType includes emergency admission and regular admission.
- DischargeType includes expiring, recovered, and null.
- Patients less than 12 years old are not admitted due to the lack of specific equipment for kids.

Design Requirements

- Eliminate any multi-valued and/or composite attribute.
- Remove any repeating groups.
- Avoid a many-to-many relationship.
- Pay attention to the multiplicity (cardinality and partition).
- Make sure the type of relationship is correct (Identifying vs Non-Identifying).
- All entities must be connected.
- Avoid any unnecessary relationship.
- Make sure the ERD and design document match.
- Use Crow's Foot Notation.
- Specify the primary key fields in each table by specifying PK beside the field.
- Specify the foreign key fields in each table by specifying FK beside the field.

Design Decisions

Entity Name	Entity Type	Why Entity Included	How Entity is Related to Other Entities
Patient	Primary	The primary purpose of our database is to manage COVID-19 patients more efficiently. We create "Patient" as the core entity to record patients' relationships with other entities and further analyze their situation to modify treatment strategies and admission standards. Patients' age and gender can also be used to collect demographic data on Covid-19, making researchers better understand the disease.	As a core entity in this database, the Patient entity has one-to-many identifying relationships with the PatientSymptom, the PatientExamination, the PatientAddress, and the MedicalHistory entity. The Patient entity has one-to-many non-identifying relationships with the Admission, the TreatmentResult, and the PatientBed entity.
Address	Primary	One of the objectives of this database is to track the geographical distribution of COVID-19 patients to send alerts and prevent community spread. This entity can be used to predict high-risk locations.	The Address entity has a one-to-many identifying relationship with the PatientAddress entity.
Physician	Primary	The physician is an important entity representing the members of the hospital medical staff. Physicians treat COVID-19 patients by their medical history and may determine their admission and discharge.	The Physician entity has a one-to-many non-identifying relationship with the TreatmentResult entity. Physicians may order Treatment for a Patient based on other information.
Clinical Symptom	Primary	Clinical symptoms are an important basis for diagnosis. The clinical symptom is a subjective manifestation of a morbid condition reported by a patient. Symptoms differ with the severity of the	The ClinicalSymptom entity has a one-to-many identifying relationship with the PatientSymptom entity.

		COVID-19 disease, and it will help physicians to assess patients' health condition. For example, whether a patient needs emergency medical care immediately or not. The entity can work as an important reference so that the doctor can diagnose conditions of the disease.	
Admission	Primary	Admission can provide basic time and type records when patients admit to and discharge from the hospital, including AdmissionDate, DischargeDate, AdmissionType, DischargeType, Frequency Record, and LengthOfStay. By knowing how long each patient stays, the hospital can improve the entire treatment process and adjust admission standards accordingly to maximize the bed utilization.	The Admission entity has a many-to-one non-identifying relationship with the Patient entity.
Examination	Primary	The examination provides specific information about the patient's examination combined with the PatientExamination entity, including Name, Type, ExamDate, ExamResult, ExamSeverity. Physicians can get a better sense of patients' physical condition through examinations. In addition, physicians could determine the severity of the patient by comparing the results of the examination with the indicators provided by WHO's guidance.	The examination entity has a one-to-many identifying relationship with the PatientExamination entity.

Medical Condition	Primary	The MedicalCondition can provide details about patients' medical conditions combined with MedicalHistory entity, including Description, StartDate, EndDate, and CurrentCondition (recovered or continued). As far as we know, patients with certain medical conditions could be at higher risk for severe illness from COVID-19 and they need extra precautions. This entity provides important information for physicians to distinguish those high-risk patients, leading to reconsideration and adjustment of existing treatments and admission standards.	The MedicalCondition entity has a one-to-many identifying relationship with the MedicalHistory entity.
Treatment	Primary	Treatment can provide information about the treatments combined with the TreatmentResult entity, including Type, Name, PhysicianID, PatientID, StartDate, EndDate, and Result. That information can help medical care providers to compare different treatment results, which helps to further improve and modify treatment strategies.	The treatment entity has a one-to-many non-identifying relationship with the TreatmentResult entity.
Bed	Primary	The Bed entity can provide information for administrative staff to look up allocated beds for COVID-19 inpatients. Physicians can immediately find their inpatients according to the BedID recorded in the Bed entity. Both enhance the efficiency of managing COVID-19 patients.	The Bed entity has a one-to-many non-identifying relationship with the PatientBed entity.

Patient Address	Associative	The PatientAddress entity is an associative entity that maintains the relationship between the Patient and the Address entity.This entity is created to solve the many-to-many relationships existing between the two entities.	The PatientAddress entity has many-to-one identifying relationships with the Patient and the Address entity.
Treatment Result	Associative	This TreatmentResult entity is an associative entity that maintains the relationships between the Physician, the Treatment, and the Patient entity. This entity is created to solve the many-to-many relationships existing between the three entities.	The TreatmentResult entity has many-to-one non-identifying relationships with the Treatment, the Patient, and the Physician entity.
Medical History	Associative	This MedicalHistory entity is an associative entity that maintains the relationship between the Patient and the MedicalCondition entity. This entity is created to solve the many-to-many relationship existing between the two entities.	The MedicalHistory entity has many-to-one identifying relationships with the Patient and the MedicalCondition entity.
Patient Examination	Associative	This PatientExamination entity is an associative entity that maintains the relationship between the Patient and the Examination entity. This entity is created to solve the many-to-many relationship existing between the two entities.	The PatientExamination entity has many-to-one identifying relationships with the Examination and the Patient entity.
Patient Symptom	Associative	The PatientSymptom entity is an associative entity that maintains the relationship between the Patient and the ClinicalSymptom entity. This entity is created to solve the many-to-many relationship existing between the two entities.	The PatientSymptom entity has many-to-one identifying relationships with the Patient and the ClinicalSymptom entity.

PatientBed	Associative	The PatientBed entity is an associative entity that maintains the relationship between the Patient and the Bed entity. This entity is created to solve the many-to-many relationship existing between the two entities.	The PatientBed entity has many-to-one non-identifying relationships with the Patient and the Bed entity.