A Database for an Electronic Medical Record System

Electronic Medical Records (EMRs) or Electronic Health Records (EHRs) are considered a critical technology for improving patient care quality and reducing health care cost. It is expected that, by this year, most healthcare facilities in US will employ one or more EMR systems to manage the entire process of patient care. With detailed information about patient condition and patient care captured digitally, prevention, treatment, and management of patients will become more evidence-based and personalized as data analytics discover more knowledge about the patient and the care process. The outcome will be more predictable, the process will be more efficient, and the overall healthcare system will be more effective.

An EMR system should capture and manage all information about a patient and the care process and provide relevant information and knowledge to all stakeholders promptly and effectively. Due to the complexity of healthcare needs, the database system required to support a general EMR system is very complex often comprising more than 200 tables. In this project, we will develop a database system that serves as the backend of a simple EMR system that captures a small portion of relevant information around a focused care scenario. You may decide how to limit the scope based on your domain knowledge or discussions with people who have the domain knowledge. For example, you may decide to focus on one aspect of a nursing unit, a tissue lab, an emergency department, a dental clinic, an outpatient clinic, or a student clinic in a university. The basic requirements are the following:

- Your database should support a system that can allow a user to enter the following health care related information:
  - Patient demographic information (including address and insurance)
  - Provider information (including specialty)
  - Visit information (including time and facility)
  - Clinical care information (including recording of signs and symptoms, discharge diagnosis and prescriptions, and orders and results of exams, tests, and procedures)
  - Other pertinent information depending on scenarios, for example, clinics will need to manage appointments and exam rooms, emergency department will need to manage information about beds. All clinics will also need to manage supplies and billing
- Your database should support editing of existing records to correct data entry mistakes or legitimate changes of information (e.g. change of address or insurance).
- Your database should support searching of patient records based on name, ID, and possibly other information such as visit dates.

- Your database should support reporting functions such as listing of all patients who satisfy certain selection criteria, such as those who have been given certain diagnosis, or who visited on certain days, or who have been seen by certain doctor, or combinations of these such as, the diagnoses of patients who visited the clinic twice within the shortest time interval.

This is an individual project. It is important to scope a manageable project. Again, focus on one aspect of a nursing unit, a tissue lab, an emergency department, a dental clinic, an outpatient clinic, or a student clinic in a university. You may consider working in multiple iterations (i.e., agile development) and gradually expand the functionality of the system as time permits.

Database design should be based on requirements. Thus, your first task is to define the scope of your EMR system and then determine a reasonably realistic requirements specification that supports the information management needs of the clinical environment. Be sure to include this in the final documentation. You may use Canvas and/or email. Please ask questions as often and as early as possible.

The next step is to develop a UML data model based on information needs of the requirements specification. This model should include reasonable attributes and primary keys for each class, associations (and possibly association classes) between classes with specification of multiplicity, possibly other types of relationships (i.e. subclass, aggregation, composition). A well-designed model should lead to a good relational database design. **Please make an effort to ensure that all the tables are in BCNF**.

Based on the database design, you need to develop SQL scripts to implement this design. Make sure to specify constraints such as primary keys and foreign keys properly. I suggest that you use table level constraints to specify foreign keys and give each constraint a proper name.

After the database is created, you should develop a set of SQL scripts to support the functions specified in the requirements document.

Finally, you should add to the database creation script additional SQL statements to populate some test data in the database. The test data is important for demonstrating the design of the database as well as the SQL scripts that you have created.

Deliverables

- Presentation (5~10 min video recording) explaining/demonstrating your system design
- Requirements specification (Word doc)
- UML Data model
- ER diagram (Workbench)
- Database creation script (with test data)
- SQL scripts to support EMR system functions

- All materials should be organized into one zip folder (codes should be in SQL script files, not in word/text forms)

Evaluation criteria

- Functionality (must work correctly first)
- Quality
- Documentation
- Note the rubric file for details