CSC540 - DATABASE MANAGEMENT CONCEPTS & SYSTEMS – FALL 2016

PROJECT 1 DESCRIPTION – *The Design & Implementation of a Personal Health Management (PHM) Database Application*

Background

The goal of this application is to assist people (both healthy and otherwise) track and manage health status information. People can track their "observations about certain health indicators and activities of daily living" whose patterns can be reflective of their health status. Tracking such information can help create alerts when something is wrong or when patients become slack about health management. As is becoming increasingly common, the user of health supporters are being encouraged to assist, motivate and encourage patients to comply with directives. Consequently, a useful personal health management application will help with recording and monitoring specific health indicators, raise alerts by notifying patient and health supporter (where appropriate).

In this project, you will be required to design an E-R model, translate the E-R model to a relational schema, implement the relational schema and perform some data retrieval queries in Oracle. You are required to implement a simple menu---driven Java interface (CLI) for interacting with the database that uses JDBC. Although not required, you are welcome to design a Swing/Web application (GUI). **Project teams should be of size 4**. (Currently roll in class is 148 so this works out best).

A final report and in-person demonstration of project will be required. Dates to be announced but sometime in late Oct or early Nov.

First Deliverable: Project Milestone 1 Report: **Due September 11th.**
For the first report, you should write

1. names and unity ids of team members (4)
2. a list of Entity and Relationship Types that you identify in the project description. For each relationship type, you should state the arity of the relationship e.g. if it is binary, ternary, etc. Relationships should include any hierarchical relationships (subtypes) that you identify**.** There is no need for verbose text, just a categorized listing of these is fine.
3. A statement acknowledging that you have asked all questions you need to clarify any ambiguities in description.

Second Deliverable: Project Milestone 2 Report: **Due September 25th**.
For this report, you should list any application constraints that you identify in description. Also, include any functional dependencies that you think are implied.

Final Report Due: Oct 16th (tentative). Guidelines of final report will be announced soon**.**

Data Requirements

Patients – The PHM application needs to maintain recordings of health indicators, monitor and generate useful alerts to increase patient's compliance and help coordinate activities between patients and their health supporters. Health Supporters are designated people (family, friend or social worker) authorized by patients to help manage their health status. This is particularly helpful if there is a high risk of patient suddenly becoming incapacitated due to rapid decline in physiological or mental status. Patients can be broadly categorized into two categories. A Well Patient is an everyday person who doesn't necessarily have any major illness but is health-conscious and wants to track their health information. Sick Patients are those that have been assigned at least one disease diagnosis e.g. HIV, Heart Disease and COPD. (COPD is a lung disease usually associated with long---term smoking that makes breathing very difficult). The application should initially be designed based on these given disease categories. However, it should be general enough so that new disease categories can be added in the future.

Patients are identified with a unique identifier and have additional information such as date of birth, name, address, gender and their diagnoses (could be multiple) also recorded. A patient may have up to two Health Supporters (one primary and one secondary) who are identified with unique identifiers. However, every sick patient must have at least one. Contact information for health supporters is stored as well as the date of role authorization (the date that patient authorized them in that role). Prior to authorization dates, health supporters should not have access to patient information. A health supporter is the one that enters any specific recommendations for a patient given by a doctor. For any disease class that they are in, patients essentially inherit the observation recommendations for that class of patients (unless a specific recommendation has been given for that patient).

Health Observations – There are different kinds of health observations that can be tracked and managed. Most are general observations and applicable to all patients e.g. (weight, exercise, blood pressure, and mood). However, the difference is that while for Well Patients, observation requirements are merely recommendations, for Sick Patients, observation requirements are mandatory. For example, it may be recommended that every patient get their blood pressure checked monthly. But, it isn't considered a crisis or risk if one doesn't do so. However, for a Heart Disease patient, the recommendation should be daily and it would be considered as a requirement. In some cases, some observation types may be inapplicable to particular groups of patients but applicable for others. For example, generally there is no requirement for Well Patients to check their temperature regularly. On the other hand, for HIV patients, a persistent higher than normal temperature may indicate an infection which they are susceptible to due to their weak immune system.

Observations e.g. blood pressure may have upper and lower limits associated with normal patients. However, normal ranges sometimes differ for different individuals, so doctor may specify a different limit for a specific patient. Observation types have an unique name and description, a measure and metric(s). For example, the measure of blood pressure has two components: systolic pressure and diastolic pressure, which are both numeric values. Temperature and weight are also integer values. For those with values, there might have upper and lower limits associated with them. Therefore, for Well Patients, there will be a recommended frequency and limits for each observation type (including "none", like in the Temperature example). However, each Sick Patient class may include recommendations that override those for Well Patients. We need to record all observations for the patient including the type of observation (temperature, blood pressure,..), the date/time of the observation and recording (which might be different from the observation time. E.g. patient felt pain in morning but recorded that in the evening). Below is a summary of observation types and some of theirs characteristics. You are free to add additional auxiliary information that you may feel is necessary for an observation type.

Type	**Additional Information (where do I put in frequency for normal and sick**
Weight	Numerical types. Lower and Upper Limits –Yes
Blood Pressure	Systolic, Diastolic. Each numerical types. Upper and Lower limits – Yes

Oxygen Saturation	SPO2 level, numerical. Upper and lower limit
Pain	Ordinal [1 – 10]
Mood	Ordinal {Happy, Sad, Neutral}
Temperature	Numerical. Lower and Upper Limit

This table will be updated with relevant threshold information for the different observation type values as well as observation frequency recommendations for the different patient categories.

Application Requirements.

Alerts

Sending alerts will be helpful for encouraging compliance in patients. There are two kinds of alerts that can be considered. First, is like an *outside-the-limit alert* when a certain threshold percentage number of consecutive readings are over the specified limits for the patient. For example, if more than 70% of 5 consecutive observations are outside specified limits. *Outside-the-limit thresholds* are specific for each patient. Patients and Health Supporters can view alerts and clear them (as described below). The second type is *low-activity-alerts* which help to identify patients that seem to be disengaged from the system. For example, if the recommended frequency of an observation type is X and patients haven't recorded any activity by certain threshold beyond X. Both patients and Health Supporters can view these alerts. Such alerts are cleared in one of two ways: Either the Health Supporter clears them (essentially representing the fact that they have intervened in some way) or a patient enters an observation for the missing observation type.

Application Flow (**Tentative**): This part of description gives a general idea of what the application should be like. A more complete application flow description will follow in the not too distant future**.**

The application entry point should be an account creation screen or login (if already existing) for patients and Health Supporters. After patients log in they should be given options like: ***Enter Observation Data***, ***View Existing Observation Data***, ***View Alerts***, *and* ***Update Patient Information***. In Update Patient Information mode, users can enter diagnoses, enter Health Supporter etc. If a patient enters a disease class, the subsequent logins will require a selection of health supporter to be entered (if none) before any other tasks are possible. Another option **Clear Alerts** for clearing alerts should be allowed only after user has viewed alert. That is, a user shouldn't just be able to clear alerts before seeing them. Another important requirement is that for entering observation data, only available options should be the options for observation types associated with the patient classes that the patient belongs to. For example, if a patient is not a HIV patient, the option to enter Temperature observations shouldn't be there (unless it is in the general category of observations for all patients).

Queries (Tentative).

The following give the nature of queries that you will expected to implement in your application. You can create a separate menu option screen for "implemented queries". A complete list of such queries will also be included in the description.

- **Insert/Update/Delete Queries:**

1. Add new patient or health supporter account.
2. Add a new diagnosis or insert a health supporter for an existing patient.

3. Delete a current health supporter account.
4. Update the information for current patients.

- **Retrieval SQL Queries** --- used to find specific information**:**

1. Find patients who belong to more than one Sick Patient class
2. Find all Sick patients whose Health Supporters are also Sick patients
3. Find patients who have two Health Supporters

- **Reporting queries --- used to find more general information:**

1. For each patient and each month of 2015, list all the alerts that were generated.
2. For each month of 2015, list the patients with the most alerts.

Demo Test Data

Sample data will be provided closer to the time of the demo to ensure that all teams have the same data. This is only to enable the grading of projects to be on a uniform footing. Therefore, during the process of development, you are to create and test application with your own sample data.

Submission Instructions (TBA)