

Project Proposal

Database Systems

CS 353 - 1

Hospital Database Management System

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1. Introduction

This is the proposal for a Hospital Database Management System. This report explains the functionalities, requirements, limitations, constraints, and entity-relation (ER) model of the system.

The report starts off with a brief description of the project, which explains the scope and properties of the system. It continues with answering the question of why a database management system is required for a hospital. It explains the rationale for implementing such a system and the advantages it provides.

The report continues by describing the requirements of the system, which include functional as well as non-functional requirements. In the functional requirements, the basic functionalities of the system are explained. It describes the functionalities available for different users of the database system. In the non-functional requirements, features and general characteristics that affect the user experience are explained.

In the next section, the report elaborates on the pseudo requirements and limitations. Pseudo requirements provide information about the technologies and programming languages that will be used to implement the system. Limitations describe the boundaries and constraints of the system.

Finally, the report provides an Entity Relation diagram, which will be used as the basis of the database design. The ER diagram is implemented with regard to the functional and non-functional requirements and limitations.

2. Description

2.1. Why is a Database Needed for the Hospital Management System?

A hospital management system comprises a massive amount of data. The storage, manipulation, and authenticity of this data require a sophisticated data management system that a database provides. A hospital has to deal with a great number of patients every day and each patient is likely to have details that are necessary to keep track of. Moreover, the hospital staff is composed of doctors, nurses, and other medical professionals. This hospital staff may need to be added in case of recruitment or may need to be removed. Thus, a centralized system is needed that ensures that the data stored corresponding to the state of the hospital on any day in fact corresponds to that particular state. The need

to handle immense amounts of data for multiple entities and the need to maintain the authenticity of the data requires the usage of a database.

2.2. How is a Database Going to be Used in the System?

The database is going to be used to store the details of the hospital staff - doctors, nurses, laboratorians, and other administrative staff. It is also going to keep track of patients, their appointments, and their medical records. Moreover, a hospital is supposed to handle emergencies and this case is reflected in the database by storing information about emergency situations. The existence of pharmacies in the hospital is handled by the database design allowing the existence of multiple pharmacies in the hospital. Each pharmacy has an inventory of medicines, which the database is going to track as well. Along with the information of tests stored, the database is going to keep track of patients who have their tests conducted along with the test results if available. Apart from the operational data of the hospital, the database is going to store information about the patients who are admitted to the hospital as well as the room availability status in departments. A hospital may be composed of multiple departments, which in turn have multiple units, wards, and rooms. The database is going to keep track of each department. It is going to store information relating to the availability of wards and rooms. To handle billings, the database is going to keep track of the amount due for each patient and the nature of these bills - test fares, appointment fares, and costs of medicines. Lastly, the database is going to track the surgeries that are to be performed in the hospital. While handling all these cases, it will be ensured that the data in the database does not become inconsistent when database operations are performed.

3. Requirements

3.1. Functional Requirements

The Hospital Database Management System we are proposing features the following main end-user types: Employees, doctors, nurses, staff heads, and patients. The main aim of the Hospital-DBMS is to accurately be able to treat the diseases of patients and generate a report with the subsequent treatments.

From an engineering perspective, the basic use cases for such a DBMS would be:

- 3.1.1. Patient
 - ❖ Request an appointment
 - ❖ Cancel an appointment
 - ❖ View X-rays, MRIs, and other types of imaging documents
 - ❖ View prescription
 - ❖ Edit personal information like name, age, etc.
 - ❖ Request doctor change
 - ❖ Pay bills
- 3.1.2. Inpatient
 - ❖ Request room change
 - ❖ Request nurse change
 - ❖ Report service quality
- 3.1.3. Doctor
 - ❖ View patients' personal information, health status, test results, as well as X-rays, MRIs, and other types of imaging documents.
 - ❖ View weekly schedule
 - ❖ Cancel an appointment
 - ❖ Request a holiday
 - ❖ View interns' information
 - ❖ Allow an intern to a patient's information
- 3.1.4. Medical Intern
 - ❖ View supervisor information
 - ❖ View list of available supervisors
 - ❖ Request a supervisor
 - ❖ Request a supervisor change
 - ❖ View the information of visible patients
 - ❖ Request to attend an operation
 - ❖ View list of operations they can attend
- 3.1.5. Laboratorist
 - ❖ View test details
 - ❖ Upload/Download test reports
 - ❖ Update resort status (pending, in-process, completed)
 - ❖ View prescription list
- 3.1.6. Accountant
 - ❖ View payment history
 - ❖ Generate payment invoice
 - ❖ Order payment invoice
 - ❖ Handle the transactions

- 3.1.7. Administration
 - ❖ View all the equipments and details
 - ❖ Add medicine to the medicines list
 - ❖ Manage employees - Add, remove, update
- 3.1.8. Front-desk staff
 - ❖ Scheduling and Booking of Rooms
 - ❖ Assignments of Patients and Operations
- 3.1.9. Pharmacist
 - ❖ View available medicines
 - ❖ Manage medicines in the inventory
 - ❖ View prescriptions

3.2. Non-Functional Requirements

- 3.2.1. Security

Authentication shall be used where each stakeholder shall be able to view and manipulate nothing other than the parts specified in the functional requirements.
- 3.2.2. Response time

The system shall be responsive where the change shall take no more than 1 sec to be visible everywhere in the system.
- 3.2.3. Capacity

The system shall be able to support a minimum of 2000 people at once.
- 3.2.4. Errors

All errors shall be registered in log files.
- 3.2.5. Backup

The system shall create a backup once every week.
- 3.2.6. Availability

The system shall be available 99.95% of the time that is a downtime of 4.38 hours per year.

3.3. Pseudo Requirements (Constraints)

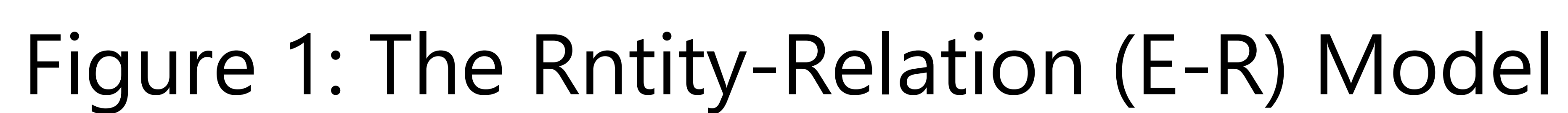
- 3.3.1. SQL database has to be used.
- 3.3.2. Raw SQL queries should be used.

4. Limitations

- 4.1. A doctor with an appointment at a particular time slot cannot be allotted to perform a surgery or to diagnose other patients.
- 4.2. A room or ward whose capacity is full should not be assigned to any new patient.
- 4.3. An O.P.D doctor should not be assigned to an I.P.D patient.
- 4.4. A medical intern should not be able to prescribe medicines without the approval of a doctor.
- 4.5. The pharmacy is not allowed to give out medicines without a prescription.
- 4.6. The laboratorist should only perform tests if a doctor requests the tests.
- 4.7. A nurse should not be assigned to check on multiple rooms or wards at the same time.
- 4.8. A patient should only be admitted to a room upon the doctor's approval.

5. Entity-Relation (ER) Model

The R-R model can be seen in figure 1.



6. Conclusion

The Hospital Database Management System is a web-based application for managing operations of a hospital. It includes administration of employees (doctors, nurses, laboratorists, etc.) as well as patients. The system is responsible for managing the patients admitted into the hospital as well as outpatients. The hospital has equipment to perform tests for patients. The system is going to keep track of this equipment along with the results of the tests. The system is also responsible for managing pharmacies and keeping track of their inventories so that medicines are easily available for patients.

This report begins by introducing the system and then provides a reasoning for the use of a relational database. An entity-relational model is provided for the hospital database management system. Time-permitting more entities and relations may be added. The report also gives information about the functional, non-functional, and the pseudo requirements. The limitations the system must adhere to are also provided.

7. Webpage

Project Documents Webpage

<https://cs353-group-27.github.io/>