

MEDICAL MANAGEMENT SYSTEM AND ANALYTICS

Sai Harshith Kumar Akkenapelly

Computer Science dept, Georgia State University
Atlanta, United States

Sivani Padarathi

Computer Science dept, Georgia State University
Atlanta, United States

Abstract—Our project Hospital Management system includes registration of patients, storing their details into the system, and also computerized billing in the pharmacy, and labs. Our software has the facility to give a unique id for every patient and stores the details of every patient and the staff automatically. It includes a search facility to know the current status of each room. User can search availability of a doctor and the details of a patient using the id. The Hospital Management System can be entered using a username and password. It is accessible either by an administrator or receptionist. Only they can add data into the database. The data can be retrieved easily. The interface is very user-friendly.

The data are well protected for personal use and makes the data processing very fast. In this, we deal with 3 modules. First module deals with Developing a DDL for creating the schema in the database, applicant registration details, transaction scheduling and summary, applicant visit history, report on missing data, transaction scheduling details etc. Second module deals with allotment details, scheduling, summary, reprocessing facility, initiate daily process etc. Third module deals with transaction scheduling details, report missing data reprocessing facility etc. we will create schema for all that modules and integrate them to work properly.

It deals with the collection of patient's information, diagnosis details, etc. Traditionally, it was done manually. The main function of the system is register and store patient details and doctor details and retrieve these details as and when required, and also to manipulate these details meaningfully. System input contains patient details, diagnosis details, while system output is to get these details on to the screen. The Hospital Management System can be entered using a username and password. It is accessible either by an administrator or receptionist. Only they can add data into the database. The data can be retrieved easily. The data are well protected for personal use and makes the data processing very fast.

Keywords—Data Base Management systems, Medical, SQL queries.

I. INTRODUCTION

A database is an organized collection of data. The data is typically organized to model aspects of reality in a way

that supports processes requiring information. A DBMS makes it possible for end users to create, read, update and delete data in a database. The DBMS essentially serves as an interface between the database and end users or application programs, ensuring that data is consistently organized and remains easily accessible. The DBMS manages three important things: the data, the database engine that allows data to be accessed, locked, and modified, and the database schema, which defines the database's logical structure. These three foundational elements help provide concurrency, security, data integrity, and uniform administration procedures. The DBMS can offer both logical and physical data independence. That means it can protect users and applications from needing to know where data is stored or having to be concerned about changes to the physical structure of data.

The main purpose of maintaining a database for hospital management is to reduce the manual errors involved in the patient admission process and make it convenient for the hospital staff to maintain the data about their patients. Due to automation many loopholes that exist in the manual maintenance of the records can be removed. The speed of obtaining and processing the data will be fast. For future expansion, the proposed system can be web-enabled so that clients can make various inquiries about patients. It takes a lot of time and causes many errors while data entering. Due to this, sometimes a lot of problems occur and they are facing many disputes. To solve the above problem, we design a database that includes patient details, and patient history. This program also helps us to know the present status of a patient whether the patient is admitted and treated or not.

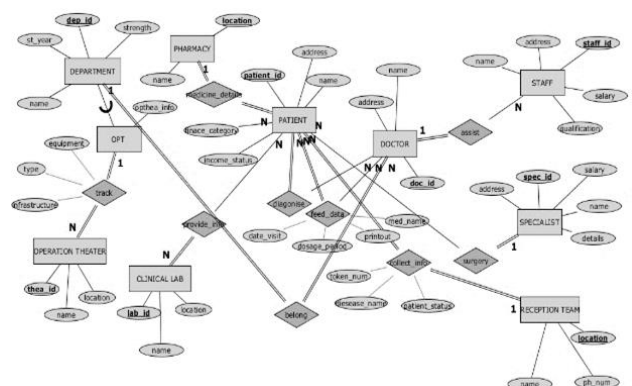


Fig 1.1. Entity Relationship(ER) Diagram of our System

II. LITERATURE SURVEY

Consider a Hospital/ HealthCare Unit. The Hospital has a reception team whose responsibility is to collect information about the patient, the nature of disease he is suffering with, economic category. In case of new patient the reception will collect the necessary information such as name, address and assign the patient id, financial community category. In case of existing patient they also assist the patient to the concerned specialized doctor by recording the patient ailment and assign a token number.

The doctors diagnose the patient and will feed the data in to the computer about the disease , its stage(critical, regular etc.) and the medicine name, dosage period, dosage times, along with the date and next expected date of visit, diagnostic tests required. The patient is issued with a printout which has details of case entered by the doctor, medicines and next expected date of visit.

The hospital also has diagnostic clinical labs. The patient once specify his patent id the lab technicians will get the information about what tests to be conducted and the reports will be loaded as PDF.

The hospital has operation theatres for each department and the maintenance of these theatres are looked after by OPT department. The OPT department is responsible to look over the equipment, their services, cleanliness, other infrastructure which need to be update on regular basis. The OPT department will keep track of the operation held in each theatre such as the patient id, doctor id, type of operation, supporting staff details, equipment and needed infrastructure.

The Pharmacy will get the details of the medicines to be issued to patient once he enters the patient id in the software UI.

III. DATABASE DESIGN

List Of Entities:

1. Pharmacy
2. Department
3. Patient
4. Staff
5. Doctor

6. Opt
7. Operation Theater
8. Clinical Lab
9. Specialist
10. Reception Team

List of attributes:

1. Pharmacy
 - Location
 - Name
2. Department
 - department id
 - Strength
 - St_year
 - Name
3. Patient
 - Patient_id
 - Address
 - Name
 - Finace_category
 - Income_status
4. Staff
 - Staff_id
 - Address
 - Name
 - Salary
 - Qualification
5. Doctor
 - Doc_id
 - Name
 - Address
6. Opt
 - Opthea_info
7. Operation Theater
 - Thea_id
 - Location
 - Name
8. Clinical Lab
 - lab_id
 - Location
 - Name
9. Specialist
 - Spec_id
 - Salary
 - Address
 - Name
 - Details
10. Reception Name
 - Ph_num
 - Location
 - Name

Normalization & Final List of Relations

Normalization:-

1 NF:

Rule-1: It should not contain repeating groups, should have atomic attributes, multivalued The attribute is not good practice.

Rule 2: We need to identify key attributes from composite primary key, every primary key determines the non-primary key.

Good Practice: If unrelated information in tables exists, split them initially.

2 NF:

Rule-1: A Relation will be in 2 NF if it exists in 1 NF

Rule 2: It should not have partial dependencies.

3 NF:

Rule-1: A Relation will be in 3 NF if it exists in 2 NF

Rule 2: It should not have transitive dependencies.

So, on considering all the above conditions it is clear that all the tables mentioned in

schema is in 1 NF, 2 NF, 3 NF.

As a result of which we don't need to normalize them again.

Final Relationships:-

1. Track :: OPT(1)<=>OPERATION THEATER(N)
- 2.Medicine_details :: PHARMACY(1)<=>PATIENT(N)
- 3.Provide_info :: PATIENT(N) <=> CLINIC LAB(N)
- 4.Assist :: STAFF(N) <=> DOCTOR(1)
- 5.Diagnose :: PATIENT(N) <=> DOCTOR(M)
- 6.Feed_data :: PATIENT(N) <=> DOCTOR(M)
- 7.Belong :: DEPARTMENT(1) <=> DOCTOR (N)
- 8.Surgery :: SPECIALIST(1) <=> PATIENT(N)
- 9.Collect_info :: PATIENT(N) <=> RECEPTION TEAM(1)

IV. DESIGN PROGRAMMING TOOLS

- Apache Web Server
- MySQL Database
- Web Development-HTML,CSS,JavaScript
- PHP

V. IMPLEMENTATION

There will be 3 main components associated with the project in the order of decreasing priority:

1)Database design - This component of the project will take care of database creation. The below is the relational schema of our project.

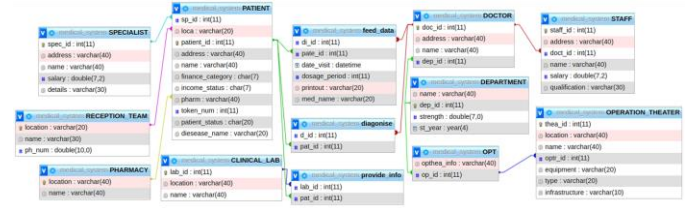


Fig 4.1 Relational Schema of the system.

2)CMS development- CMS or Content Management System will be the entry point for the data to store into the database. Users need to perform operations like CRUD (Create, Read, Update, Delete) operations.

```
CREATE TABLE IF NOT EXISTS DEPARTMENT(
name varchar(40),
dep_id int primary key,
strength double(7,0),
st_year year(4));
```

Fig 4.2. Creating a department table in the database.

```
1 INSERT INTO DEPARTMENT( name,dep_id,strength,st_year)
2 VALUES('Cardiology',1,400,1999);
```

Fig 4.3 Inserting some data into the table.

name	dep_id	strength	st_year
Cardiology	1	400	1999

Fig 4.4 Data entry into the database.

Some of the SQL queries used in this project are,

Creation queries:

- CREATE TABLE IF NOT EXISTS DEPARTMENT(
name varchar(40),
dep_id int primary key,
strength double(7,0),
st_year year(4));
- CREATE TABLE IF NOT EXISTS OPT(
opthea_info varchar(40),
op_id int ,
constraint fk foreign key (op_id) references DEPARTMENT(dep_id));
- CREATE TABLE IF NOT EXISTS OPERATION_THEATER(
thea_id int primary key,
location varchar(40),

```

name varchar(40) not null,
optr_id int ,
equipment varchar(20),
type varchar(20) not null ,
infrastructure varchar(10),
constraint fk18 foreign key (optr_id) references
OPT(op_id));

```

- CREATE TABLE IF NOT EXISTS CLINICAL_LAB(
lab_id int primary key,
location varchar(40),
name varchar(40));
- CREATE TABLE IF NOT EXISTS PHARMACY(
location varchar(40) primary key,
name varchar(40));

Insertion queries

- DEPARTMENT

```

INSERT INTO DEPARTMENT(
name,dep_id,strength,st_year)
VALUES('Cardiology',1,400,1999);
INSERT INTO DEPARTMENT(
name,dep_id,strength,st_year)

```
- OPT

```

INSERT INTO OPT(opthea_info,op_id)
VALUES('all operation theaters are running',5);

```
- OPERATION_THEATER

```

INSERT INTO
OPERATION_THEATER(thea_id,name,location,ty
pe,equipment ) VALUES(1,'ALPHA','first
floor','cardio','Cardiac Monitors');

```
- CLINIC_LAB

```

INSERT INTO
CLINICAL_LAB(lab_id,name,location)
VALUES(1,'ENT','first floor');
INSERT INTO
CLINICAL_LAB(lab_id,name,location)
VALUES(2,'BG','SECOND floor');

```
- PHARMACY

```

INSERT INTO PHARMACY(name,location)
VALUES('AKSHAY','first floor');
INSERT INTO PHARMACY(name,location)
VALUES('KUMAR','SECOND floor');

```

Update statements

- UPDATE OPERATION_THEATER
SET optr_id=5 where thea_id=1;
- UPDATE OPERATION_THEATER
SET optr_id=5 where thea_id=2;
- UPDATE PATIENT
SET sp_id=4 where patient_id=14;
- UPDATE PATIENT
SET sp_id=3 where patient_id=11;
- UPDATE STAFF
SET doct_id=1 where staff_id=1;
- UPDATE STAFF
SET doct_id=1 where staff_id=2;
- UPDATE OPERATION_THEATER
SET infrastructure='NOT GOOD' WHERE
thea_id=2;
- UPDATE OPERATION_THEATER
SET infrastructure='NOMINAL' WHERE
thea_id=3

3)Web Interface Development: The webpage design and implementation is done using

- PHP
- React JS
- Node JS(for APIs)
- MySQL (for Database)

The data flow can be seen as below, User can access the data and enter the data using app/website interface, The front end of the website is designed using ES6, the updated version of JavaScript.

The nodeJS has been used as the severe hosting and handling the backend of the project, The Backend uses MySQL as the database to store, retrieve and access the data. The database can be visualized using the MySQL workbench.

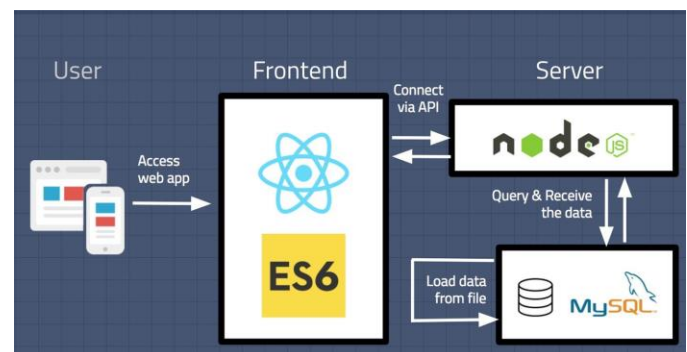


Fig 4.5 Data flow through the technologies.

VI. RESULTS

Medical System

New User

Name: John doe

Address: 789 Balloon street, unit 567

Email: john@gmail.com

Doctor: Select...

Disease: Malaria

Patient status: In control

Create

Fig 4.6 New user Creation in the webpage.

Medical System

Patients list

Add Patient

ID	Name	Address	Doctor	Action
101	ARUN	VIJAYAWADA	John	kry
11	NITHIN	KOLKATA	lewis	kry
14	jain	delhi	russow	del
17	druv	chennai	lewis	PAI
97	kumar	VIZAG	Joseph	brz

Fig 5.1 List of patients in the hospital database.

As shown above, the staff can be able to create a new patient and can see the list of patients.

Medical System

Doctors list

Add Doctor

ID	Name	Address	Action
1	Dr. AJIT	VIJAYAWADA	Edit Delete
2	Dr. NITHIN	HYDERABAD	Edit Delete
3	Dr. lewis	africa	Edit Delete
4	Dr. joseph	kolkata	Edit Delete
5	Dr. John	bihar	Edit Delete
6	Dr. babu	chennai	Edit Delete
7	Dr. russow	america	Edit Delete

Fig 5.2 List of Doctors in the hospital database.

The admin can edit the doctors that are available in the hospital, He can create new records, delete and view all the doctors. He has the access to All the details of doctors.

4)Reports development: The database data can be extracted and can be represented using many Data visualization tools like power BI and Tableau.

Generated data can be used to draw major insights of Insurance data, Resources and Departmental Analysis. Administrative staff can take further steps, and plan accordingly by these data Insights.

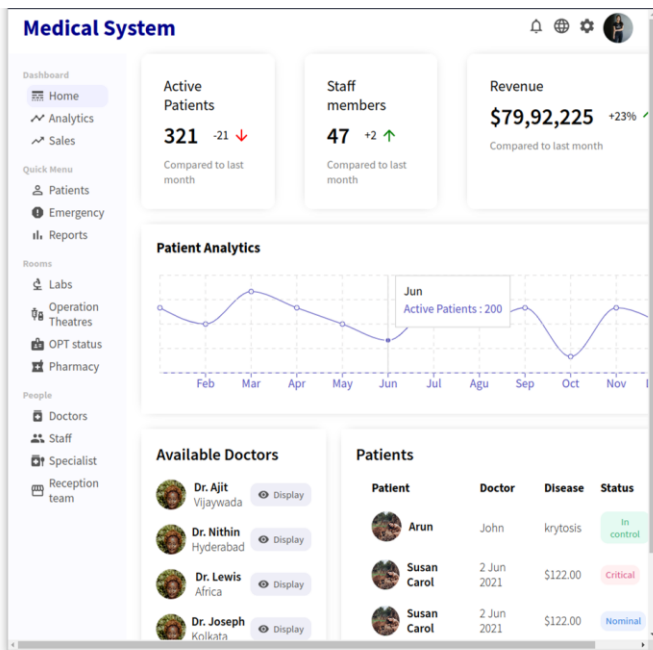


Fig 4.7 Graphical representation of live patients in the Health Care Unit.

VII. CONCLUSIONS

This project Medical Management System and Analytics is for computerizing the working in a hospital. The software takes care of all the requirements of an average hospital and is capable to provide easy and effective storage of information related to patients that come up to the hospital. It generates test reports; provide prescription details including various tests, check-up, and medicines prescribed to patient and doctor. It also provides injection details and billing facility. The system also provides the facility of backup as per the requirement. The system proposes a user-friendly interface to make the medical system seamless and error free. The Medical Management system helps to continuously monitor all the information, activities and diagnosis of all the patients in a centralized space. The software takes care of all the requirements of an average hospital and is capable to provide easy and effective storage of information related to patients that come up to the hospital. Data Analytics can be drawn using various data visualization techniques

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WORK AND CONTRIBUTION

Sai Harshith Kumar Akkenapelly

- Project Ideation
- Back End
- Schema Development
- Documentation

Sivani Padarathi

- Project implementation
- Queries Scripting
- Front End
- Database Development