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Chittagong University of Engineering & Technology (CUET)

Abstract

The main intention of introducing this system is to reduce the manual work at Health center counters. Every sort of task is performed by the system, such as registering different types of persons (i.e employees, students and others), enquiries, and complaints etc. reducing much paper work and burden of file storage. Also the latest information is right available for the officials and executives wherever they require.

Where the system must be placed?

There are a lot of benefits to the Health center by placing the system at their registration. At the same time the patients are also benefited using this system. They can get the work done within no time.

How to use the system?

Using the system is as simple as using the personal computer. Since end user computing is developing in our country. It is beneficial to both Health center and the patients. Every step is clearly defined and help is provided throughout the application to the user. Even the exceptions are handled well to avoid confusion.

How is it beneficial to the Health Center?

The heath center can get much out of the system. The system is used to enter the patient details and to enter the details about the health center and the details about the reports of the patients. A patient can get his necessary medical treatment from anywhere of the country by booking their serial anytime for desired physician. Corruption can also be prevented by implementing this System.

Contents

INTRODUCTION

1.1   Literature Review:

Hospital are the essential part of our lives, providing best medical facilities to people suffering from various ailments, which may be due to change in climatic conditions, increased work-load, emotional trauma stress etc. It is necessary for the hospitals to keep track of its day-to-day activities & records of its patients, doctors, nurses, ward boys and other staff personals that keep the hospital running smoothly & successfully.

But keeping track of all the activities and their records on paper is very cumbersome and error prone. It also is very inefficient and a time-consuming process Observing the continuous increase in population and number of people visiting the hospital. Recording and maintaining all these records is highly unreliable, inefficient and error-prone. It is also not economically & technically feasible to maintain these records on paper.

Thus keeping the working of the manual system as the basis of our project. We have developed an automated version of the manual system, named as "Hospital Management System".

The main aim of our project is to provide a paper-less hospital up to 90%. It also aims at providing low-cost reliable automation of the existing systems. The system also provides excellent security of data at every level of user-system interaction and also provides robust & reliable storage and backup facilities.

1.2 Objective of the project:

The project "Hospital Management System" is aimed to develop to maintain day-to-day state of admission/discharge of patients, list of doctors, different types of medical test etc. It is designed to achieve the following objectives:

1. To computerize all details regarding patient details & hospital details.

2. Scheduling the appointment of patient with doctors to make it convenient for both.

3. Scheduling the services of specialized doctors and emergency properly so that facilities provided by hospital are fully utilized in effective and efficient manner.

4. If the doctor issues test to patients, it should take the schedule for the patient in Pathology lab.

5. It should be able to handle the test reports of patients conducted in the pathology lab of the hospital.

6. The inventory should be updated automatically whenever a transaction is made.

7. The information of the patients should be kept up to date and there record should be kept in the system for historical purposes.

1.3 General Methodology:

Data collection:

Secondary data is data collected by someone other than the user. Common sources of secondary data for social science include censuses, organizational records and data collected through qualitative methodologies or qualitative research. Primary data, by contrast, are collected by the investigator conducting the research.

➢ **http://ctgdoctorsinfo.blogspot.com/**

It is an online blog which keeps track all the doctor information in Chittagong city of Bangladesh. It also update the list every time so that we can get the most recent information.

1.3.1 System Requirement:

Hardware requirement:

Processor: 1.5 GHz (Pentium Dual Core) or Higher

RAM: 2GB or above

Hard Disk: 10GB or above

Input Devices: Keyboard, Mouse

Output Devices: Monitor; -14" VGA

Software requirement:

OPERATING SYSTEM: Windows XP, 7, 8, 10.

DATABASE SOFTWARE: ORACLE 12 SE2.

PROGRAMMING LANGUAGE: PHP, SQL, CSS, Java script, and HTML.

SERVER SOFTWARE: Xampp server.

Editor: Notepad++.

1.3.2 Project definition:

The name of different module is given below:

1) Log in module

2) Notice module

3) Contact us module

4) Hospital management module

5) Patient management module

6) Doctor management module

7) Test module

8) Bill Module

1.3.3 Description of every module:

1. **Login Module**: In this module, there are two types of login. One is Admin Login. Other is Patient Login. Here, people are firstly sign up by their own Email, and their given password, username and others. When they are first time sign up their information are saved in the database. Further they are log in by their password and given Email. Admins are signup by their ID.

2. **Notice Module**: In this module, Admin can upload any notice for the site visitors from the Hospital authority. Patient can see the Notice.

3. **Contact us module**: In this module, hospital contacts, FB page, Twitter page, Map (Via Google Map) are given for patient.

4. **Hospital management Module**: In this Module, patient can see a promotional video or Documentary about the respected hospital.

5. **Patient Module**: Here, Patients give their detail information such as name, age, gender, location, division, district, symptoms etc. They can also see their serial no. of the respected doctors, visiting time & doctor info.

6. **Doctor management Module**: Here, Admin can select the respected doctor according to the given information of patients & give the serial number.

7. **Test module**: Here, patient can learn about different type of test. Admin can select the test for patient according to the doctor's recommendation & prepare the test report.

8. **Bill Module**: Here, Admin prepare the final bill and provide it to the patient. Patient can collect their money receipt.

E-R DIAGRAM

2.1 Introduction to E-R Diagram

An entity-relationship model (E-R model) is a detailed, logical representation of the data for an organization or for a business area. The E-R
model is expressed in terms of entities in the business environment, the relationships (or associations) among those entities, and the attributes (or properties) of both the entities and their relationships. An E-R model is normally expressed as an entity-relationship diagram (E-R diagram, or ERD), which is a graphical representation of an E-R model.

2.2 Entities of the E-R Diagram

An E-R diagram consists of three main components. They are Entity, Attribute and Relationship. An entity is a person, place, device, event or concept and an attribute is a property of an entity class. The requirements
for an entity are the following.
• One or more attributes
• At least one Primary Key Attribute
• Many possible distinct instances
A relationship is an association between two entities based on a key attribute. The figure 2.1 represents the E-R diagram of Hall Management System.
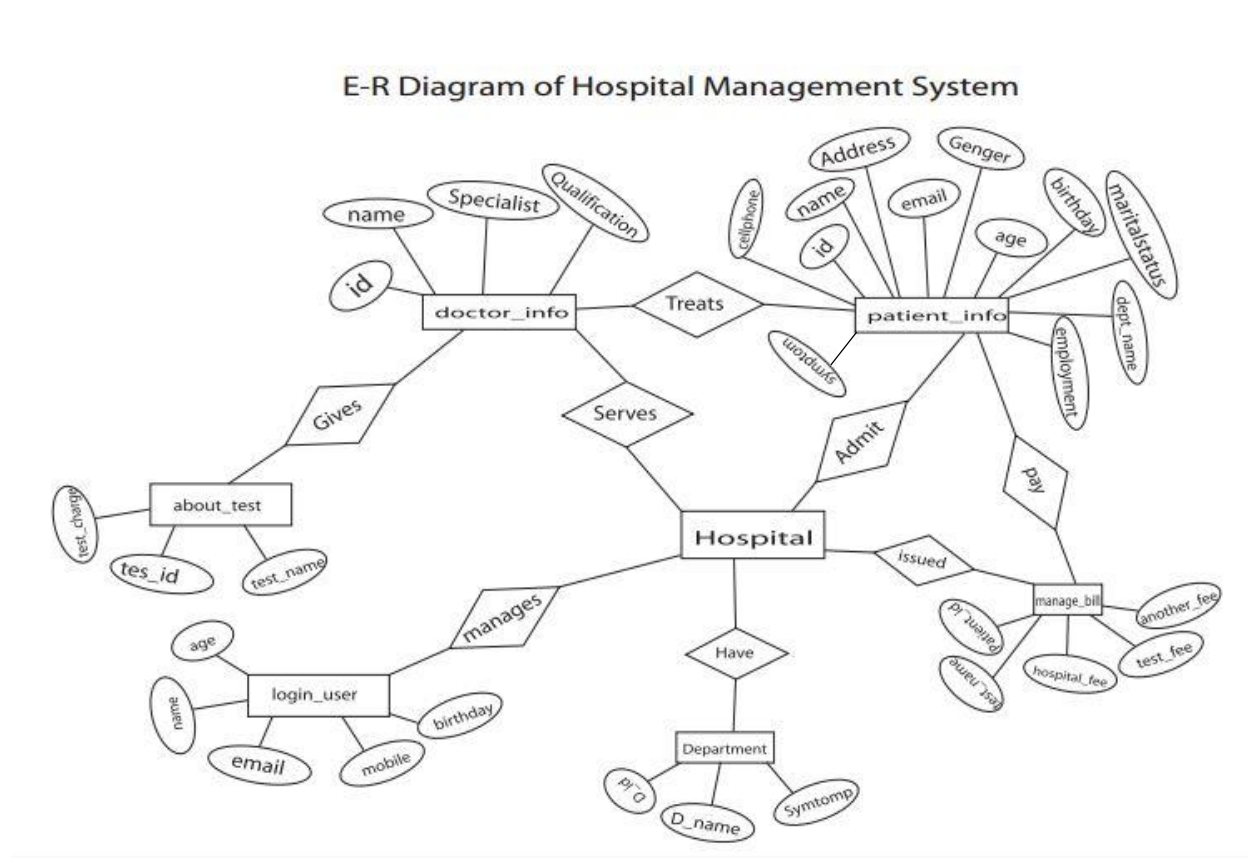
Figure2.1: ER Diagram of Hall Management System

Table 3.1: Entities used in the E-R diagram (figure 3.1)

Hospital	In a hospital different types of management system like Patient management, Doctor management , Test management etc.
Login user	Persons or Authority who will control this website and Manages Hospital.
Patient	A Patient who takes treatment and facilities from Hospital by this website
Doctor	A Doctor who Treats patient and also assign a test for the patient
Department	There are more department for different treatment.
About Test	There are different types of test in Hospital whose have unique id and charge

| Manage Bill | An Administrator can calculated the total bill for any patient. Hospital, Test have different amount of charge. |

2.3 Attributes of the Entities

The attributes of the entities in figure 2.1 are shown in table 2.2.

Entity	Attribute
Hospital	Name, Location
Login user	name, email, age, birthday, mobile, gender.
Patient	Patient id, Name, Address, Gender, Age, Email, Birthday, Employment, Cellphone, Department name, Symptom.
Doctor	Doctor id, Name, Designation, Qualification, Specialist.
Department	Department id, Department Name Symptom.
About Test	Test id, Test name, Test charge.
Manage Bill	Patient id, Hospital fee, Test name, Test fee, Another fee.

2.4 Relationships of the E-R Diagram

The relationships used in the figure 3.1 are shown in the table 3.3. There are 12 relationships in the diagram. In those there are one to one relationship, many to many relationships and many to many relationships.
There is a recursive relation between dining manager and student because manager is selected from students.

Table 2.3: Relationships used in the E-R diagram (figure 2.1)

Entities	Relationship
Hospital, doctor info	Serves
Hospital, patient info	Admit
Hospital, Department	Have
Hospital, Manage Bill	Serves
Hospital, Login user	Manages
Doctor info, About Test	Gives
Doctor info, Patient info	Treats

Relational Mapping

3.1 Definition of Relational Mapping

In this chapter, we describe relational mapping or logical database design, with special emphasis on the relational data model. Logical database design is the process of transforming the conceptual data model (described in chapter 3) into a logical data model that is consistent and compatible with a specific type of database technology. To make a well structure relation we must map our relational diagram.

Conceptual data modeling is about understanding the organization, getting the right requirements. Logical database design is about creating stable database structures and correctly expressing the requirements in a technical language. Both are important steps that must be performed carefully.

It is important, however, to note that the relational data model is a form of logical data model, and as such it is different from the conceptual data models. Thus, an E-R data model is not a relational data model, and an E-R model may not obey the rules for a well-structured relational data model. That is okay, because the E-R model was developed for other purposes like understanding data requirements and business rules about the data and not structuring the data for sound database processing, which is the goal of logical database design.

3.2 E-R to Relational Mapping Algorithm

To construct a logical database from a conceptual database model such as
E-R diagram, we have to follow the E-R to Relational Mapping Algorithm.
The algorithm consists of seven steps.
• Step 1: Mapping of Regular Entity Types
• Step 2: Mapping of Weak Entity Types
• Step 3: Mapping of Binary 1:1 Relation Types
• Step 4: Mapping of Binary 1:N Relationship Types
• Step 5: Mapping of Binary M:N Relationship Types
• Step 6: Mapping of Multivalued attributes
• Step 7: Mapping of N-ary Relationship Types

This is the concepts of a general mapping algorithm. The correspondence
between E-R and relational model are shown in table 3.1

Table 3.1: Correspondence between E-R and relational model

ER MODEL	RELATIONAL MODEL
Entity type	Entity relation
1:1 or 1:N relationship type	Foreign key or relationship relation
M:N relationship type	Relationship relation and two foreign keys
n-ary relationship type	Relationship relation and n foreign keys
Simple attribute	Attribute
Composite attribute	Set of simple component attributes
Multivalued attribute	Relational and foreign key
Value set	Domain
Key attribute	Primary or secondary key

Doctor_info

Doctor_id	Doctor_name	Designation	Qualification	Specialist	H_name

Patient_info

P_id	Name	Age	Email	Gender	Dept_name	Symptom	Address	D_id	H_name

About_test

Test_id	Test_name	Test_fee	D_id

Hopital

H_name	Location

Department

D_id	D_name	Symptom	H_name

Manage_bill

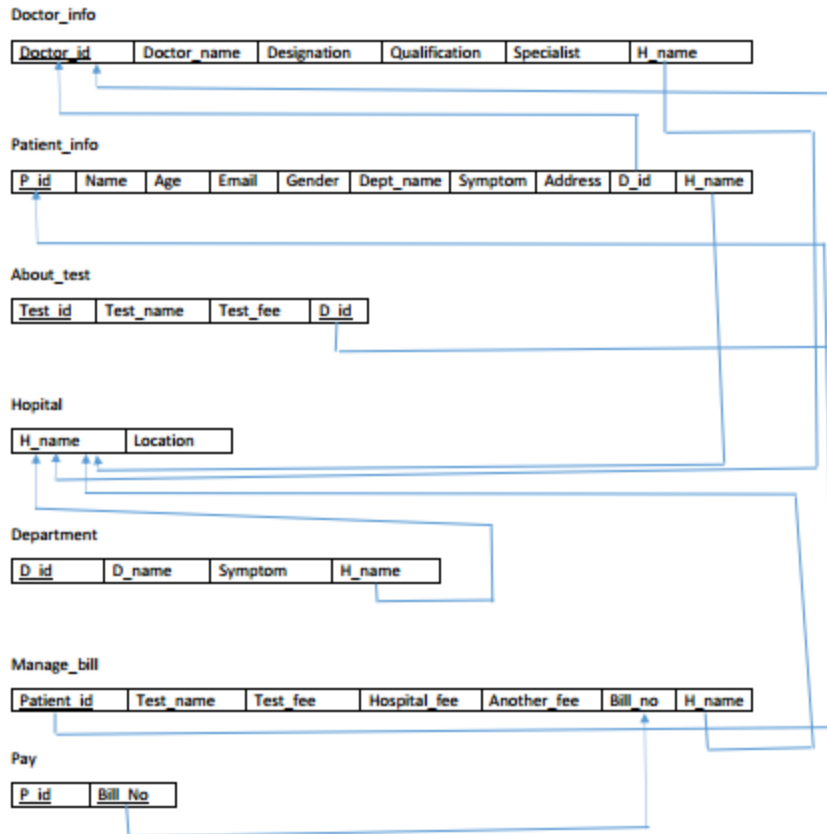| Patient_id	Test_name	Test_fee	Hospital_fee	Another_fee	Bill_no	H_name

Pay

P_id	Bill_No

Fig: Relational-Mapping of Hospital Management System.

Normalization

4.1 Introduction to Normalization

Following the steps outlined previously for transforming ER diagrams into relations often results in well-structured relations. However, there is no guarantee that all anomalies are removed by following these steps. Normalization is a formal process for deciding which attributes should be grouped together in a relation so that all anomalies are removed. Normalization is the process of successively reducing relations with anomalies to produce smaller, well-structured relations. Following are some of the main goals of normalization.

• Minimize data redundancy, thereby avoiding anomalies and conserving storage space.

• Simplify the enforcement of referential integrity constraints.

• Make it easier to maintain data (insert, update, and delete).

• Provide a better design that is an improved representation of the real world and a stronger basis for future growth.

Normalization makes no assumptions about how data will be used in displays, queries, or reports. Normalization, based on what we will call normal forms and functional dependencies, defines rules of the business, not data usage. Further, remember that data are normalized by the end of logical database design. Thus, normalization places no constraints on how data can or should be physically stored or, therefore, on processing

performance. Normalization is a logical data modeling technique used to ensure that data are well structured from an organization-wide view.

4.2 Steps in Normalization

Normalization can be accomplished and understood in stages, each of which corresponds to a normal form. A normal form is a state of a relation that requires that certain rules regarding relationships between attributes (or functional dependencies) are satisfied. We describe these rules briefly in this section and illustrate them in detail in the following sections.

1. First normal form: Any multivalued attributes (also called repeating groups) have been removed, so there is a single value (possibly null) at the intersection of each row and column of the table.

2. Second normal form: Any partial functional dependencies have been removed (i.e., non-key attributes are identified by the whole primary key).

3. Third normal form: Any transitive dependencies have been removed (i.e., non-key attributes are identified by only the primary key).

4. Boyce-Cod normal form: Any remaining anomalies that result from functional dependencies have been removed (because there was more than one possible primary key for the same non-keys).

5. Fourth normal form: Any multivalued dependencies have been removed.

6. Fifth normal: form Any remaining anomalies have been removed.

In our project we do not have any multivalued attributes, functional dependencies or transitive dependencies. This is because in all our table we have one primary key. So it become easy for us to normalize table and make well structure relation with less anomalies. Our Final Normalization table is given below.

Doctor_info

Doctor_id	Doctor_name	Designation	Qualification	Specialist	H_name

Patient_info

P_id	Name	Age	Email	Gender	Dept_name	Symptom	Address	D_id	H_name

About_test

Test_id	Test_name	Test_fee	D_id

Hopital

H_name	Location

Department

D_id	D_name	Symptom	H_name

Manage_bill

Patient_id	Test_name	Test_fee	Hospital_fee	Another_fee	Bill_no	H_name

Pay

P_id	Bill_No

Fig: Normalization (Upto 4th NF) of Hospital Management System.

IMPLEMENTATION

5.1 Standard Query Language (SQL)

SQL is a standard language for accessing and manipulating databases.
SQL stands for Structured Query Language. It is an ANSI (American National Standards Institute) standard. SQL can perform several manipulation on database. Some of them are following.

• Execute queries against a database

• Retrieve data from a database

• Insert records in a database

• Update records in a database

• Delete records from a database

• Create new databases

• Create new tables in a database

• Create stored procedures in a database

• Set permissions on tables, procedures, and views

5.2 Snapshots

Fig: Website homepage.

Fig: Signup Page

Fig: Test management page

Patient Information

Patient Name

First Name	Last Name
First Name	Last Name

User Name   Password

Mohammad_Hasan   •••••••••

Address

Address

District	select division
District	Division

Date of Birth

Month ⬍   Day ⬍   Year ⬍

Age

Email Address

[   ]

Cell Phone

[   ]

Home Phone

[   ]

Preferred Method of Contact

Mail ⇕

Marital Status

○ Single ○ Married ○ Divorced ○ Widowed

Employment

○ Employed ○ Unemployed ○ Disabled ○ Retired ○ Student

Preferred Pharmacy

[   ]

Preferred Pharmacy Phone

[   ]

Preferred Pharmacy Phone

[   ]

Preferred Pharmacy Address

[   ]

Symptoms

☐ Allergies   ☐ Gastric   ☐ Diarrhoea   ☐ Anxiety   ☐ Arthritis   ☐ Asthma

☐ Pneumonia   ☐ Dysentery   ☐ Blood Clots   ☐ Cancer - Type   ☐ Fever

☐ Cerebrovascular Accident   ☐ Cronary Artery Disease   ☐ COPD (Emphysema)

☐ Depression   ☐ Diabetes   ☐ Gallbladder Disease   ☐ Eye disorder   ☐ Hepatitis B

☐ Hypertension   ☐ Ear,Nose,Throad   ☐ Liver Disease   ☐ Migraine Headaches

☐ Myocardial Infarction   ☐ Osteoarthritis   ☐ Osteoporosis   ☐ Peptic Ulcer Disease

☐ Renal Disease   ☐ Seizure Disorder   ☐ Thyroid Disease
Check any past/current patient problems

Exercise Activity

○ Moderate   ○ Vigorous   ○ Sedentary

Exercise days/week:

[   ]

Exercise Activity

○ Moderate   ○ Vigorous   ○ Sedentary

Exercise days/week:

[   ]

Tobacco Use

○ No   ○ Daily   ○ Weekly   ○ Less   ○ Former User

Alcohol Use

○ No   ○ Daily   ○ Weekly   ○ Less   ○ Former User

Are you currently taking supplements or prescription medication?

○ Yes, I am.   ○ I do not take any medications.

Do you suffer from any known allergies?

○ Yes   ○ No

[Submit]

Fig: Patient admission form

Fig: Billing page.

Fig: Billing page

Fig: Add Doctor page.

Fig: Doctor Management.
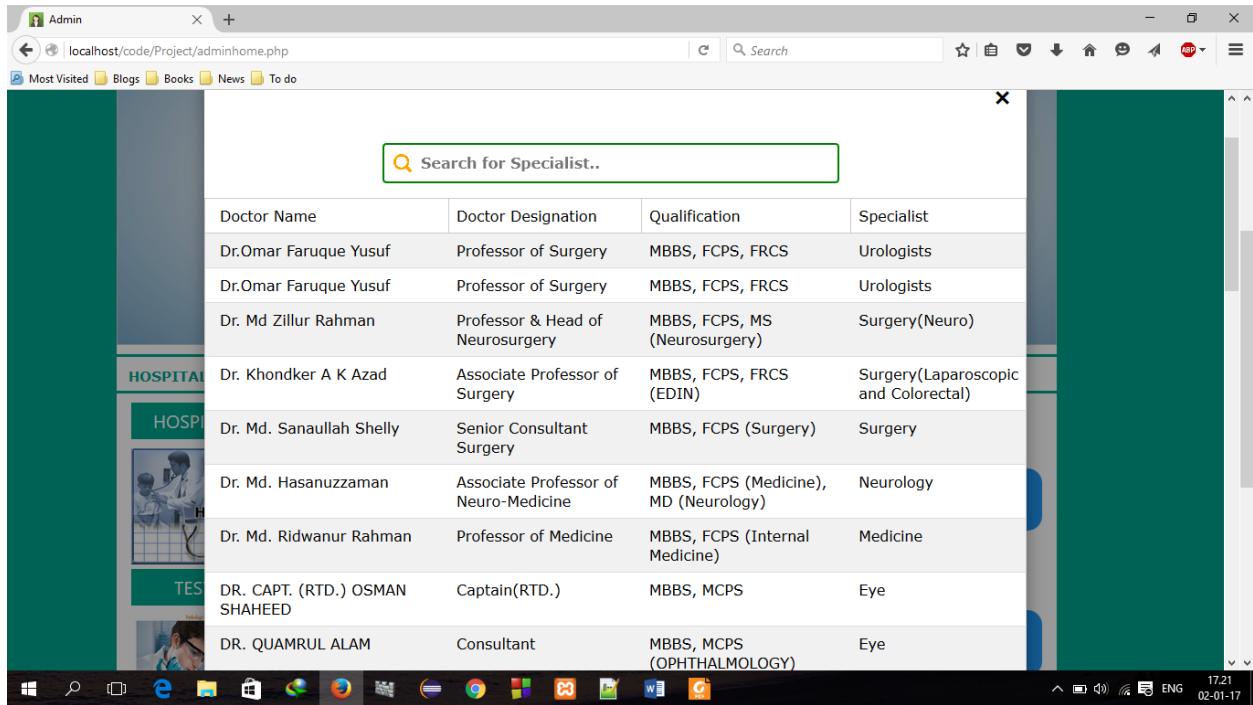
SQL Queries:

Database: login, Table: manage_bill, Purpose: Dumping data

Patient_id	hospital_fee	test_name	test_fee	another_fee
11113	150	CT Scan	1500	120
11114	150	Blood Test	500	120

```
1  SELECT `Doctor_Name`, `Doctor_Id`, `Doctor_designation`, `Qualification`, `Specialist` FROM `doctor_info`ORDER
   BY Specialist
```

Database: login, Table: doctor_info, Purpose: Dumping data

Doctor_Name	Doctor_Id	Doctor_designation	Qualification	Specialist
Dr.Omar Faruque Yusuf	10011	Professor of Surgery	MBBS, FCPS, FRCS	Urologists
Dr. Abdus Salek Mollah	10012	Head of Endocrynology dept	MBBS	Diabetis
Dr. Md. Iftikher Hossain Khan	10013	Professor	MBBS, M.D (E.M)	Diabetis
Dr. Nil Kantha Bhatachharja	10014	Professor & Head of ENT	MBBS, FCPS	ENT
Dr. Abdul Kaiyum	10015	Surgeon	MBBS,DLO,FCPS	ENT
Dr. Fazle Elahee Mahmood	10016	Associate Professor	MBBS, MS, Ph.D. (ENT)	ENT
Dr. Kamol Krishna Pramanik	10017	Surgeon	MBBS, FCPS (ENT)	ENT
Dr. S. M. Tariq	10018	Vice-Principal, BGC Trust Medical College	MBBS, DO (DU), MS (London)	Eye
DR. CAPT. (RTD.) OSMAN SHAHEED	10019	Captain(RTD.)	MBBS, MCPS	Eye
DR. QUAMRUL ALAM	10020	Consultant	MBBS, MCPS (OPHTHALMOLOGY)	Eye
DR. S.K. ROY	10021	Consultant	MBBS	Eye
Dr. Khondker A K Azad	10022	Associate Professor of Surgery	MBBS, FCPS, FRCS (EDIN)	Surgery(Laparoscopic and Colorectal)
Dr. Md. Sanaullah Shelly	10023	Senior Consultant Surgery	MBBS, FCPS (Surgery)	Surgery
Dr. Md Zillur Rahman	10024	Professor & Head of Neurosurgery	MBBS, FCPS, MS (Neurosurgery)	Surgery(Neuro)
Dr. Md. Hasanuzzaman	10025	Associate Professor of Neuro-Medicine	MBBS, FCPS (Medicine), MD (Neurology)	Neurology
Dr. Md. Ridwanur Rahman	10026	Professor of Medicine	MBBS, FCPS (Internal Medicine)	Medicine
Dr.Khaled	10027	Associate Professor	B.D.S(D.D.C)	Dentists
Dr.Omar Faruque Yusuf	10029	Professor of Surgery	MBBS, FCPS, FRCS	Urologists

Doctor_Name	Doctor_Id	Doctor_designation	Qualification	Specialist
aruque Yusuf	10011	Professor of Surgery	MBBS, FCPS, FRCS	Urologists
Dr. Abdus Salek Mollah	10012	Head of Endocrynology dept	MBBS	Diabetis
Dr. Md. Iftikher Hossain Khan	10013	Professor	MBBS, M.D (E.M)	Diabetis
Dr. Nil Kantha Bhatachharja	10014	Professor & Head of ENT	MBBS, FCPS	ENT
Dr. Abdul Kaiyum	10015	Surgeon	MBBS,DLO,FCPS	ENT
Dr. Fazle Elahee Mahmood	10016	Associate Professor	MBBS, MS, Ph.D. (ENT)	ENT
Dr. Kamol Krishna Pramanik	10017	Surgeon	MBBS, FCPS (ENT)	ENT
Dr. S. M. Tariq	10018	Vice-Principal, BGC Trust Medical College	MBBS, DO (DU), MS (London)	Eye

Patient_id	hospital_fee	test_name	test_fee	another_fee
11113	150	CT Scan	1500	120
11114	150	Blood Test	500	120

```
1  UPDATE `manage_bill` SET `hospital_fee`=120,`test_name`='CT Scam',`test_fee`=1500,`another_fee`=120 WHERE
   Patient_id=1113
```

5.3 List of Used Programming Language & their Functions:

HTML:

HTML is a markup language for describing web documents (web pages) and CSS is a style sheet language that describes the presentation of an HTML document. HTML and CSS are the most useful tools to design a website. To make our website look better and dynamic we use bootstrap and JavaScript. Specially in making of sign up page we use JavaScript and HTML5.

PHP:

PHP is a server scripting language, and a powerful tool for making dynamic and interactive Web pages. PHP is a widely-used, free, and efficient alternative to competitors such as Microsoft's ASP.PHP runs on various platforms. It is compatible with almost all servers used today and it also supports wide range of databases.

JAVASCRIPT:

JavaScript is a programming language that is run by most modern browsers. It supports object-oriented programming and procedural programming. It can be used to control web pages on the client side of the browser, server-side programs, and even mobile applications.

MYSQL:

MySQL is a freely available open source Relational Database Management System (RDBMS) that uses Structured Query Language (SQL). SQL is the most popular language for adding, accessing and managing content in a database. It is most noted for its quick processing, proven reliability, ease and flexibility of use. To connect Database and website we use MySQL.

CONCLUSION

6.1 CONCLUSION

The project Hospital Management System (HMS) is for computerizing the working in a hospital. It is a great improvement over the manual system. The computerization of the system has speed up the process. In the current system, the front office managing is very slow. The hospital managing system was thoroughly checked and tested with dummy data and thus is found to be very reliable. 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 and also provides the facility for searching the details of the patient. It also provides billing facility on the basis of patient's status whether it is an indoor or outdoor patient. The system also provides the facility of backup as per the requirement.

6.2 FUTURE ENHANCEMENTS

The proposed system is Hospital Management System. We can enhance this system by including more facilities like pharmacy system for the stock details of medicines in the pharmacy.

Providing such features enable the users to include more comments into the system.

6.3 LIMITATIONS:

- The size of the database increases day-by-day, increasing the load on the database back up and data maintenance activity.

- Training for simple computer operations is necessary for the users working on the system.

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