DATABASE PROJECT

HOSPITAL MANAGEMENT SYSTEM

MADE USING MYSQL

1. Problem statement

Inadequacies and Disconnections in Hospital Management Systems

The current hospital management system faces operational inefficiencies and data fragmentation, hindering the seamless delivery of healthcare services. Manual processes and disjointed information systems contribute to delays, errors, and compromised patient care. With disconnected modules for admissions, medical records, appointments, and billing, there's a lack of real-time coordination, impacting decision-making, resource utilization, and overall staff efficiency.

Inefficient Patient Care Coordination:

The fragmentation of patient-related data across various modules leads to suboptimal patient care coordination. Siloed information results in delayed decision-making, limited access to patient histories, and an increased risk of medical errors, ultimately affecting the quality of healthcare services and patient safety.

Suboptimal Resource Management:

The absence of a streamlined system for tracking medical resources, such as medications and equipment, leads to inefficient resource utilization. Current systems lack effective association of resources with billing information, causing challenges in inventory management, expense tracking, and maintaining accurate financial records.

Operational Inefficiencies in Staff Management:

Manual management of staff information and their association with different departments, appointments, and admissions contributes to operational inefficiencies. Staff members face challenges in accessing timely information, leading to scheduling conflicts, miscommunication, and decreased overall productivity.

Proposal for Improvement (Integrated HMIS):

To address these challenges, we propose implementing a centralized Hospital Management Information System (HMIS) connecting patient information, medical records, appointments, emergency records, ICU records, surgery records, and billing information. This integration aims

to provide real-time data sharing, ensuring healthcare providers access accurate information for informed decision-making.

Key Improvements

This hospital management system aims to enhance patient care coordination, streamline resource utilization, optimize staff management, and improve overall data integrity. Real-time access to comprehensive patient histories and coordinated scheduling will improve decision-making. Integrated tracking of medical resources with billing information will streamline inventory management and financial records. Centralized staff information and efficient association with departments, appointments, and admissions will enhance communication and scheduling capabilities.

By implementing this integrated HMIS, we aim to significantly improve the efficiency of hospital management, enhance patient care, and provide healthcare providers with essential tools for delivering high-quality services.

2. Detailed model for the Database Design

Hospital management have the following entities with their attributes:

Patient:
PatientID (Primary Key)

Name

DOB (Date of Birth)

Gender

ContactInfo

Address

Staff:
StaffID (Primary Key)

Name

DOB (Date of Birth)

Gender

ContactInfo

Address

Position

DepartmentID (Foreign Key)

Doctor:
DoctorID (Primary Key)

Name

DOB (Date of Birth)

Gender

ContactInfo

Address

Specialization

Schedule

DepartmentID (Foreign Key)

Nurse:
NurseID (Primary Key)

Name
DOB (Date of Birth)
Gender
ContactInfo
Address
Shifts
DepartmentID (Foreign Key)

Department
DepartmentID (Primary Key)
DepartmentName
Description

Admission
AdmissionID (Primary Key)
PatientID (Foreign Key)
AdmissionDate
DischargeDate
AdmissionReason

MedicalRecord:
RecordID (Primary Key)
PatientID (Foreign Key)
AdmissionID (Foreign Key)
MedicalConditions
Allergies
Medications
TreatmentDetails
Results
Timestamp

Appointment:
AppointmentID (Primary Key)
PatientID (Foreign Key)
DoctorID (Foreign Key)
AppointmentDate
Status

Emergency Department Record:

EmergencyRecordID (Primary Key)

PatientID (Foreign Key)

DoctorId (Foreign Key)

EmergencyType

TreatmentDetails

Timestamp

ICU Record

ICURecordID (Primary Key)

PatientID (Foreign Key)

DoctorId (Foreign Key)

ICUType

EquipmentUsed

Timestamp

Surgery Record

SurgeryRecordID (Primary Key)

PatientID (Foreign Key)

DoctorId (Foreign Key)

SurgeonID (Foreign Key)

SurgeryType

OperationDate

Notes

DiagnosticProcedure

ProcedureID (Primary Key)

PatientID (Foreign Key)

ProcedureType

Results

Timestamp

Billing Information

BillingID (Primary Key)

PatientID (Foreign Key)

TotalAmount

PaymentStatus

InvoiceDate

Relationships:

- **Patient to Admission:**
  - Relationship: One-to-Many
  - Description: A patient may have multiple admissions, but each admission corresponds to a single patient.
- **Patient to MedicalRecord:**
  - Relationship: One-to-One
  - Description: Each patient has one and only one medical record.
- **Patient to Appointment:**

  - Relationship: One-to-Many
  - Description: A patient may have multiple appointments, but each appointment corresponds to a single patient.
- **Patient to Emergency Department Record:**

  - Relationship: One-to-Many
  - Description: A patient may have multiple emergency department records, but each emergency record corresponds to a single patient.

- **Patient to ICU Record:**

  - Relationship: One-to-Many
  - Description: A patient may have multiple ICU records, but each ICU record corresponds to a single patient.

- **Patient to Surgery Record:**

  - Relationship: One-to-Many
  - Description: A patient may have multiple surgery records, but each surgery record corresponds to a single patient.

- **Patient to DiagnosticProcedure:**

- o   Relationship: One-to-Many
- o   Description: A patient may have multiple diagnostic procedures, but each procedure corresponds to a single patient.

- **Patient to PatientFinancialInformation:**

  - o   Relationship: One-to-One
  - o   Description: Each patient has one and only one set of financial information, including insurance and billing details.

- **Doctor to Department:**

  - o   Relationship: Many-to-One
  - o   Description: Many doctors can belong to one department.

- **Nurse to Department:**

  - o   Relationship: Many-to-One
  - o   Description: Many nurses can belong to one department.

- **Staff to Department:**

  - o   Relationship: Many-to-One
  - o   Description: Many staff members can belong to one department.

- **Doctor to Appointment:**

  - o   Relationship: One-to-Many
  - o   Description: A doctor may have multiple appointments, but each appointment corresponds to a single doctor.

- **Staff to Admission:**
  - o   Relationship: One-to-Many
  - o   Description: A staff member may be associated with multiple admissions, but each admission corresponds to a single staff member.
- **MedicalResource to BillingInformation:**

  - o   Relationship: Many-to-Many
  - o   Join Table: ResourceBilling

- o Description: Many resources (medicines and medical equipment) can be associated with multiple billing records, and a billing record can involve multiple resources.

- **Appointment to Doctor:**

  - o Relationship: Many-to-One
  - o Description: Many appointments can be assigned to one doctor.

- **BillingInformation to PatientFinancialInformation:**

  - o Relationship: One-to-One
  - o Description: Billing information is associated with one set of financial information (insurance and billing details) for a patient.

- **Doctor to ICU Record**

  - o Relationship: many-to-many
  - o Description: One doctor is associated with many ICU records and one ICU record is associated with many doctors.

- **Doctor to Surgery Record**

  - o Relationship: many-to-many
  - o Description: One doctor is associated with many Surgery records and one Surgery record is associated with many doctors.

- **Doctor to Emergency Department Record**

  - o Relationship: many-to-many
  - o Description: One doctor is associated with many Emergency Department records and one Emergency Department record is associated with many doctors.

3. comprehensive overview of every table

1. Patient Table:

The "Patient" table is an important component of Hospital Management system. It provides the essential information about patients receiving healthcare services.

- PatientID (Primary Key) - INTEGER
- Name - VARCHAR
- DOB (Date of Birth) - DATE
- Gender - VARCHAR
- ContactInfo - VARCHAR   - Address - VARCHAR

2. Staff Table:

The "Staff" table provides every basic information about staff also in which department they are working.

- StaffID (Primary Key) – INTEGER
- Name – VARCHAR
- DOB (Date of Birth) – DATE
- Gender – VARCHAR
- ContactInfo – VARCHAR
- Address – VARCHAR
- Position – VARCHAR
- DepartmentID (Foreign Key) – INTEGER

3. Doctor Table:

The "Doctor" table is a most essential part of the Hospital Management System. It provides the important information about the Doctor providing Health care services.
- DoctorID (Primary Key) - INTEGER
- Name - VARCHAR
- DOB (Date of Birth) - DATE
- Gender - VARCHAR
- ContactInfo - VARCHAR
- Address - VARCHAR
- Specialization - VARCHAR
- Schedule - VARCHAR
- DepartmentID (Foreign Key) - INTEGER

4. Nurse Table:

"Nurse" table provide the information about nurses working in the hospital i.e. contact information, shifts and department they are working in etc.

- NurseID (Primary Key) - INTEGER
   Name - VARCHAR
- DOB (Date of Birth) - DATE
- Gender - VARCHAR
- ContactInfo - VARCHAR
- Address - VARCHAR
- Shifts - VARCHAR
- DepartmentID (Foreign Key) - INTEGER

5. Administrative Staff Table:

Another staff table is "Administrative Staff" Table which provides important information about the staff and also gives the information of their department. Because table is connected to department table.

- StaffID (Primary Key) - INTEGER
- Name - VARCHAR
- DOB (Date of Birth) - DATE
- Gender - VARCHAR
- ContactInfo - VARCHAR
- Address - VARCHAR
- Position - VARCHAR
- DepartmentID (Foreign Key) - INTEGER

6. Department Table:

"Department" table contains the record of basic information needed for a department. Every department has a its unique id so that it can be identified distinctively.

- DepartmentID (Primary Key) – INTEGER
- DepartmentName – VARCHAR   - Description – VARCHAR

7. Admission Table:
"Admission" table provides information about the admission of the patient in hospital to keep the record of patient admission in the hospital.

- AdmissionID (Primary Key) – INTEGER
- PatientID (Foreign Key) – INTEGER
- AdmissionDate – DATE
- DischargeDate – DATE   - AdmissionReason – VARCHAR

8. MedicalRecord Table:

The "MedicalRecord" table holds every information that is important for the patient's medical record like patient's Id, allergies and diagnosis etc.

- RecordID (Primary Key) - INTEGER
- PatientID (Foreign Key) - INTEGER
    AdmissionID (Foreign Key) - INTEGER
- MedicalConditions - VARCHAR
- Allergies - VARCHAR
- Medications - VARCHAR
- TreatmentDetails - VARCHAR
- Results - VARCHAR   - Timestamp - TIMESTAMP

9. Appointment Table:

"Appointment" table connects the patient and doctor table to keep the record of every appointment.

- AppointmentID   (Primary   Key)   –
  INTEGER
- PatientID (Foreign Key) – INTEGER   -
  DoctorID (Foreign Key) – INTEGER
- AppointmentDate – DATE   - Status –
  VARCHAR

10. Emergency Department Record Table:

Another table that connects patients and doctor table is emergency department record that keep the information of every emergency happens in the Hospital.

- EmergencyRecordID (Primary Key) - INTEGER
- PatientID (Foreign Key) - INTEGER
- DoctorId (Foreign Key) - INTEGER
- EmergencyType - VARCHAR
- TreatmentDetails - VARCHAR   - Timestamp - TIMESTAMP

11. ICU Record Table:

The "ICU Record " table provides the information about ICU, patient and Doctor working in this unit.

- ICURecordID (Primary Key) - INTEGER
- PatientID (Foreign Key) - INTEGER
- DoctorId (Foreign Key) - INTEGER
- ICUType - VARCHAR
- EquipmentUsed - VARCHAR   - Timestamp - TIMESTAMP

12. Surgery Record Table:

"Surgery Record " table holds the record of every surgery , the patient in it and the ID of Surgeon.

- SurgeryRecordID (Primary Key) - INTEGER
- PatientID (Foreign Key) - INTEGER
- DoctorId (Foreign Key) - INTEGER
- SurgeonID (Foreign Key) - INTEGER
- SurgeryType - VARCHAR
- OperationDate - DATE
    Notes - VARCHAR

13. DiagnosticProcedure Table:

"DiagnosticProcedure" table holds the record of laboratory test and different scans of the patients.

- ProcedureID (Primary Key) - INTEGER
- PatientID (Foreign Key) - INTEGER
- ProcedureType - VARCHAR
- Results - VARCHAR   - Timestamp - TIMESTAMP

14. Billing Information Table:

"Billing Information" provides the basic information of bill like amount paid and the patient.

- BillingID (Primary Key) - INTEGER
- PatientID (Foreign Key) - INTEGER
- TotalAmount - DECIMAL
- PaymentStatus - VARCHAR   - InvoiceDate - DATE

Entity Relation Diagram: