

Case Study

We Care Everyone: A Comprehensive Hospital Management System

Healthcare IT Department
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Course: Data concepts

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Introduction:-

The 'We Care Everyone' hospital management system aims to streamline hospital operations by implementing a structured database system. This system provides efficient patient care management, staff scheduling, inventory tracking, and a transparent billing system. The use of relational databases enhances data organization and ensures seamless operations.

Mission:

Hospital goal is to build a simple and effective database system that helps manage patient care, schedule appointments, and support staff. It will keep track of medical records, billing, inventory, and emergencies while providing useful reports to improve hospital operations.

Objective:

1. Efficient Patient Management
2. Streamlined Employee Management
3. Patient Appointment Scheduling
4. Effective Inventory & Equipment
5. Accurate & Transparent Billing
6. Optimized Department Management

4. Database Design

List of Tables:

1. Department_Info
2. Employee_Details:
3. Patient_Details:
4. **Patient_Appointments:**
5. **Service_Table:**
6. Stock_Details:
7. Invoice_Details:

A. Tables and Fields

a. Department_info Table:

Field Name	Datatype	Description
DepartmentID	INT	Unique id for each department
Department_Name	VARCHAR	Different department has different names

b. Employee_Details:

Field Name	Datatype	Description
StaffID	INT	Different id for each staff members.
FirstName	VARCHAR	First Name of staff member.
LastName	VARCHAR	Last name of staff member
Role	VARCHAR	Particular work for each staff
DepartmentID	INT	Unique id for each department

c. Patient_Details:

Field Name	Datatype	Description
Patient_ID	INT	Unique id for each patient
FirstName	VARCHAR	First name of patient
LastName	VARCHAR	Last name of patient
DOB	DATE	Date of birth of patient
Gender	VARCHAR	Gender of patient
Contactinfo	VARCHAR	Contact of patient
Address	VARCHAR	Location of patient

d. **Patient Appointments:**

Field Name	Datatype	Description
AppointmentID	INT(PK)	Unique ID for each appointment
Reason	TEXT	Reason for checkup or appointment.
PatientID	INT(FK)	Unique identity for each patient.
StaffID	INT(FK)	Different identity for each staff members
ReasonID	INT	Different ID for each reason.
AppointmentDate	DATETIME	Date of appointment.

e. **Service Table:**

Field Name	Datatype	Description
ServiceID	INT(PK)	Different services has different IDs.
Service Name	VARCHAR	Name of particular service.
PatientID	INT(FK)	Unique identity for each patient.
AppointmentID	INT(FK)	Unique ID for each appointment
ReasonID	INT(FK)	Different ID for each reason
Amount	DECIMAL	Total amount of services has taken.
StaffID	INT(FK)	Different identity for each staff members.

f. **Stock_Details**

FieldName	Datatype	Description
StockID	INT	Different IDs of all Equipment.
ItemName	VARCHAR	Name of particular items.
Category	VARCHAR	Category of items.
Quantity	INT	Total quantity of items and equipment.

g. Invoice_Details:

Field Name	Datatype	Description
BillingID	INT(PK)	Unique ID for each bill.
PatientID	INT(FK)	Unique IDs for each patient.
DepartmentID	INT(FK)	Unique IDs for each department.
StockID	INT(FK)	Different IDs of all equipment.
Amount	DECIMAL	Total amount of services has taken.
BillingDate	DATE	Date of payment.

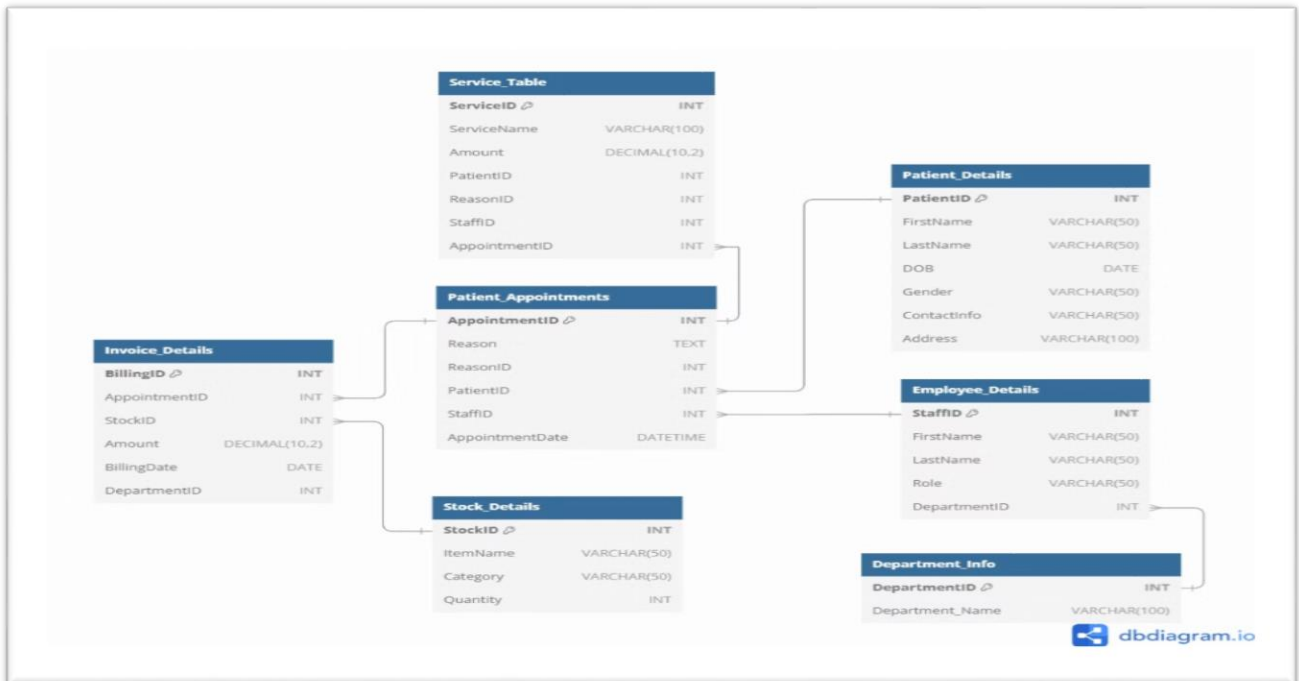
5. Relationships:

A relational database links data across multiple tables using keys:

- Primary Key (PK): A unique ID for each record in a table.
- Foreign Key (FK): A reference to a primary key in another table, creating relationships

Relation Type	Explanation	Example
One to One	One record links to only one other record.	Each appointment connects to a single service
One to Many	One record connects to multiple records.	A department (DepartmentID) has many employees. A patient (PatientID) has multiple appointments.
Many to Many	Multiple records in one table link to multiple in another.	Doctors can treat many patients, and patients can see multiple doctors.

6. Entity-Relationship Diagram (ERD):-



7. My SQL Database and Queries:

Appointment Table:

SQLQuery_1 - localh... (root) • test.patient_appointments_1 - localh... (root) • SQLQuery_2 - disconnected •

Database: hospitaldb

```

25 Gender VARCHAR(50) CHECK (Gender IN ('Male', 'Female', 'Other')),
26 ContactInfo VARCHAR(50),
27 Address VARCHAR(100)
28 );
29
30 -- Create Table: Patient_Appointments
31 CREATE TABLE Patient_Appointments (
32 AppointmentID INT PRIMARY KEY,
33 Reason TEXT,
34 ReasonID INT UNIQUE, -- Ensure ReasonID is unique
35 PatientID INT,
36 StaffID INT,
37 AppointmentDate DATETIME,
38 FOREIGN KEY (PatientID) REFERENCES Patient_Details(PatientID),
39 FOREIGN KEY (StaffID) REFERENCES Employee_Details(StaffID)
40 );
41 select * from Patient_Appointments;
42 -- Create Table: Service_Table
43 CREATE TABLE Service_Table (
44 ServiceID INT PRIMARY KEY,
45 ServiceName VARCHAR(100),

```

Results Messages

AppointmentID	Reason	ReasonID	PatientID	StaffID	AppointmentDate
1	Heart Checkup	11	1001	1	2025-01-02 00:00:00
2	Neurological Exam	12	1002	2	2025-01-06 00:00:00
3	Routine Checkup	13	1003	3	2025-01-11 00:00:00
4	X-Ray and Diagnostics	14	1004	4	2025-01-13 00:00:00
5	Emergency consultation	15	1005	5	2025-01-16 00:00:00

Ln 42, Col 1 (37 selected) Spaces: 4 UTF-8 CRLF 5 rows MySQL 00:00:01 localhost: hospitaldb

Department Table:

SQLQuery_1 - localh... (root) • test.patient_appointments_1 - localh... (root) • SQLQuery_2 - disconnected •

Database: hospitaldb

```

25 Gender VARCHAR(50) CHECK (Gender IN ('Male', 'Female', 'Other')),
26 ContactInfo VARCHAR(50),
27 Address VARCHAR(100)
28 );
29
30 -- Create Table: Patient_Appointments
31 CREATE TABLE Patient_Appointments (
32 AppointmentID INT PRIMARY KEY,
33 Reason TEXT,
34 ReasonID INT UNIQUE, -- Ensure ReasonID is unique
35 PatientID INT,
36 StaffID INT,
37 AppointmentDate DATETIME,
38 FOREIGN KEY (PatientID) REFERENCES Patient_Details(PatientID),
39 FOREIGN KEY (StaffID) REFERENCES Employee_Details(StaffID)
40 );
41 select * from Department_Info;
42 -- Create Table: Service_Table
43 CREATE TABLE Service_Table (
44 ServiceID INT PRIMARY KEY,
45 ServiceName VARCHAR(100),

```

Results Messages

DepartmentID	DepartmentName
101	Cardiology
102	Neurology
103	Pediatrics
104	Radiology
105	Emergency

Ln 42, Col 1 (32 selected) Spaces: 4 UTF-8 CRLF 5 rows MySQL 00:00:01 localhost: hospitaldb

Service Table:-

The screenshot displays the SQL Server Enterprise Manager interface. On the left, the 'Servers' tree shows the 'hospitaldb' database selected, with the 'service_table' table highlighted under the 'Tables' folder. The main pane shows the SQL query editor with the following code:

```

25 Gender VARCHAR(50) CHECK (Gender IN ('Male', 'Female', 'Other')),
26 ContactInfo VARCHAR(50),
27 Address VARCHAR(100)
28 );
29
30 -- Create Table: Patient_Appointments
31 CREATE TABLE Patient_Appointments (
32 AppointmentID INT PRIMARY KEY,
33 Reason TEXT,
34 ReasonID INT UNIQUE, -- Ensure ReasonID is unique
35 PatientID INT,
36 StaffID INT,
37 AppointmentDate DATETIME,
38 FOREIGN KEY (PatientID) REFERENCES Patient_Details(PatientID),
39 FOREIGN KEY (StaffID) REFERENCES Employee_Details(StaffID)
40 );
41
42 -- Create Table: Service_Table
43 CREATE TABLE Service_Table (
44 ServiceID INT PRIMARY KEY,
45 ServiceName VARCHAR(100),

```

Below the query editor, the 'Results' tab shows the data for the 'Service_Table' table:

	ServiceID	ServiceName	Amount	PatientID	AppointmentID	ReasonID	StaffID
1	1	Heart Surgery	15000.00	1001	1	11	1
2	2	MRI Scan	5000.00	1002	2	12	2
3	3	Vaccination	1000.00	1003	3	13	3
4	4	X-Ray	1200.00	1004	4	14	4
5	5	Emergency Consultation	2000.00	1005	5	15	5

The status bar at the bottom indicates the current position is 'Ln 42, Col 1 (30 selected)' and the database is 'localhost: hospitaldb'.

Patient_Appointment_View

```

CREATE VIEW Patient_Appointment_View AS
SELECT
    pa.AppointmentID,
    pd.FirstName AS Patient_FirstName,
    pd.LastName AS Patient_LastName,
    ed.FirstName AS Staff_FirstName,
    ed.LastName AS Staff_LastName,
    pa.Reason,
    pa.AppointmentDate
FROM
    Patient_Appointments pa
JOIN
    Patient_Details pd ON pa.PatientID = pd.PatientID
JOIN
    Employee_Details ed ON pa.StaffID = ed.StaffID;

```

	AppointmentID	Patient_FirstName	Patient_LastName	Staff_FirstName	Staff_LastName	Reason	AppointmentDate
1	1	John	Doe	Dr. Sarah	Connor	Heart Checkup	2025-01-02 00:00:00
2	2	Jane	Smith	Dr. Alan	Grant	Neurological Exam	2025-01-06 00:00:00
3	3	Alice	Johnson	Dr. Emily	Watson	Routine Checkup	2025-01-11 00:00:00
4	4	Bob	Brown	Dr. James	Carter	X-Ray and Diagnostics	2025-01-13 00:00:00
5	5	Emma	Davis	Nurse Lisa	Smith	Emergency Consultation	2025-01-16 00:00:00

Patient_Service_History_View:

```

CREATE VIEW Patient_Service_History_View AS

SELECT

    st.ServiceID,

    st.ServiceName,

    st.Amount AS Service_Cost,

    pd.FirstName AS Patient_FirstName,

    pd.LastName AS Patient_LastName,

    ed.FirstName AS Staff_FirstName,

    ed.LastName AS Staff_LastName,

    pa.AppointmentDate

FROM

    Service_Table st

JOIN

    Patient_Details pd ON st.PatientID = pd.PatientID

JOIN

    Employee_Details ed ON st.StaffID = ed.StaffID

JOIN

    Patient_Appointments pa ON st.AppointmentID = pa.AppointmentID;

```

Results		Messages						
	ServiceID	ServiceName	Service_Cost	Patient_FirstName	Patient_LastName	Staff_FirstName	Staff_LastName	AppointmentDate
1	1	Heart Surgery	15000.00	John	Doe	Dr. Sarah	Connor	2025-01-02 00:00:00
2	2	MRI Scan	5000.00	Jane	Smith	Dr. Alan	Grant	2025-01-06 00:00:00
3	3	Vaccination	1000.00	Alice	Johnson	Dr. Emily	Watson	2025-01-11 00:00:00
4	4	X-Ray	1200.00	Bob	Brown	Dr. James	Carter	2025-01-13 00:00:00
5	5	Emergency Consultation	2000.00	Emma	Davis	Nurse Lisa	Smith	2025-01-16 00:00:00

Conclusion:

A well-designed database is the foundation of a **reliable** and **efficient** hospital management system. This structure will **streamline operations**, **enhance patient care**, and **support strategic decision-making** in the hospital