**Hospital Database Project Report**

**1. Introduction**

**1.1 Project Overview**

The **Hospital Database Management System** is designed to efficiently store, manage, and analyze hospital-related data, including patient records, physician details, appointments, procedures, medications, and billing information. The project leverages **SQL** for database operations and integrates **Power BI/Tableau** for advanced visualizations.

**1.2 Objectives**

* To develop a relational database model for a hospital management system.
* To store and manage patient, physician, and staff information.
* To analyze hospital operations through SQL queries.
* To generate meaningful insights using Power BI/Tableau visualizations.

**2. Database Design**

**2.1 Entity-Relationship (ER) Diagram**

The ER diagram illustrates the relationships between key entities, such as **patients, physicians, appointments, medications, procedures, and hospital rooms**.

**2.2 Tables and Schema**

The database consists of multiple tables, each designed to store specific information. Below is an overview of key tables:

| **Table Name** | **Description** |
| --- | --- |
| patient | Stores patient details (SSN, name, address, phone, insurance, etc.). |
| physician | Stores physician details, including specialization. |
| appointment | Tracks patient appointments with doctors. |
| undergoes | Links patients with procedures performed. |
| medication | Stores medication details. |
| prescribes | Links medications prescribed to patients by physicians. |
| stay | Tracks patient hospital stays, including room assignments. |
| room | Stores details about hospital rooms. |
| department | Stores hospital department information. |
| trained\_in | Tracks physicians trained in specific procedures. |

**3. Data Insertion & Queries**

**3.1 Data Population**

* Inserted **50+ patients**, **6 physicians**, and **multiple nurses and staff**.
* Appointments and hospital stays were populated based on realistic healthcare scenarios.
* Procedures and medications were assigned to respective patients.

**3.2 SQL Queries for Analysis**

A total of **39 queries** were written to analyze various aspects of hospital operations:

**Query 1: Retrieve all nurses who are yet to be registered.**

SELECT \*

FROM nurse

WHERE registered = FALSE;

**Explanation:** This query retrieves all nurses who have not been registered yet by filtering records where the registered column is FALSE.

**Query 2: Find the physician who has performed the most procedures.**

SELECT physician, COUNT(procedure) AS procedure\_count

FROM undergoes

GROUP BY physician

ORDER BY procedure\_count DESC

LIMIT 1;

**Explanation:** This query counts the number of procedures performed by each physician and sorts them in descending order. The LIMIT 1 ensures only the top physician is displayed.

**Query 3: Retrieve the details of patients who have been admitted for more than 7 days.**

SELECT p.name

FROM patient p

JOIN stay s ON p.ssn = s.patient

WHERE (s.end\_date - s.start\_date) > 7;

**Explanation:** This query identifies patients whose hospital stay lasted more than 7 days by calculating the difference between end\_date and start\_date.

**Query 4: Find the most prescribed medication.**

SELECT m.name

FROM medication m

JOIN prescribes pr ON m.code = pr.medication

GROUP BY m.name

ORDER BY COUNT(\*) DESC

LIMIT 1;

**Explanation:** This query joins medication and prescribes tables, counts the number of times each medication was prescribed, and retrieves the most frequently prescribed one.

**Query 5: Count the number of appointments for each physician.**

SELECT physician, COUNT(\*) AS total\_appointments

FROM appointment

GROUP BY physician;

**Explanation:** This query counts the total number of appointments for each physician by grouping records based on physician.

**Query 6: Retrieve all procedures that have never been performed.**

SELECT procedure\_id, name

FROM procedure

WHERE procedure\_id NOT IN (SELECT DISTINCT procedure FROM undergoes);

**Explanation:** This query lists all procedures that have never been performed by checking which procedure\_ids do not exist in the undergoes table.

**Query 7: Find the physician who has trained in the most procedures.**

SELECT physician, COUNT(treatment) AS total\_trained

FROM trained\_in

GROUP BY physician

ORDER BY total\_trained DESC

LIMIT 1;

**Explanation:** This query counts the number of treatments each physician is trained in and identifies the one with the highest count.

These are just a few examples; the project includes **39 queries**, each solving a specific problem related to hospital management.

**4. Power BI/Tableau Visualizations**

**4.1 Key Dashboards**

The project includes the following **Power BI/Tableau dashboards**:

1. **Appointment Trends** – Total number of appointments per physician, department, and time period.
2. **Patient Admissions** – Number of patients admitted per department with average stay duration.
3. **Most Performed Procedures** – Visual representation of procedures performed across different specializations.
4. **Billing & Revenue Analysis** – Total hospital revenue categorized by departments and procedures.
5. **Medication Prescriptions** – Most commonly prescribed medications and their distribution.

**5. Implementation & GitHub Repository**

**5.1 GitHub Repository Structure**

The project is hosted on **GitHub** to maintain version control and collaboration. The repository includes:

📂 **Hospital-Database-Analysis** │── 📄 README.md (Project Documentation)  
│── 📂 SQL-Scripts/ (SQL files for schema, data insertion, and queries)  
│── 📂 Documentation/ (ER diagram, project report)  
│── 📂 Visualizations/ (Power BI & Tableau files)

**5.2 How to Use**

1. **Clone the GitHub repository:**
2. git clone https://github.com/your-username/Hospital-Database-Analysis.git
3. **Run SQL scripts** to create tables and insert data.
4. **Use Power BI/Tableau** to connect with the database and generate insights.

**6. Conclusion & Future Scope**

**6.1 Key Takeaways**

* The project successfully demonstrates an end-to-end hospital database system.
* SQL queries provide deep insights into hospital operations.
* Power BI/Tableau visualizations enhance data interpretation.

**6.2 Future Enhancements**

* **Integrate Machine Learning** for predictive healthcare analytics.
* **Implement Role-Based Access Control (RBAC)** for enhanced data security.
* **Develop a Web Interface** for user-friendly hospital management.

**7. References**

* PostgreSQL/MySQL Documentation
* Power BI/Tableau Official Documentation
* Healthcare Data Management Best Practices

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