GREY SLOAN MEMORIAL HOSPITAL ANALYSIS

Overview

This project focuses on analyzing healthcare data to understand trends in patient appointments, doctor specializations, revenue generation, and operational efficiency. By examining historical data from 2020 to 2023, it provides insights into patient engagement, return rates, and staffing effectiveness. The analysis helps in identifying key areas for improvement, optimizing resource allocation, and enhancing overall healthcare service delivery.

Process

1. **Data Collection:**
    - Gathered historical data from 2020 to 2023, covering patient appointments, doctor specializations, and financial performance.
    - Extracted key metrics such as appointment trends, returning patient counts, revenue, and doctor distribution.
2. **Data Cleaning & Transformation:**
    - Removed inconsistencies, missing values, and duplicate records to ensure data integrity.
    - Standardized date formats, categorized specializations, and structured revenue details for analysis.
3. **Exploratory Data Analysis (EDA):**
    - Analyzed trends in patient visits, specialization distribution, and revenue patterns.
    - Examined doctor-patient ratios and returning patient trends to understand healthcare engagement**.**
4. **Visualization & Dashboarding:**
    - Created an interactive Power BI dashboard to showcase insights.
    - Used visual elements such as line charts, bar charts, and pie charts to represent data intuitively.
5. **Analysis & Recommendations:**
    - Identified operational inefficiencies and areas for process improvement.
    - Suggested data-driven recommendations for optimizing doctor utilization and patient scheduling.

Objectives

- Understand trends in patient appointments across different years and months.
- Analyze the distribution of doctors across specializations and their workload.
- Assess financial performance, including revenue fluctuations and major revenue drivers.
- Evaluate doctor-patient ratios to determine staffing efficiency.
- Identify operational bottlenecks and areas for process optimization.

MECE Breakdown (Mutually Exclusive, Collectively Exhaustive):

1. Patient Analysis

- **Appointment Trends:** Monthly and yearly variations in patient visits.
- **Returning Patients:** Trends in patient loyalty and re-engagement over time.
- **No-show & Cancellation Rates:** Impact of missed appointments on efficiency.

2. Doctor Analysis

- **Specialization Breakdown:** Distribution of doctors across different specializations.
- **Appointment Allocation:** Number of appointments handled per doctor.
- **Doctor-Patient Ratio:** Assessment of staffing levels in relation to patient volume.

3. Financial Analysis

- **Revenue Trends:** Yearly revenue fluctuations and contributing factors.
- **Key Revenue Drivers:** Most profitable procedures and specializations.
- **Impact of External Factors:** The influence of events like COVID-19 on financial performance.

4. Operational Efficiency

- **Staff Utilization:** Identification of underutilized or overworked doctors.
- **Appointment Scheduling Efficiency:** Areas for reducing wait times and improving patient engagement.
- **Optimization Strategies:** Methods to enhance efficiency through improved resource allocation.

Tables & Explanations

1. Appointment Table

Stores details of patient appointments, including scheduling and doctor-patient interactions.

- **Date –** Appointment date.
- **DoctorID (Foreign Key) –** Doctor assigned for the appointment.
- **PatientID (Foreign Key) –** Patient attending the appointment.
- **AppointmentID (Primary Key) –** Unique identifier for each appointment.

Appointment-Based Metrics

- **AppointmentsByDate –** Total appointments scheduled per date.
- **AvgRevenuePerPatient –** Average revenue generated per patient.
- **DocCountBySpl –** Number of doctors categorized by specialization.
- **DoctorPatientRatio –** Ratio of doctors to patients**.**
- **ReturningPatients –** Number of patients who have visited more than once**.**
- **Revenue –** Total revenue generated**.**
- **RevenueByDoctor –** Revenue breakdown per doctor**.**
- **TotalAppointments –** Overall count of appointments.
- **TotalBillingByPatient –** Cumulative billing per patient.
- **TotalDoctors –** Count of active doctors**.**
- **TotalPatients –** Total number of registered patients**.**
- **TotalSpecialization –** Number of different doctor specializations available**.**

2. Patient Table

Holds basic patient details.

- **email –** Patient's contact email.
- **firstname –** Patient's first name.
- **lastname –** Patient's last name.
- **PatientID (Primary Key)** – Unique identifier for each patient.

3. Billing Table

Tracks financial transactions for medical services.

- **Amount –** Total cost billed for services.
- **InvoiceID (Primary Key) –** Unique identifier for each invoice.
- **Items –** List of billed services or procedures.
- **PatientID (Foreign Key) –** Links the bill to the respective patient.

4. Medical Procedure Table

Records procedures performed during appointments.

- **AppointmentID (Foreign Key) –** Links procedure to a specific appointment.
- **ProcedureID (Primary Key) –** Unique identifier for each medical procedure.
- **ProcedureName –** Name of the medical procedure conducted.

5. Doctor Table

Contains information about healthcare professionals.

- **DoctorID (Primary Key) –** Unique identifier for each doctor**.**
- **DoctorMail –** Contact email of the doctor.
- **DoctorName –** Full name of the doctor.
- **Specialization –** Doctor's area of expertise (e.g., Cardiology, Pediatrics).

Key Insights

- **Fluctuating Appointment Trends:** Patient visits peaked in January and April, with a drop in mid-year months. This suggests seasonal demand variations in healthcare services.
- **Doctor-Patient Ratio Concern:** A **0.60 doctor-patient ratio** indicates potential overstaffing, meaning doctors may not be fully utilized. This suggests an opportunity to optimize resource allocation.
- **Revenue Trends:**
    - Revenue peaked in **2020 at $90M**, driven by high demand during the COVID-19 pandemic.
    - Revenue declined in **2021 ($84M) and 2022 ($79M)** due to the pandemic's impact on healthcare accessibility.
    - In **2023, revenue rebounded to $88M**, indicating a recovery phase in patient engagement.
- **Key Revenue Contributors:** Specializations like **Otolaryngology, Surgery, and Radiology** generated the highest revenue. Procedures such as **X-rays, CT scans, MRI scans, and trauma resuscitation** were major revenue drivers.
- **Operational Challenges:**
    - **Underutilization of Doctors:** The low doctor-patient ratio suggests inefficiencies in staff distribution.
    - **No-show Issues:** Missed appointments impact operational efficiency, requiring better follow-up and scheduling practices.
    - **Overstaffing Risks:** With relatively low patient volumes per doctor, there may be an opportunity to optimize staff allocation.

Recommendations

- **Optimize Staffing Levels:** Adjust doctor schedules based on patient demand to improve efficiency.
- **Enhance Patient Follow-Ups:** Implement automated reminders to reduce no-show rates.
- **Focus on High-Demand Specializations:** Allocate more resources to Otolaryngology, Surgery, and Radiology.
- **Leverage Predictive Analytics:** Use historical data to forecast appointment trends and improve resource planning.
- **Improve Revenue Streams:** Introduce new services in high-revenue procedures like imaging and trauma care.