

Healthcare Analytics Project Report

Hospital Revenue & Operational Performance Analysis

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November 2025

Contents

1	Introduction	1
2	Data Preparation & Cleaning	2
2.1	Data Standardization	2
2.2	Handling Missing or Inconsistent Data	2
2.3	Data Structuring for Analysis	2
3	Analytical Approach	2
4	Key Insights	2
4.1	Seasonal Slowdown	2
4.2	Hourly Traffic Analysis	3
4.3	Revenue by Age Group	3
4.4	Physician Performance Analysis	3
4.5	Patient Behavior Patterns	3
5	Dashboard Development	4
6	Tools & Techniques Used	4
6.1	Excel Functions	4
6.2	Data Analysis Tools	4
6.3	Visualization & Design	4
7	Conclusion	5
8	Future Enhancements	5

1 Introduction

This report presents a comprehensive analysis of hospital operational and financial data using Excel-based data analytics techniques. The dataset includes over 9,200 patient visits and more than \$2.5 million in total revenue, providing a solid foundation for identifying performance trends, revenue drivers, and operational efficiency opportunities. The primary objective of this project was to build a data-driven dashboard that supports strategic and operational decision-making within a healthcare environment.

2 Data Preparation & Cleaning

Significant effort was dedicated to data cleaning to ensure accuracy and reliability. Key steps included:

2.1 Data Standardization

- Standardized date formats across the dataset.
- Extracted components such as hour, month, and year using Excel functions including:
 - HOUR()
 - MOD()
 - EDATE()

2.2 Handling Missing or Inconsistent Data

- Identified and managed missing values in patient attributes and timestamps.
- Normalized categorical columns such as gender, insurance status, and visit type.

2.3 Data Structuring for Analysis

- Created supporting lookup tables and calculated fields.
- Prepared the dataset for Pivot Table aggregation and dashboard visualization.

3 Analytical Approach

The analysis focused on identifying:

- Seasonal and monthly trends in patient visits
- Revenue fluctuations by hour, doctor, and age group
- Operational peak hours
- Physician performance metrics
- Patient demographic contributions
- Insurance and referral behavior

This multi-layered approach allowed for extraction of insights that support hospital decision-making.

4 Key Insights

4.1 Seasonal Slowdown

The data revealed a clear drop in patient activity during January and December. These months consistently recorded below-average revenue and patient volume. This insight suggests the need for:

- Seasonal promotional strategies
- Adjusted staffing levels
- Optimized resource allocation during low-demand months

4.2 Hourly Traffic Analysis

Patient traffic demonstrated significant patterns throughout the day:

- Main peak observed between 8 AM and 4 PM
- An unexpected late-night spike at 10 PM
- Decline after midnight and early morning hours

Implication: The late spike indicates an opportunity to redistribute staff during this time to maintain service efficiency and reduce wait times.

4.3 Revenue by Age Group

The analysis highlighted that middle-age groups (ages 20–50) generated the highest share of revenue. Younger and older groups contributed steadily but at lower levels.

This insight can support:

- Targeted wellness programs
- Preventive care initiatives
- Age-specific service planning

4.4 Physician Performance Analysis

A detailed comparison of physicians showed variations in:

- Total revenue generated
- Number of patients handled
- Revenue-per-patient efficiency

This metric is crucial for understanding doctor workload, performance distribution, and opportunities for improving medical resource allocation.

4.5 Patient Behavior Patterns

Additional metrics provided meaningful behavioral insights:

- **Gender distribution:** Balanced male/female split
- **Insurance coverage:** Nearly 50% of patients had active insurance
- **Referral ratio:** 41% of patients were referred, indicating strong word-of-mouth or partner-clinic relationships
- **Patient Giving Score:** 72% positive responses, reflecting satisfaction and donation potential

5 Dashboard Development

The final visualization was built entirely in Excel, focusing on clarity and executive-level readability.

Dashboard Features:

- KPI cards (Total Revenue, Patient Count, Average Score)
- Hourly revenue line chart
- Revenue by age bar chart
- Doctor performance comparison bars
- Gender, insurance, and referral pie charts
- Interactive filters for: Months, Years, Quarters, Days

The dashboard enables stakeholders to explore patterns dynamically and extract insights immediately, without manual analysis.

6 Tools & Techniques Used

6.1 Excel Functions

- HOUR, MOD, EDATE
- IF, AND, OR
- VLOOKUP / XLOOKUP
- COUNTIF & SUMIF
- Date/time transformations

6.2 Data Analysis Tools

- Pivot Tables
- Pivot Charts
- Conditional formatting
- Custom sorting and time grouping

6.3 Visualization & Design

- Clear, structured dashboard layout
- Consistent color theme
- Easy-to-read KPI highlights
- Decision-focused visual hierarchy

7 Conclusion

This project demonstrates how data analytics can transform raw hospital data into meaningful, actionable insights.

By understanding seasonal performance, hourly patient patterns, physician efficiency, and patient demographics, hospital leadership can:

- Improve staffing decisions
- Optimize revenue
- Enhance patient experience
- Strengthen operational planning

This analysis reinforced the importance and real-world impact of data analytics within the healthcare sector, particularly in fast-moving operational environments.

8 Future Enhancements

Potential improvements include:

- Adding predictive modeling for patient traffic
- Automating data refresh using Power Query
- Developing a Power BI version for deeper interactivity
- Integrating external datasets (weather, holidays, insurance sources)