“HOSPITAL EMERGENCY ROOM DASHBOARD : POWER BI”

PROJECT REPORT

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INTRODUCTION

Emergency rooms (ERs) play a vital role in hospitals, providing immediate medical attention to patients in critical and urgent conditions. They operate 24/7, handling a wide range of cases, from minor injuries to life-threatening emergencies. Efficient management of ER operations is crucial to ensure timely treatment, reduce patient wait times, and optimize resource allocation.

This report focuses on analyzing various aspects of emergency room operations over a 19-month period (April 2023 - October 2024). It examines **patient wait times, satisfaction levels, peak busy periods, departmental referrals, patient demographics, race distribution, and admission patterns**. The objective is to identify trends and challenges, providing valuable insights that can help improve ER efficiency and patient care.

ABSTRACT

Emergency rooms (ERs) are essential for providing urgent medical care, requiring efficient management to reduce wait times and improve patient outcomes. This **Power BI** project analyzes ER operations over a **19-month period (April 2023 - October 2024)**, focusing on **patient wait times, satisfaction, peak busy periods, referrals, demographics, and admission patterns**.

By leveraging **interactive dashboards**, this analysis uncovers key trends, identifies bottlenecks, and provides actionable insights to optimize ER efficiency. The use of **Power BI's analytics capabilities** enables data-driven decision-making, helping hospitals enhance patient care and resource allocation.

OBJECTIVE

The primary objective of this project is to develop a comprehensive **Hospital Emergency Room Dashboard** using **Power BI** to analyze and optimize the operations of the ER. The dashboard will track and analyze key performance indicators (KPIs) such as **patient wait times, patient satisfaction, department referrals, patient demographics, and admission status**.

By providing **monthly, consolidated, and detailed patient views**, the dashboard will help stakeholders monitor trends, identify bottlenecks, and make informed decisions to improve operational efficiency, patient care, and resource allocation. The goal is to generate actionable insights that enhance the overall performance of the emergency room and ensure optimal patient outcomes.

DATA ANALYSIS

1. Procedure

The analysis follows these steps:

1. **Data Collection** – Extracting patient data from the hospital's ER system.
2. **Data Cleaning** – Handling missing values, correcting data types, and ensuring consistency.
3. **Data Processing** – Performing transformations and calculations for meaningful insights.
4. **Data Visualization** – Using **Power BI** to create interactive dashboards for stakeholders.
5. **Insights Generation** – Interpreting trends to improve ER operations.

2. About the Dataset

The dataset contains **9,216 records** of hospital emergency room visits over **19 months (April 2023 - October 2024)**. It includes **12 attributes**:

- **Patient ID** – Unique identifier for each patient.
- **Admission Date & Time** – When the patient was admitted.
- **Patient Name & Initials** – Anonymized patient information.
- **Gender & Age** – Demographics of the patient.
- **Race** – Ethnicity of the patient.
- **Department Referral** – The department the patient was referred to after ER.
- **Admission Flag** – Whether the patient was admitted or discharged.
- **Satisfaction Score** – Patient's rating of ER service (0-10, with missing values).
- **Wait Time** – Time in minutes before being attended to.
- **Patients CM** – (Likely an internal hospital metric).

3. Methodology

- **Data Cleaning:**
  - Converted **admission date** into a datetime format for better analysis.
  - Checked for **missing values** (e.g., **Satisfaction Score** has many missing entries).
  - Verified **categorical data consistency** (e.g., uniform department names).
- **Data Processing:**
  - Calculated **average wait time**, **satisfaction trends**, and **admission percentages**.
  - Categorized patients by **age group, gender, and race**.
  - Identified **peak hours and days** for ER visits.
- **Visualization & Reporting:**
  - Used **Power BI** for **dynamic dashboards** to monitor ER trends in real-time.
  - Created **monthly, consolidated, and patient detail views** to capture all perspectives.

4. Data Interpretation

•**Demographics & Admissions:** Majority of patients belong to diverse racial backgrounds, with varied **admission rates**.

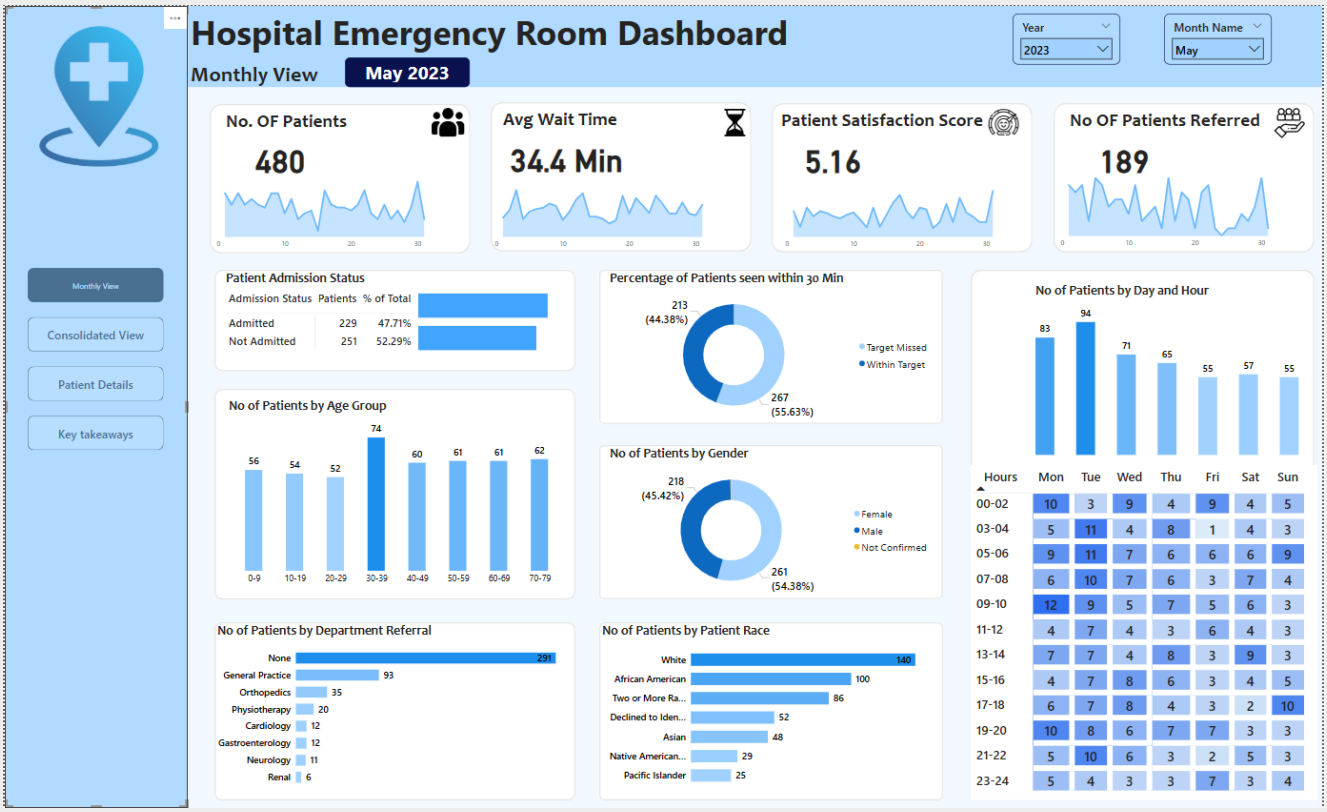
•**Wait Times & Satisfaction:** Longer wait times may correlate with lower satisfaction scores.

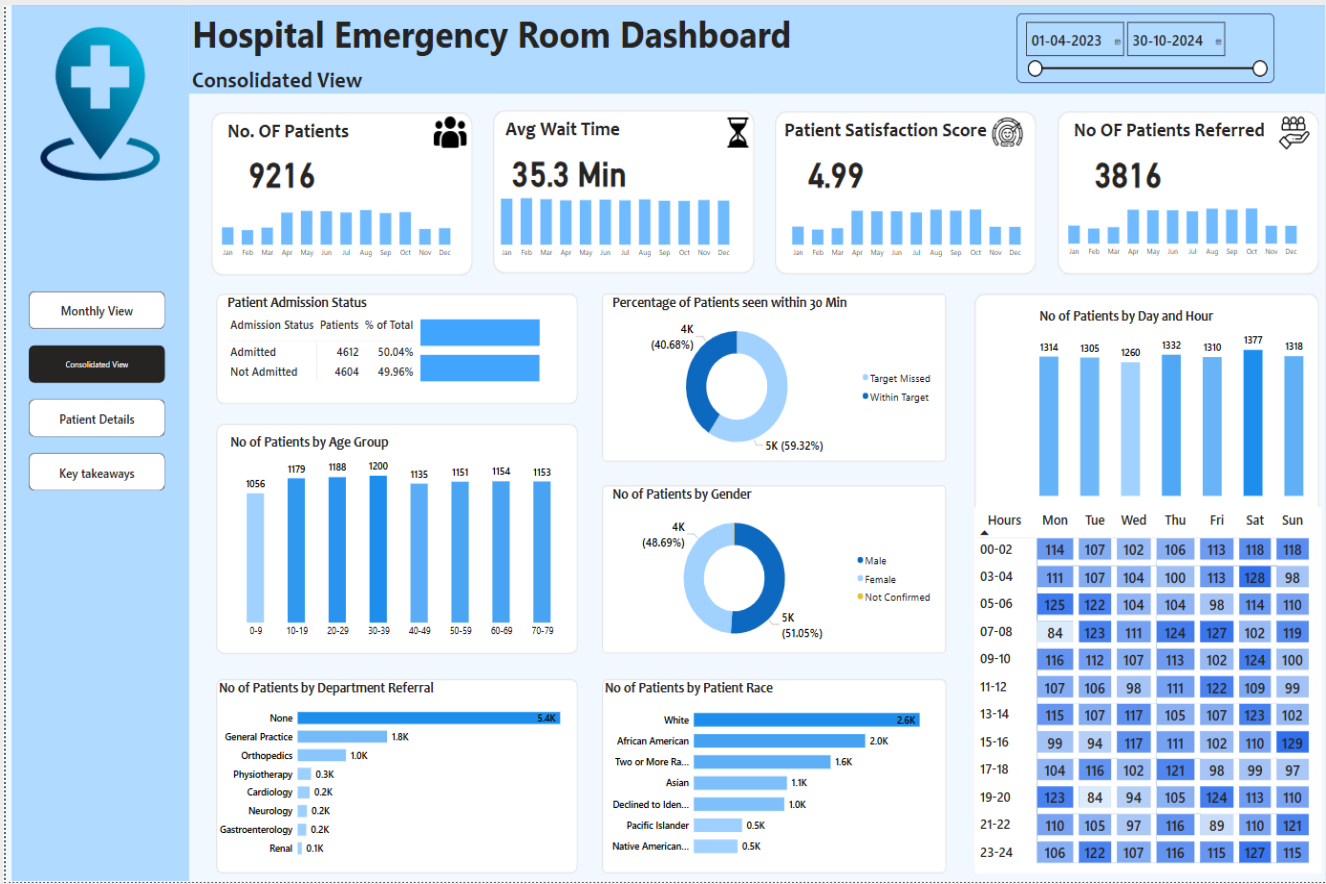
•**Peak Hours & Days:** Certain days and hours have **higher ER traffic**, requiring better staffing strategies.

•**Referral Trends:** Some departments receive more referrals, indicating the need for resource allocation.

This analysis will help **hospital administrators** make informed decisions to **enhance patient experience, reduce wait times, and optimize ER operations**.

5. Data Visualisation.





Hospital Emergency Room Dashboard

Patient Details

01-04-2023 30-10-2024

Monthly View

Consolidated View

Patient Details

Key takeaways

Patient Id	Patient Name	Patient Gender	Patient Age	Patient Admin Date	Patient Race	Patient Waittime	Department Referral	Admission Status
108-35-4145	B Brychan	Male	79	01 May 2023	White	48	None	Admitted
108-82-5384	H Rodie	Female	79	23 September 2024	Declined to Identify	56	None	Not Admitted
110-12-8128	D Scoates	Male	79	22 May 2023	Pacific Islander	15	None	Admitted
125-52-4944	N Sommerscales	Male	79	01 April 2023	White	21	General Practice	Not Admitted
147-55-5405	L Crolly	Female	79	02 March 2024	White	11	None	Admitted
154-20-9417	A Roberti	Male	79	13 September 2024	Asian	36	Gastroenterology	Not Admitted
181-11-9701	R Wetwood	Female	79	22 July 2023	Declined to Identify	44	None	Not Admitted
182-52-6741	K L'Hommee	Male	79	26 September 2023	White	56	None	Admitted
183-34-1466	V Antoons	Male	79	21 December 2023	Pacific Islander	40	General Practice	Not Admitted
186-16-0532	B Pinckstone	Female	79	24 April 2024	White	19	General Practice	Admitted
186-18-2336	L Ryal	Male	79	15 April 2024	Two or More Races	53	None	Not Admitted
190-98-0234	C Poltone	Male	79	10 July 2024	Asian	52	None	Admitted
193-43-6202	D Jon	Male	79	06 April 2023	White	13	Gastroenterology	Not Admitted
196-55-4306	L Caghan	Female	79	27 June 2023	African American	37	None	Not Admitted
204-74-7032	D Mingardo	Male	79	29 June 2023	Two or More Races	39	None	Not Admitted
212-94-9148	F Buey	Female	79	14 April 2024	White	51	General Practice	Admitted
213-37-6807	S Douce	Male	79	16 August 2023	White	48	Orthopedics	Not Admitted
220-33-1376	T Holtom	Male	79	24 October 2023	Native American/Alaska Native	45	None	Admitted
221-94-0515	S Stillman	Female	79	24 January 2024	Declined to Identify	49	None	Not Admitted
222-26-0023	X Swaite	Female	79	22 September 2024	White	10	None	Admitted
247-22-9153	W Freeborne	Female	79	08 August 2024	Two or More Races	35	General Practice	Admitted
259-09-5907	U Kimbrough	Male	79	02 May 2023	White	56	Physiotherapy	Admitted
266-90-9815	L Casewell	Female	79	28 July 2023	Two or More Races	50	General Practice	Not Admitted
274-70-0428	B Maginn	Female	79	07 July 2023	White	38	General Practice	Admitted
285-69-9065	B Duinkerk	Female	79	25 June 2024	African American	14	General Practice	Not Admitted
290-17-4655	Y Whitington	Female	79	01 June 2024	Asian	37	None	Not Admitted

Hospital Emergency Room Dashboard

Key Takeaways

Monthly View

Consolidated View

Patient Details

Key takeaways

Descriptive Analysis

(April 2023 - October 2024)

The emergency room dataset, covering a period of 19 months, records a total of 9,216 unique patients.

Patient Wait Time & Satisfaction:
The Average wait time was approximately 35.3 minutes, indicating a need for improvement to enhance patient flow. The average satisfaction score was 4.99 out of 10, suggesting moderate satisfaction and highlighting areas for improving patient experiences.

Departmental Referrals:
A significant number of Patients (5400) did not required referrals. Among those referred, the most common were General Practice (1840 cases) and Orthopedics (995 Cases), followed by Physiotherapy (276 Cases) and Cardiology (248 Cases)

Peak busy Periods:
The busiest day were Mondays (1377 Patients), Saturdays (1322 Patients), and Tuesdays (1318 Patients). The busiest hours were 11 AM, 7 PM, 01 PM, and 11 PM indicating need of ample staffing during these periods.

Patient Demographics:
Age Groups: Adults (30 - 39 Years) formed a large group (1200 Patients), followed by young adults (20 - 29 Years) with 1188 Patients. Other significant groups included middle
aged as well (40 - 50 Years).

Race Distribution:
The largest racial group was White (2571), followed by African American (1951), multi racial (1557), and Asian (1060) patients. A significant number of patients (1030) declined to identify their race.

Admission Patterns:
Nearly half of the patients (4612) were admitted, while the rest (4604) were treated and released.

Summary:
The dataset reveals high patient volumes, moderate satisfaction levels, and common referrals to General Practice and Orthopedics. Mondays and late night to early mornings hours are particularly busy. The patient demographics show a diverse age and racial composition, with nearly equal numbers of admitted and non admitted patients. These insights can help optimize resource allocation and improve patient care in the emergency room.

(Source : Power Bi)

1. KPIs (Key Performance Indicators) in Power BI

KPIs in Power BI help track critical business metrics. For a hospital emergency room dashboard, common KPIs might include:

Number of Patients:
The total number of patients visiting the ER daily.
Average Wait Time:
The average time patients wait before being attended to by a medical professional.
Patient Satisfaction Score:
The average satisfaction score of patients on a daily basis to evaluate the quality of service provided.
Number of Patients Referred:
The number of patients referred to specific departments from the ER each day.

2. Slicers in Power BI

Slicers are used to filter data interactively. They can be based on:

- **Year Slicer**
- **Month Slicer**
- **Date Slicer**

Slicers help users analyze different aspects of hospital performance dynamically.

3. DAX Queries for KPIs

DAX (Data Analysis Expressions) is used to create calculated measures and columns in Power BI. Here are some useful DAX formulas:

a) Day Name

```
Day Name = FORMAT('Date Table'[Date],"DDD")
```

b) Month and Year

```
Month & Year = ('Date Table'[Month Name] &
"  " & 'Date Table'[Year])
```

c) Month Name

```
Month Name = FORMAT('Date Table'[Date],"mmm")
```

d) Month Number

```
Month Number = MONTH('Date Table'[Date])
```

e) Week Day

```
Week Day = WEEKDAY('Date Table'[Date],2)
```

f) Year

```
Year = YEAR('Date Table'[Date])
```

g) Admission Status

```
Admission Status = IF('Hospital ER_Data'[Patient
Admission Flag] = TRUE,"Admitted","Not Admitted")
```

h) Age Group

```
Age Group = SWITCH(
TRUE(),
'Hospital ER_Data' [Patient Age] >= 100, "100+",
'Hospital ER_Data' [Patient Age] >= 90, "90-99",
'Hospital ER_Data' [Patient Age] >= 80, "80-89",
'Hospital ER_Data' [Patient Age] >= 70, "70-79",
'Hospital ER_Data' [Patient Age] >= 60, "60-69",
'Hospital ER_Data' [Patient Age] >= 50, "50-59",
'Hospital ER_Data' [Patient Age] >= 40, "40-49",
'Hospital ER_Data' [Patient Age] >= 30, "30-39",
'Hospital ER_Data' [Patient Age] >= 20, "20-29",
'Hospital ER_Data' [Patient Age] >= 10, "10-19",
"0-9")
```

i) Wait Time Status

```
Wait Time Status = IF('Hospital ER_Data'[Patient
Waittime]<=30,"Within Target","Target Missed")
```

j) Wait Time Interval

```
Waittime Interval =

 SWITCH(

 TRUE(),

 'Hospital ER_Data' [Admission Hour] <2, "00-02",

 'Hospital ER_Data' [Admission Hour] < 4, "03-
 04",

 'Hospital ER_Data' [Admission Hour] < 6, "05-
 06",

 'Hospital ER_Data' [Admission Hour] <8, "07-08",

 'Hospital ER_Data' [Admission Hour] < 10, "09-
 10",

 'Hospital ER_Data' [Admission Hour] < 12, "11-
 12",

 'Hospital ER_Data' [Admission Hour] < 14, "13-
 14",

 'Hospital ER_Data' [Admission Hour] < 16, "15-
 16",

 'Hospital ER_Data' [Admission Hour] < 18, "17-
 18",

 'Hospital ER_Data' [Admission Hour] <20, "19-
 20",

 'Hospital ER_Data' [Admission Hour] <22, "21-
 22",

 'Hospital ER_Data' [Admission Hour] <24, "23-
 24",

 "Above 24")
```

KEY INSIGHTS

1. **Patient Demographics:**
   - The **average patient age** is **39.85 years**, ranging from **1 to 79 years**.
   - There are **7 different racial groups** and **3 genders** recorded.
   - The **"Department Referral"** column has only **8 unique values**, indicating limited referral sources.

2. **Patient Wait Time & Admissions:**
   - The **average wait time** is **35.26 minutes**, with a range from **10 to 60 minutes**.
   - About **50% of patients wait less than 35 minutes**, but **some experience delays up to 60 minutes**.
   - Admissions occur **throughout the day**, but most happen between **5 AM and 11 PM**.

3. **Satisfaction Scores:**
   - The **average satisfaction score** is **4.99 (out of 10)**, indicating room for improvement.
   - **6,699 satisfaction scores are missing**, which is **over 72% of the data**.
   - The **minimum score is 0, and the maximum is 10**, showing a wide range in patient experiences.

4. **Data Issues & Anomalies:**
   - The **"Waittime Interval"** column has some incorrect date-like values.
   - **"Patient Admission Date" and "Patient Admin Date"** appear to be duplicates.
   - The **"Department Referral"** field has many "None" values, suggesting missing or irrelevant data.

CONCLUSION

This Power BI project analyzes patient admissions, wait times, and satisfaction scores to identify key trends and areas for improvement in hospital operations. The data reveals that while patient admissions occur throughout the day, **long wait times (averaging 35 minutes) and inconsistent satisfaction scores (average of 4.99/10) indicate potential inefficiencies** in hospital workflow.

Key findings include **peak admission hours between 5 AM and 11 PM**, a **wide range in patient satisfaction**, and **missing data in crucial areas such as feedback scores**. Additionally, some data inconsistencies, such as anomalies in wait time intervals and duplicate date columns, highlight the need for better data management.

To enhance patient experience, the hospital should **reduce wait times by optimizing staff allocation during peak hours, improve data collection for better insights, and analyze department-wise performance**. By addressing these challenges and leveraging data-driven decision-making, the hospital can enhance efficiency, patient satisfaction, and overall healthcare quality.

This analysis serves as a foundation for further exploration in Power BI, where **visualizing trends such as department-wise wait times, satisfaction heatmaps, and admission patterns** will provide deeper insights and actionable solutions.