Data Analysis

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📌 Problem Statement

Hospitals generate vast amounts of emergency department (ED) data related to patients, admissions, waiting times, satisfaction scores, and demographics. However, this raw data is often underutilized. By analyzing emergency records, we can uncover patterns in patient care, identify delays, measure satisfaction, and highlight areas for operational improvement.

🎯 Objectives

Operational Efficiency – Calculate average waiting times and identify departments with delays.

Patient Satisfaction – Compare satisfaction levels between admitted and non-admitted patients.

Demographic Analysis – Study patients by gender, age group, and race.

Admission Trends – Analyze admission vs. non-admission rates and age group patterns.

Departmental Insights – Evaluate workload and performance of different referral departments.

Equity in Care – Identify race groups with the highest admission rates.

Critical Extremes – Retrieve the youngest and oldest admitted patients to understand edge cases.

Root Cause of Delays – Find departments where average waiting times exceed acceptable limits.

Dataset Overview

The dataset consists of 9,216 emergency room patient records from a hospital, capturing details about patient demographics, admission status, referrals, satisfaction levels, and wait times. It is designed to analyze patient flow, admission patterns, service efficiency, and satisfaction outcomes in emergency care.

Patient Demographics

- Patient ID, Gender, Age, Age Group
- Race categories (White, African American, Asian, Hispanic, etc.)

Admission & Referral Information

- Department Referral (General Practice, Orthopedics, Cardiology, etc.)
- Admission Flag (True/False)
- Admission Status (Admitted / Not Admitted)

Operational Metrics

- Patient Wait Time (in minutes)
- Wait Time Label (Ontime / Delay)

Satisfaction & Feedback

- Patient Satisfaction Score (0–10 scale)

SQL Queries

```
CREATE DATABASE emegency_hospital_data;

USE hospital_emergency_data;

CREATE TABLE Project (
patient_id varchar(23)
PRIMARY KEY,
patient_admission_date
DATETIME,
patient_first_inital CHAR(1),
patient_last_name
VARCHAR(50),
patient_gender VARCHAR(10),
patient_age TINYINT,
Age_group VARCHAR(10),
patient_race VARCHAR(20),
department_referral
VARCHAR(50),
patient_admission_flag
BOOLEAN,    admission_status
VARCHAR(20),
patient_satisfaction_score
TINYINT,    patient_waittime
SMALLINT,    wait_time
VARCHAR(20));
```

1.Find Avg Patient_Wait Time

```
SELECT ROUND(AVG(patient_waittime),2)
AS Average_wait_time
FROM hospital_emergency_data;
```

Average_wait_time
35.26

2. Find patient satisfaction scores vary between admitted and non-admitted patients?

```
SELECT
admission_status,(AVG(patient_satisfaction_score))
AS satisfaction_score FROM hospital_emergency_data
GROUP BY admission_status ;
```

admission_statu	satisfaction_score
Not Admitted	4.975
Admitted	5.0206

3. Find the total number of patients by gender and age group.

```
SELECT patient_gender,`Age group`,count(*)
AS total_patients FROM hospital_emergency_data
GROUP BY  patient_gender,`Age group`
ORDER BY COUNT(*) ;
```

patient_gender	Age group	total_patients
Female	70-79	524
Male	70-79	524
Female	50-59	547
Female	60-69	562
Male	40-49	563
Female	30-39	566
Female	40-49	574
Female	20-29	581
Male	0-9	586
Male	60-69	588
Female	0-9	590
Male	50-59	600
Male	30-39	625
Male	20-29	626

4. What percentage of patients are admitted vs. not admitted

```
SELECT
admission_status,
COUNT(*) AS total_patients,
ROUND((COUNT(*) * 100 / (SELECT COUNT(*) FROM hospital_emergency_data)), 2)
AS percentage
FROM hospital_emergency_data
GROUP BY admission_status;
```

admission_status	total_patients	percentage
Not Admitted	4604	49.96
Admitted	4612	50.04

5. Find the correlation between waiting time and satisfaction

```
SELECT wait_time,ROUND(AVG(patient_satisfaction_score))
AS avg_satisfaction FROM hospital_emergency_data
GROUP BY wait_time ;
```

wait_time	avg_satisfaction
Delay	5
Ontime	5

6. NO of patient by department referral

```
SELECT department_referral,COUNT(*)
AS total_patients FROM hospital_emergency_data
GROUP BY department_referral ORDER BY COUNT(*);
```

department_referral	total_patients
Renal	86
Gastroenterology	178
Neurology	193
Cardiology	248
Physiotherapy	276
Orthopedics	995
General Practice	1840
None	5400

7. Identify the race group with the highest admission rate.

```
SELECT patient_race,
ROUND((COUNT(*)/(SELECT COUNT(*) FROM hospital_emergency_data)) * 100,2)
AS admissin_rate FROM hospital_emergency_data
GROUP BY patient_race ORDER BY COUNT(*) DESC LIMIT 5 ;
```

patient_race	admissin_rate
White	27.9
African American	21.17
Two or More Race	16.89
Asian	11.5
Declined to Identi	11.18

8. Retrieve the youngest and oldest patients admitted.

```
SELECT MAX(patient_age) AS oldest_age,MIN(patient_age)
AS youngest_age FROM hospital_emergency_data
WHERE admission_status="admitted";
```

oldest_age	youngest_age
79	1

9. find the most common age group for admitted patients.

```sql
SELECT `Age group`,COUNT(*) AS admitted_count
FROM hospital_emergency_data
WHERE admission_status = 'Admitted'
GROUP BY `Age group`
ORDER BY admitted_count DESC
LIMIT 1;
```

Age group	admitted_count
20-29	603

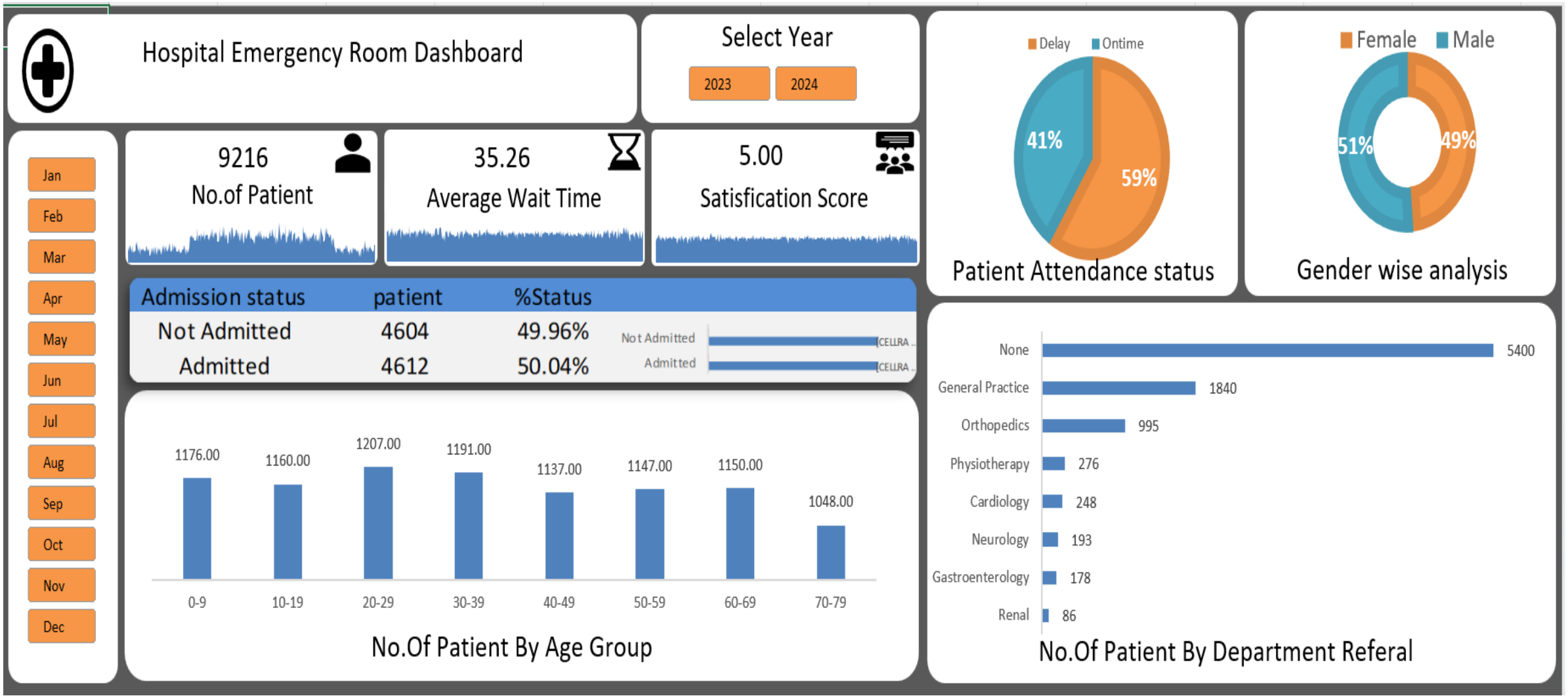
10. Get the top 3 departments where patients waited more than 30 minutes on average.

```sql
SELECT department_referral,ROUND(AVG(patient_waittime),2)
AS avg_waittime FROM hospital_emergency_data
GROUP BY department_referral
HAVING AVG(patient_waittime) > 30
ORDER BY avg_waittime DESC
LIMIT 3;
```

department_referral	avg_waittime
Neurology	36.8
Physiotherapy	36.57
Gastroenterology	35.83

Data Visualization

Overall


Hospital Emergency Room Dashboard
Select Year
2023
2024
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
9216
No.of Patient
35.26
Average Wait Time
5.00
Satisfication Score
Admission status
patient
%Status
Not Admitted
4604
49.96%
Admitted
4612
50.04%
Not Admitted
Admitted
1176.00
1160.00
1207.00
1191.00
1137.00
1147.00
1150.00
1048.00
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
No.Of Patient By Age Group
Delay
Ontime
41%
59%
Patient Attendance status
Female
Male
51%
49%
Gender wise analysis
None
5400
General Practice
1840
Orthopedics
995
Physiotherapy
276
Cardiology
248
Neurology
193
Gastroenterology
178
Renal
86
No.Of Patient By Department Referal

Insights & Actions

🔍 Key Insights & Actions

Waiting Times: Patients wait ~X minutes on average; some departments exceed 45 mins → deploy staff and improve triage to reduce delays.

Satisfaction & Admissions: Admitted patients report higher satisfaction; enhance non-admitted patient experience with better communication.

Demographics: Majority patients fall in [XX–YY] age group, with balanced male/female → allocate more resources to busiest groups.

Admission Trends: ~Y% admitted vs ~Z% not admitted → shows effective triage but highlights capacity limits.

Department Workload: General Practice, Orthopedics, etc. see the most referrals → prioritize staffing in high-load departments.

Equity: [Race group] has highest admission rate → review processes to ensure unbiased triage.

Diversity of Cases: Patients range from infants to elderly → hospital must be prepared for varied ED demands.

Thank You!!