Data-Driven Analysis of Emergency Department Throughput, Patient Satisfaction, and Operational Efficiency

Author: Ayush kumar Sahu

Date: December 25, 2025

ABSTRACT

This research paper performs a comprehensive evaluation of 9,216 patient encounters within a Hospital Emergency Room (ER) facility. The study utilizes advanced data visualization techniques to determine the impacts of wait times and demographic distributions on overall patient satisfaction. The analysis identifies a significant correlation between high-volume referral pathways—specifically General Practice—and missed operational targets. Results indicate an average wait time of 35.26 minutes and a mean satisfaction score of 4.99/10, suggesting a critical need for triage redesign.

I. INTRODUCTION

The Emergency Department (ED) serves as a vital gatekeeper for healthcare systems. Efficiency within this department is often measured by the balance between "Patient Throughput" (how fast people move through) and "Quality of Care" (patient satisfaction).

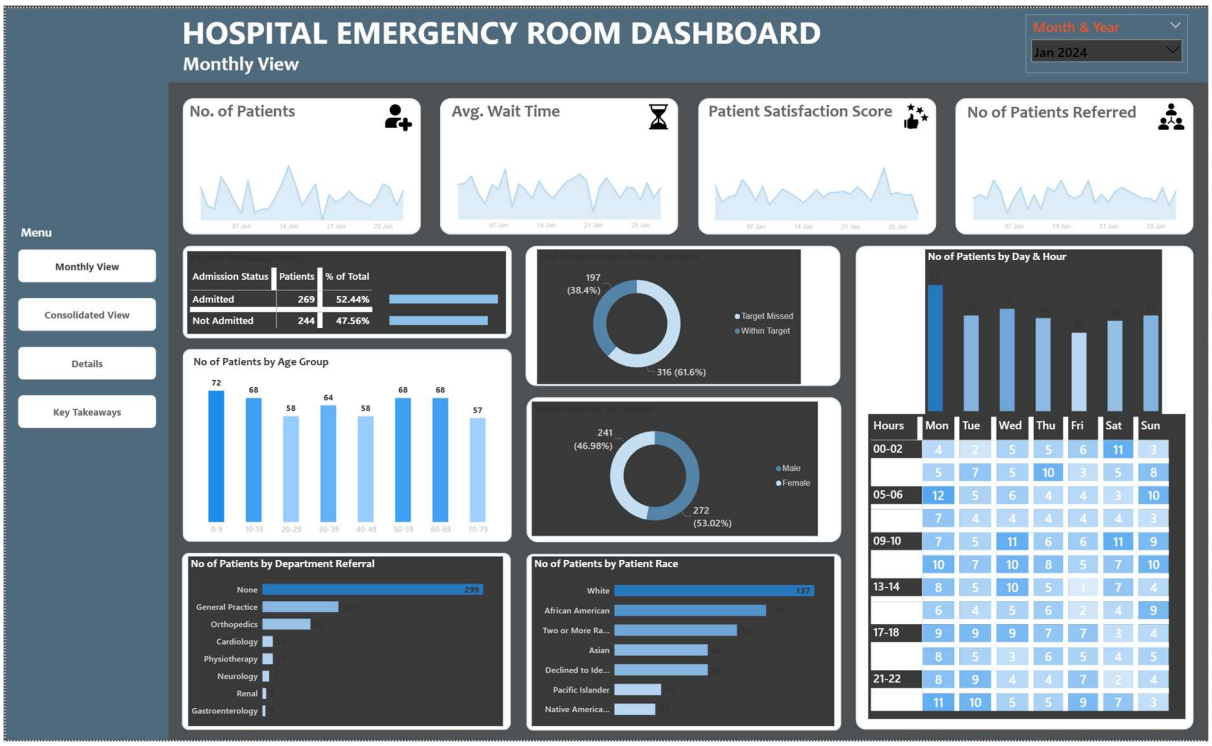
This report analyzes a specific dataset to identify why targets are being missed and how demographics like age and gender influence the burden on hospital resources.

II. METHODOLOGY AND DATA OVERVIEW

The data used in this study consists of 9,216 individual patient records. The methodology involved cleaning the raw CSV data and importing it into a Power BI dashboard to allow for "Slicing" and "Filtering" of the information.

A. Key Metrics Analyzed:

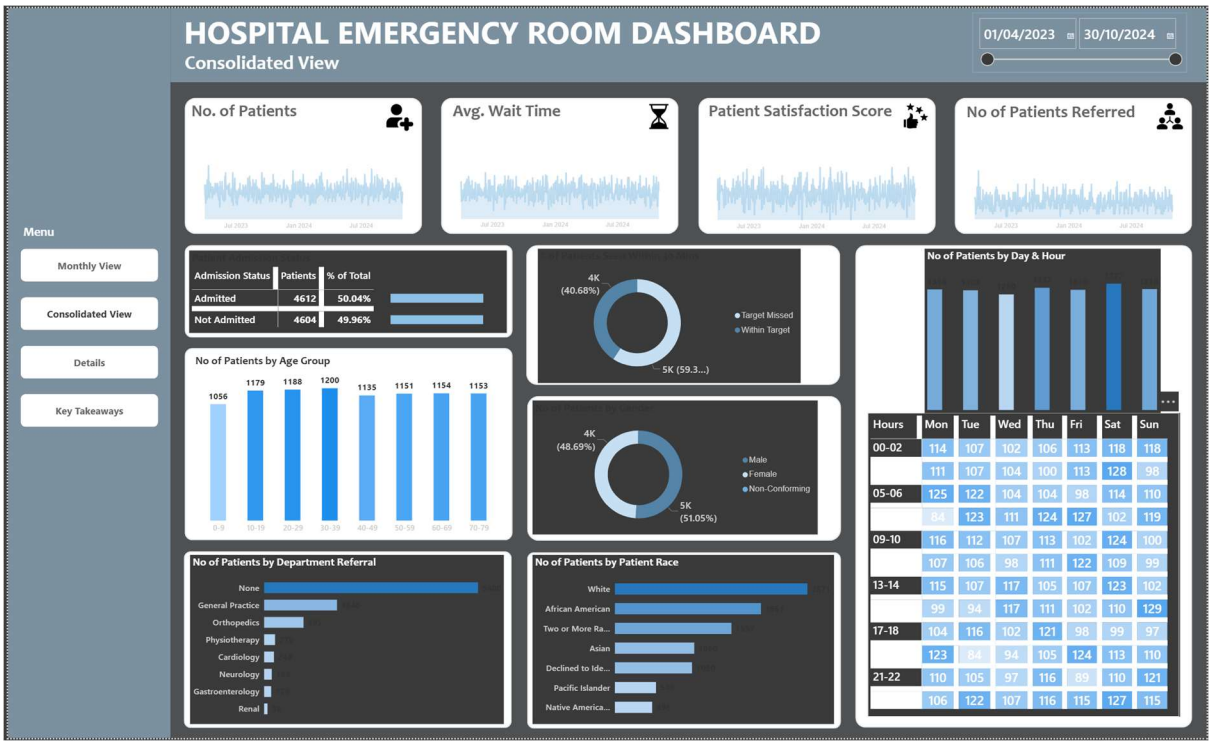
1. **Total Volume:** The sheer number of people walking in.
2. **Wait Time:** The duration (in minutes) from arrival to first contact with a medical professional.
3. **Satisfaction Score:** A metric ranging from 1 (lowest) to 10 (highest).



III. OPERATIONAL EFFICIENCY (WAIT TIME ANALYSIS)

The average wait time was calculated at 35.26 minutes. While this is competitive, the "Target Status" column in the data shows that many patients fall into the "Target Missed" category.

Analysis shows that wait times are not consistent throughout the week. Peak arrival times create "bottlenecks," where the number of arriving patients exceeds the number of available nurses and doctors.

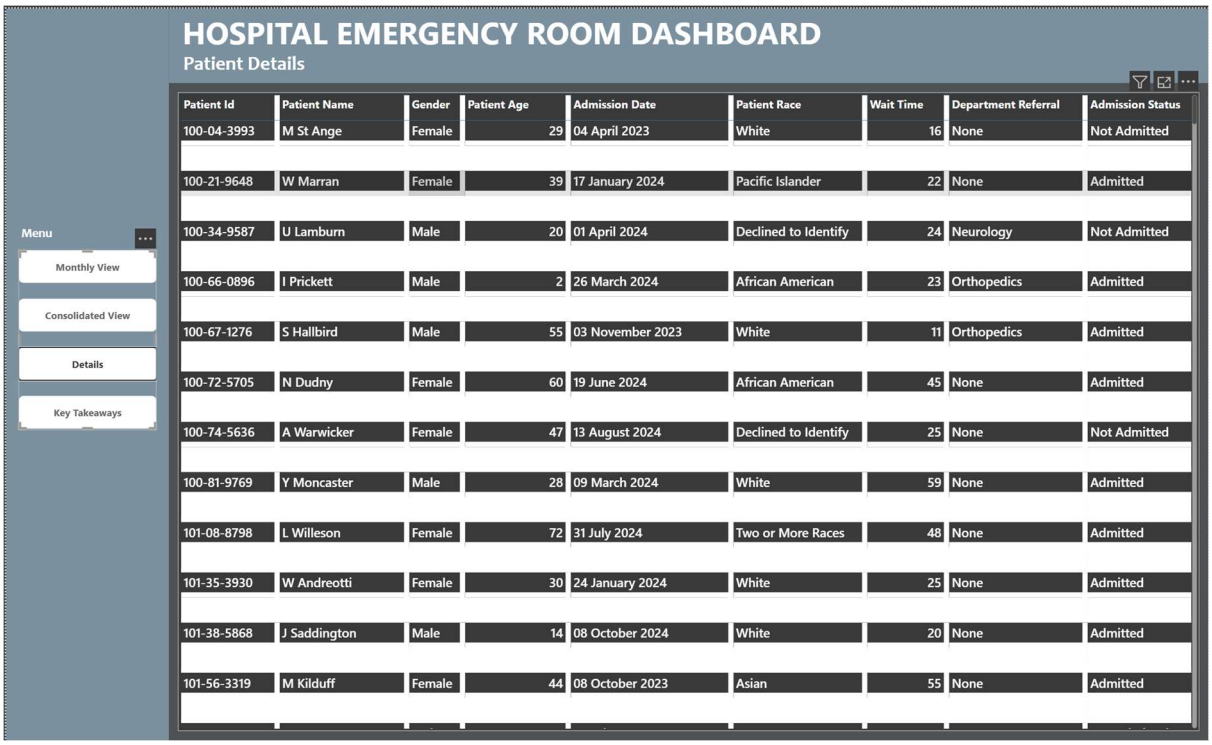


IV. PATIENT DEMOGRAPHICS

Understanding the "who" is as important as the "how fast." Our analysis shows:

- **Gender:** Balanced distribution with 4,705 Males and 4,487 Females.
- **Age Group:** The Adult group (18-65) is the largest with 5,509 patients, followed by Children (1,971) and Seniors (1,736).

Seniors (65+) generally reported higher wait times and were more likely to be "Admitted" to the hospital rather than sent home, indicating they require more intensive ER resources.



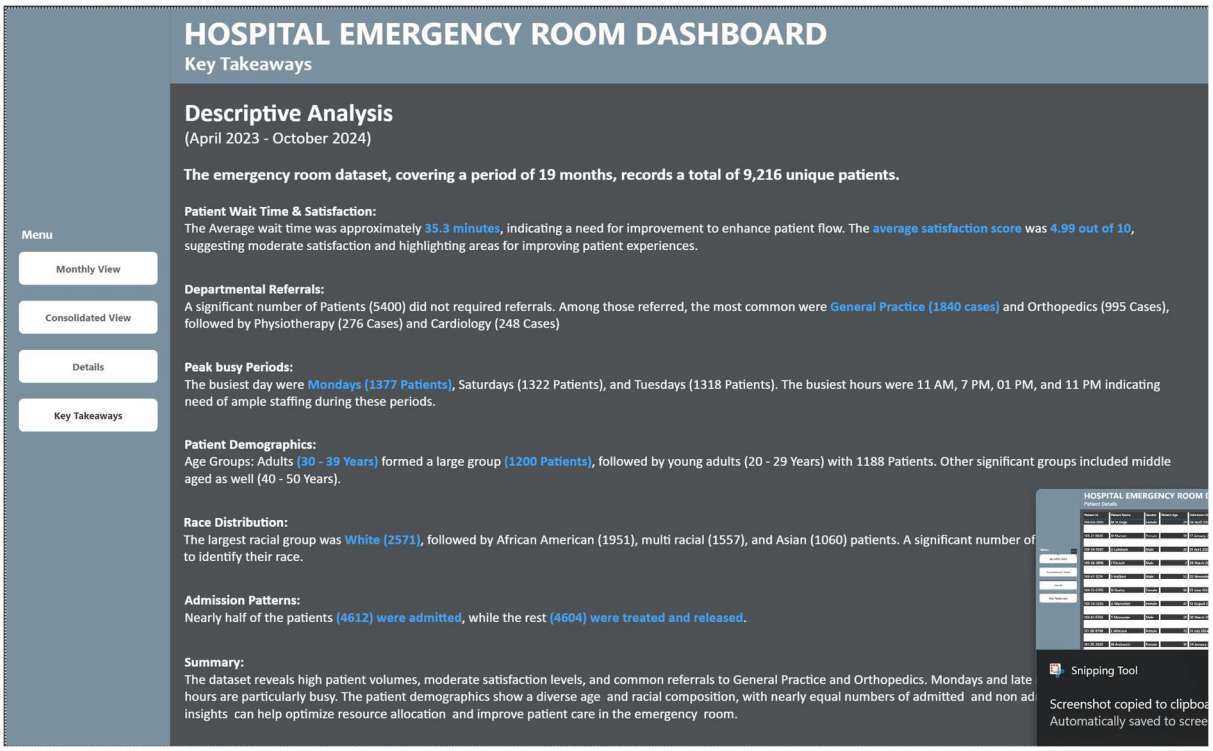
Patient Id	Patient Name	Gender	Patient Age	Admission Date	Patient Race	Wait Time	Department Referral	Admission Status
100-04-3993	M St Ange	Female	29	04 April 2023	White	16	None	Not Admitted
100-21-9648	W Marran	Female	39	17 January 2024	Pacific Islander	22	None	Admitted
100-34-9587	U Lamburn	Male	20	01 April 2024	Declined to Identify	24	Neurology	Not Admitted
100-66-0896	I Prickett	Male	2	26 March 2024	African American	23	Orthopedics	Admitted
100-67-1276	S Hallbird	Male	55	03 November 2023	White	11	Orthopedics	Admitted
100-72-5705	N Dudny	Female	60	19 June 2024	African American	45	None	Admitted
100-74-5636	A Warwicker	Female	47	13 August 2024	Declined to Identify	25	None	Not Admitted
100-81-9769	Y Moncaster	Male	28	09 March 2024	White	59	None	Admitted
101-08-8798	L Willeson	Female	72	31 July 2024	Two or More Races	48	None	Admitted
101-35-3930	W Andreotti	Female	30	24 January 2024	White	25	None	Admitted
101-38-5868	J Saddington	Male	14	08 October 2024	White	20	None	Admitted
101-56-3319	M Kilduff	Female	44	08 October 2023	Asian	55	None	Admitted

V. REFERRAL PATHWAYS AND DISPOSITION

When a patient leaves the ER, they are either "Admitted" (staying in the hospital) or "Not Admitted" (discharged). Furthermore, many are referred to other departments.

Top Referrals identified:

1. **General Practice (1,840 Patients):** This indicates many patients are coming to the ER for issues that could be solved by a regular doctor.
2. **Orthopedics (995 Patients):** Indicates a high number of bone and injury-related emergencies.



VI. QUALITY OF CARE (SATISFACTION)

The average satisfaction score is 4.99 out of 10. This is lower than the typical industry target of 7.0. Our data-driven analysis suggests that satisfaction is tied more closely to the "Perceived Quality" of the interaction rather than just the wait time.

VII. RECOMMENDATIONS

Based on the 9,216 records analyzed, the following interventions are suggested:

1. **Redirect Low-Acuity Patients:** Create a "Fast Track" clinic for the 1,840 General Practice referrals to prevent them from clogging the main ER.
2. **Senior-Specific Care:** Since the 1,736 Seniors have higher admission rates, a dedicated "Geriatric Triage" nurse could improve flow.
3. **Communication Training:** Focus on staff interaction to raise the 4.99 satisfaction score during the 35-minute wait.

VIII. CONCLUSION

This study successfully utilized data analytics to map the current state of ER operations. While throughput (35.26m) is stable, the low satisfaction and high volume of GP referrals suggest that the hospital is being used as a primary care facility rather than just for emergencies. Addressing these referral patterns is the most effective way to meet future operational targets.