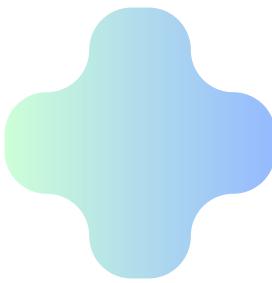


HEALTHCARE ANALYTICS

PREDICTING EMERGENCY
ROOM OVERCROWDING

PREPARED BY
SAIPRASAD.S.R



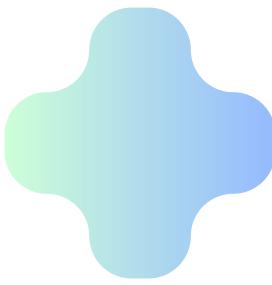


Introduction:

Emergency rooms (ERs) often get too crowded, leading to long wait times, stress on doctors and nurses, and delays in patient care. If we can predict when the ER will be overcrowded, hospitals can prepare in advance by adding more staff, arranging extra beds, and improving patient flow.

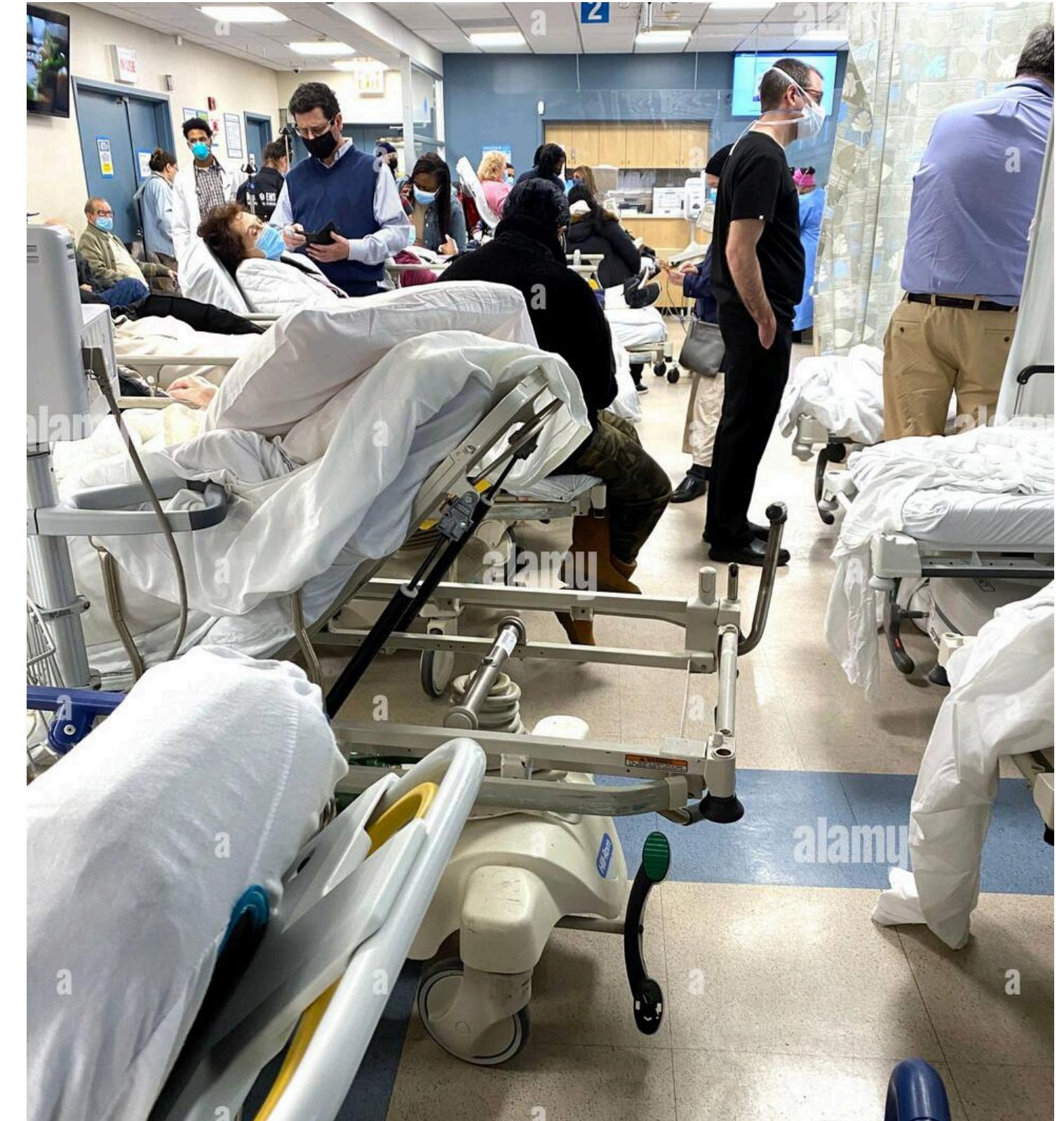
Overcrowding happens for many reasons. Some days, like weekends and holidays, bring in more patients. During flu season or extreme weather, more people visit the ER. Some patients come for minor health issues that could be treated by a regular doctor, but they go to the ER instead. Also, emergency cases like accidents and sudden illnesses add to the number of people needing urgent care. When all these things happen at the same time, hospitals struggle to keep up.

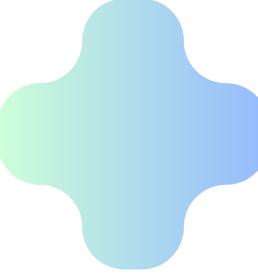




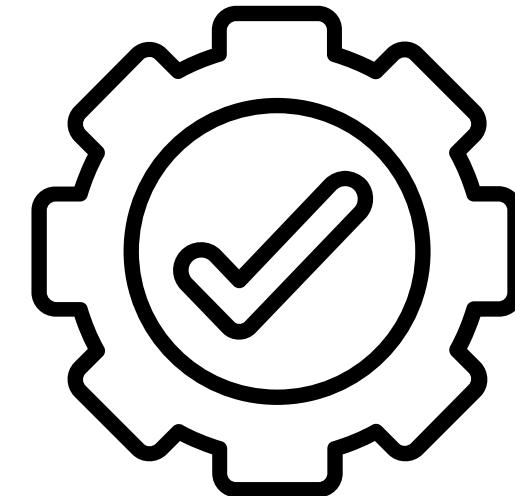
Problem Statement

Emergency rooms (ERs) often get too crowded, making patients wait a long time to see a doctor. This can be dangerous, especially for people with serious health problems. Doctors and nurses also get stressed when they have too many patients at once, and hospitals struggle to manage beds and resources properly.





PROJECT PROCESS



Data Set

- WE HAVE USE CONTAINS STRUCTURED DATA. THIS DATASET WILL INCLUDE COLUMNS RELEVANT TO HOLIDAYS, FLU SEASONS, AND WEATHER CONDITIONS THAT MAY IMPACT ER VISITS.

Data Cleaning and Preprocessing

- WE HAVE USED EXCEL FOR DATA CLEANING, HANDLE MISSING VALUES
- USED PYTHON FOR PERFORMING EXPLORATORY DATA ANALYSIS (EDA)

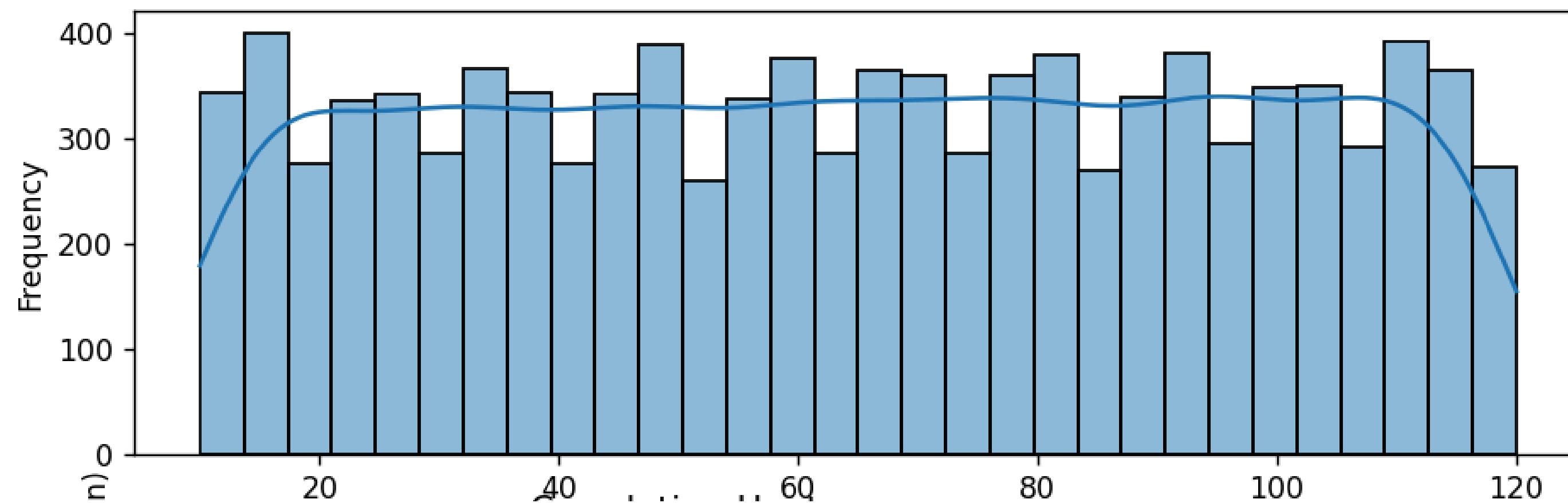
Data Visualization

- USED POWER BI AND PYTHON TO BUILD VISUALIZATIONS AND DASHBOARD

KEY INSIGHTS

- The waiting times are widely distributed, with a significant number of patients experiencing long delays (up to 120 minutes). This suggests potential overcrowding in the ER, leading to extended wait times for medical attention. Hospitals may need to optimize staffing and resource allocation to reduce patient wait times.

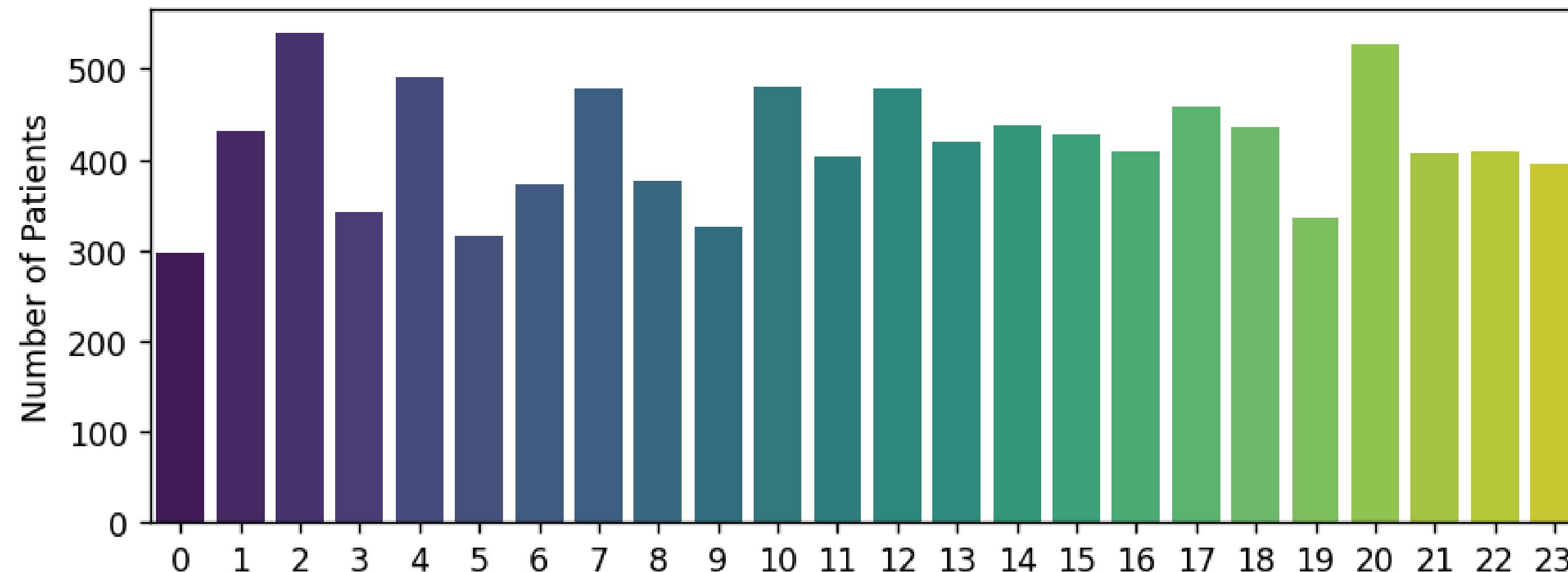
DISTRIBUTION OF WAITING TIMES



PATIENT ADMISSIONS BY HOUR:

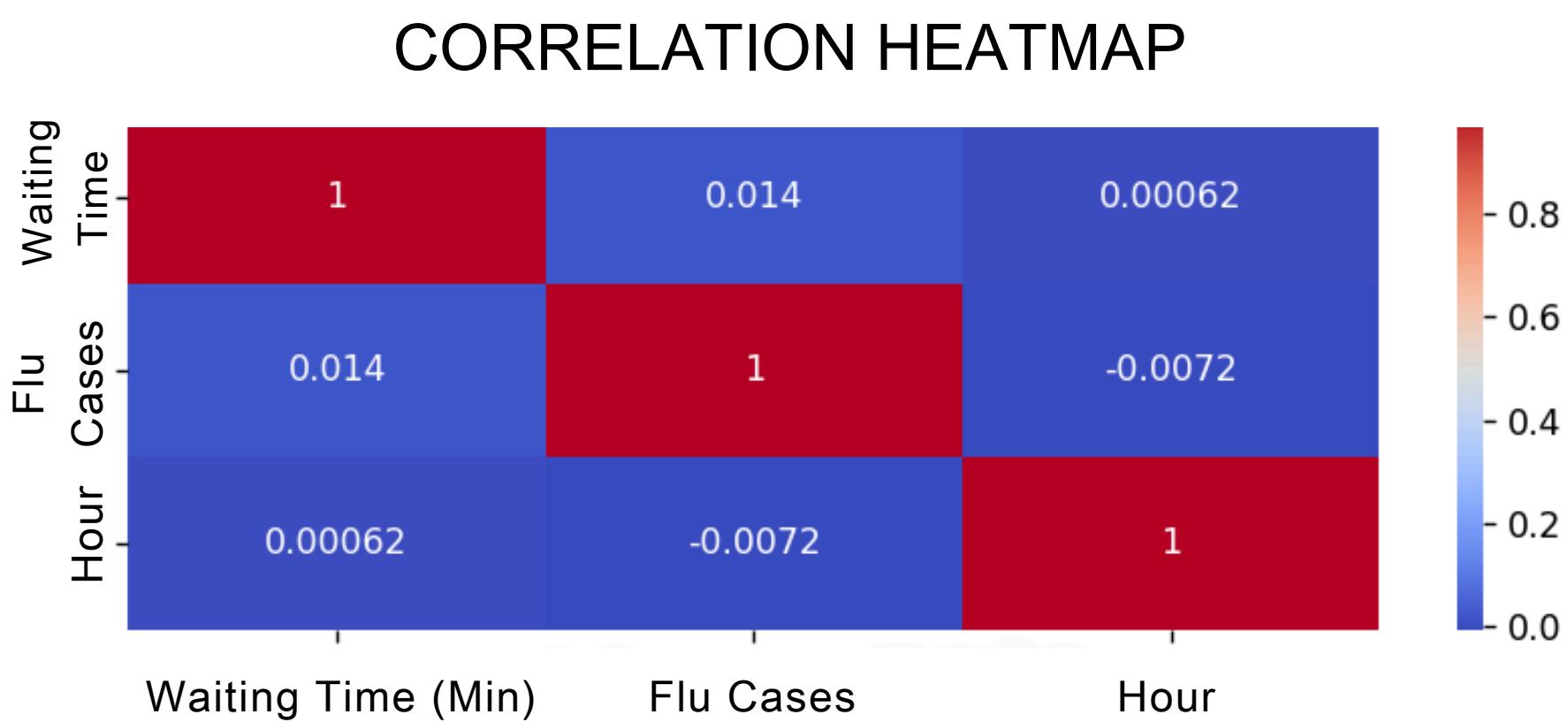
- The highest number of patients arrive at the ER during this period, possibly due to late-night emergencies like accidents, heart attacks, or other urgent medical conditions.
- The ER sees another increase in admissions during the evening, which could be due to post-work incidents, dinner-time health issues, or delayed medical visits.

PATIENT ADMISSIONS BY HOUR



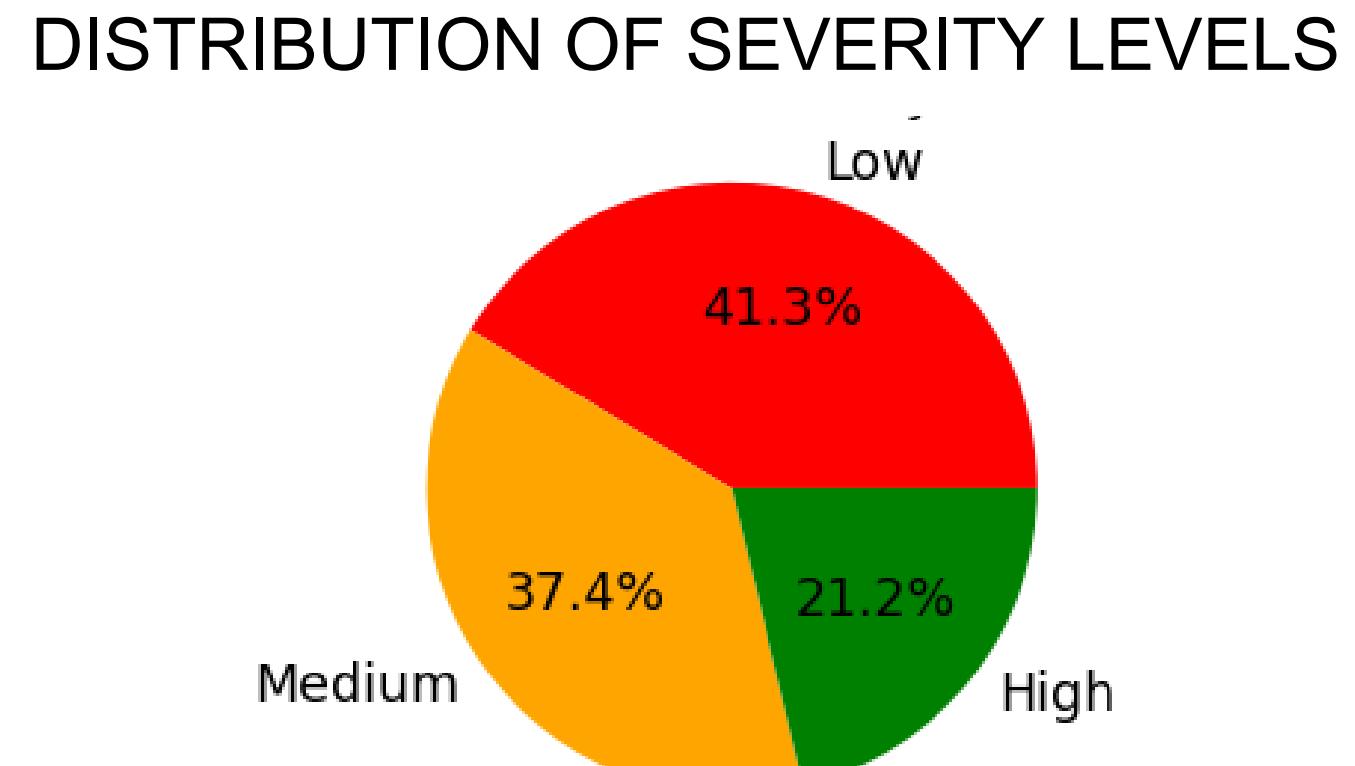
Correlation Heatmap:

- The number (0.014) shows that flu cases do not affect how long patients wait in the ER.
- This means other reasons (like staff availability or emergency cases) may be causing longer wait times.



Distribution of Severity Levels:

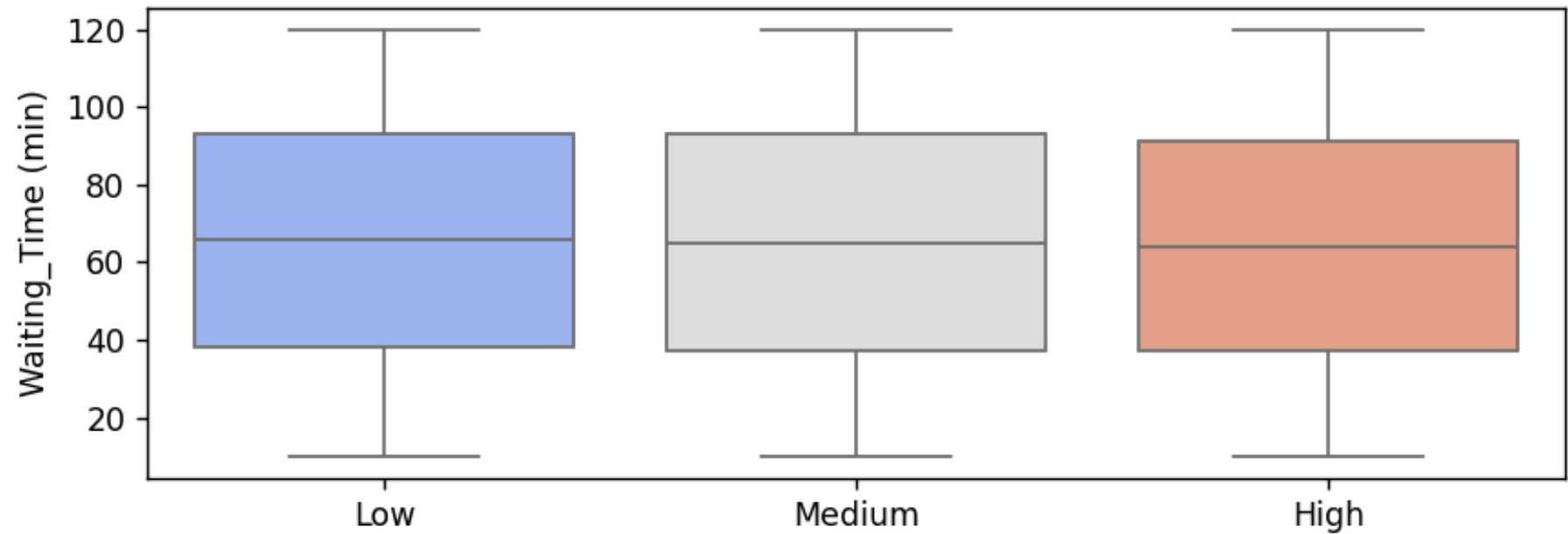
- Most of the time, the ER is not too busy (41.3%). This is a good time for doctors to take breaks or do routine check-ups.
- Only 21.2% of the time, the ER is very crowded. More doctors and nurses should be available during this time to help patients faster.



Waiting Time by Severity Level:

- The waiting time for Low, Medium, and High severity cases is almost the same. This means even high-risk patients might have to wait long, which can be dangerous.
- Some patients get treated fast (~20 min), while others wait over 2 hours (~120 min). Hospitals should prioritize critical cases to reduce waiting times for serious patients.

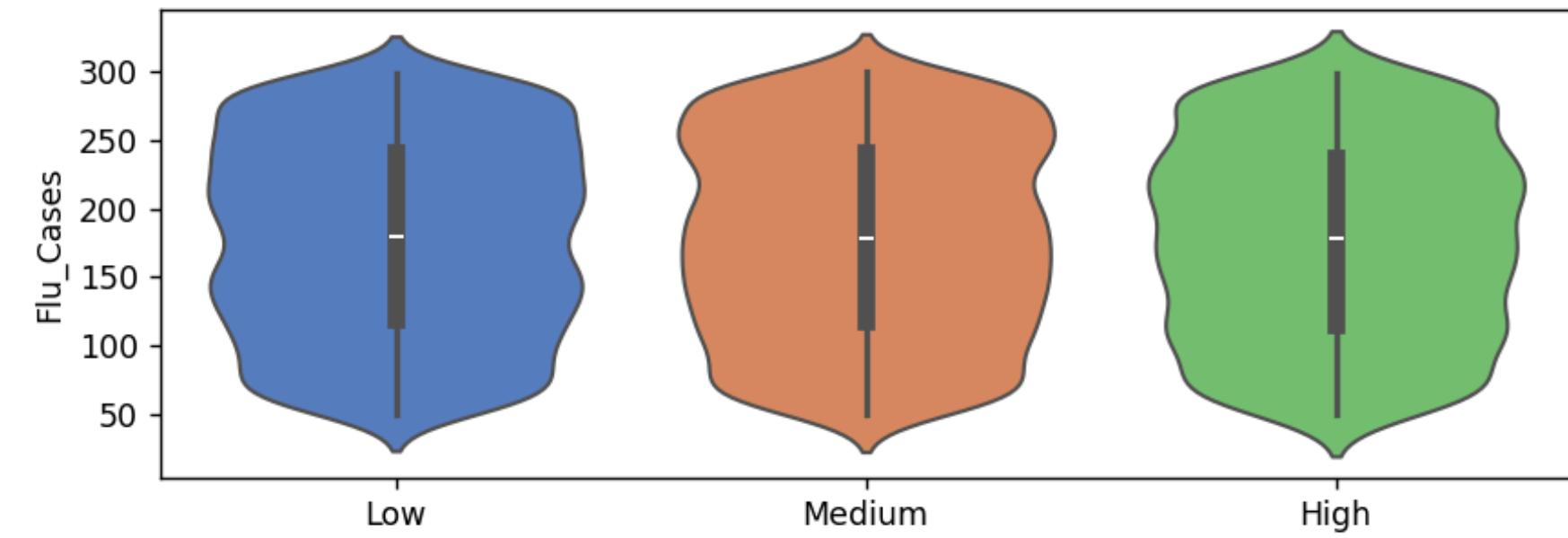
WAITING TIME BY SEVERITY LEVEL



Flu Cases by Severity Level:

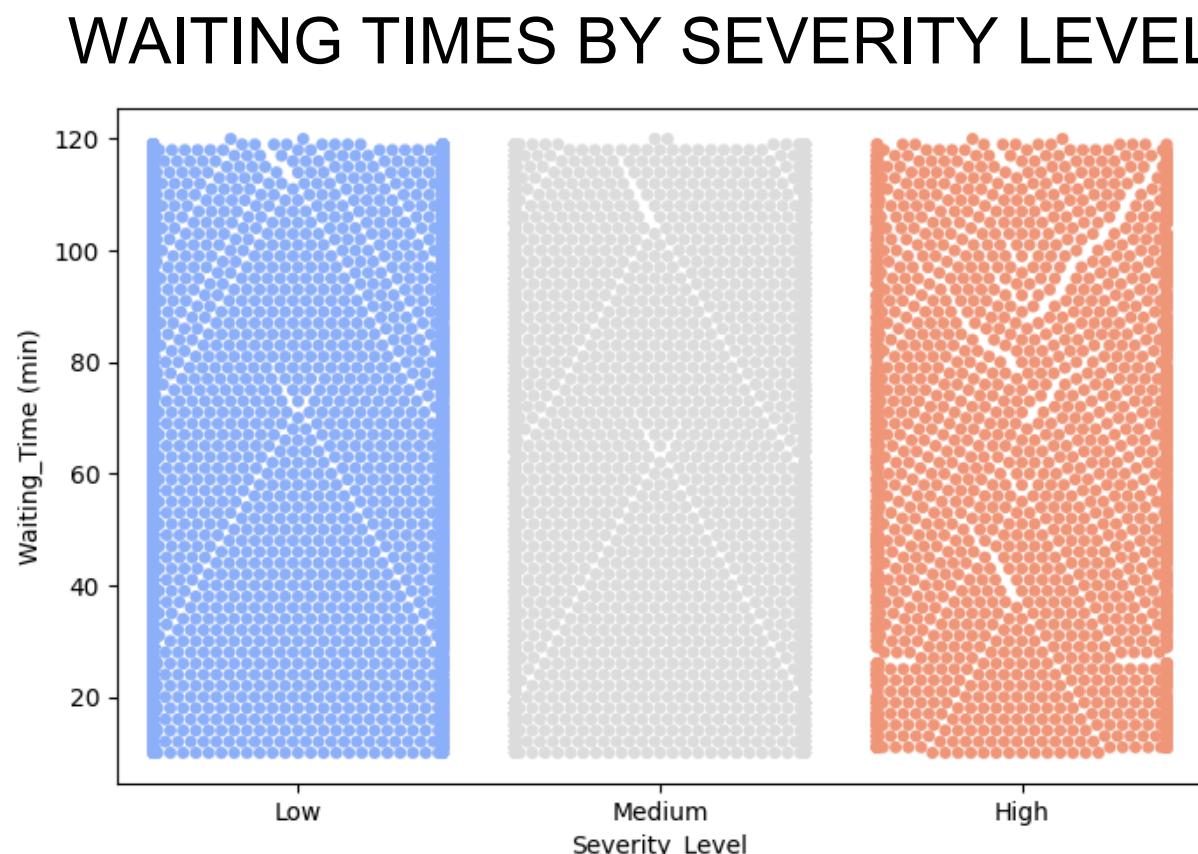
- The shape of the plots for Low, Medium, and High severity cases looks almost the same. This suggests that flu cases are spread out similarly regardless of severity.
- The thickest part of the violin shows most cases range between 100 and 250 flu cases. However, some cases go as low as ~50 and as high as ~300.

FLU CASES BY SEVERITY LEVEL



Waiting Times by Severity Level:

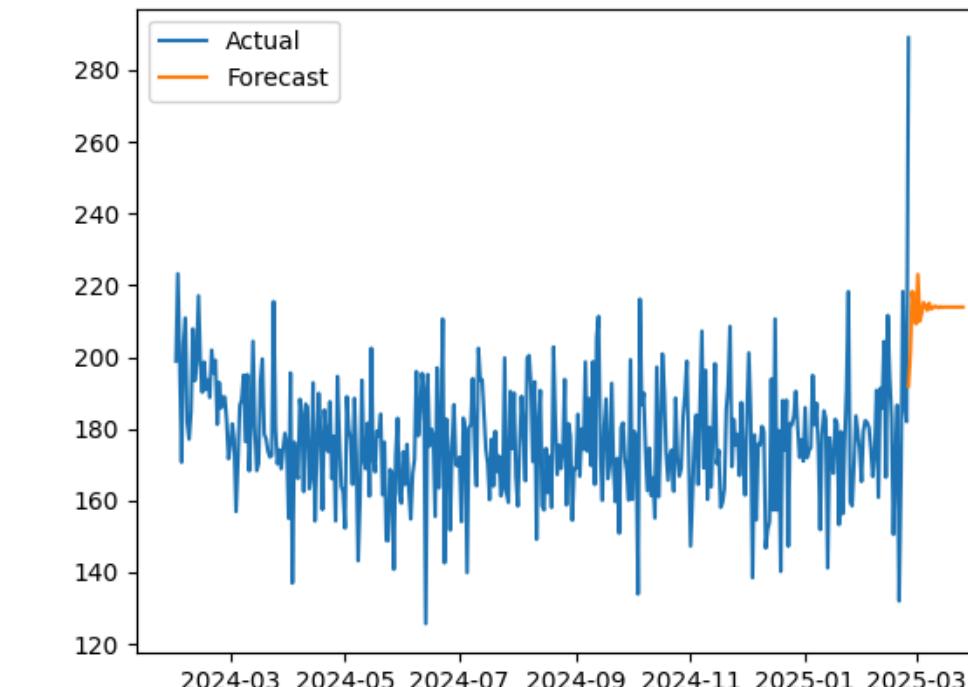
- The dots are evenly distributed from 0 to 120 minutes for Low, Medium, and High severity. This means waiting time does not strongly depend on severity level all patients experience similar delays.
- Some dots are at the top (120 minutes) across all categories, meaning some patients wait for the longest time no matter the severity level. This suggests that hospital capacity or other factors may impact wait times more than severity.



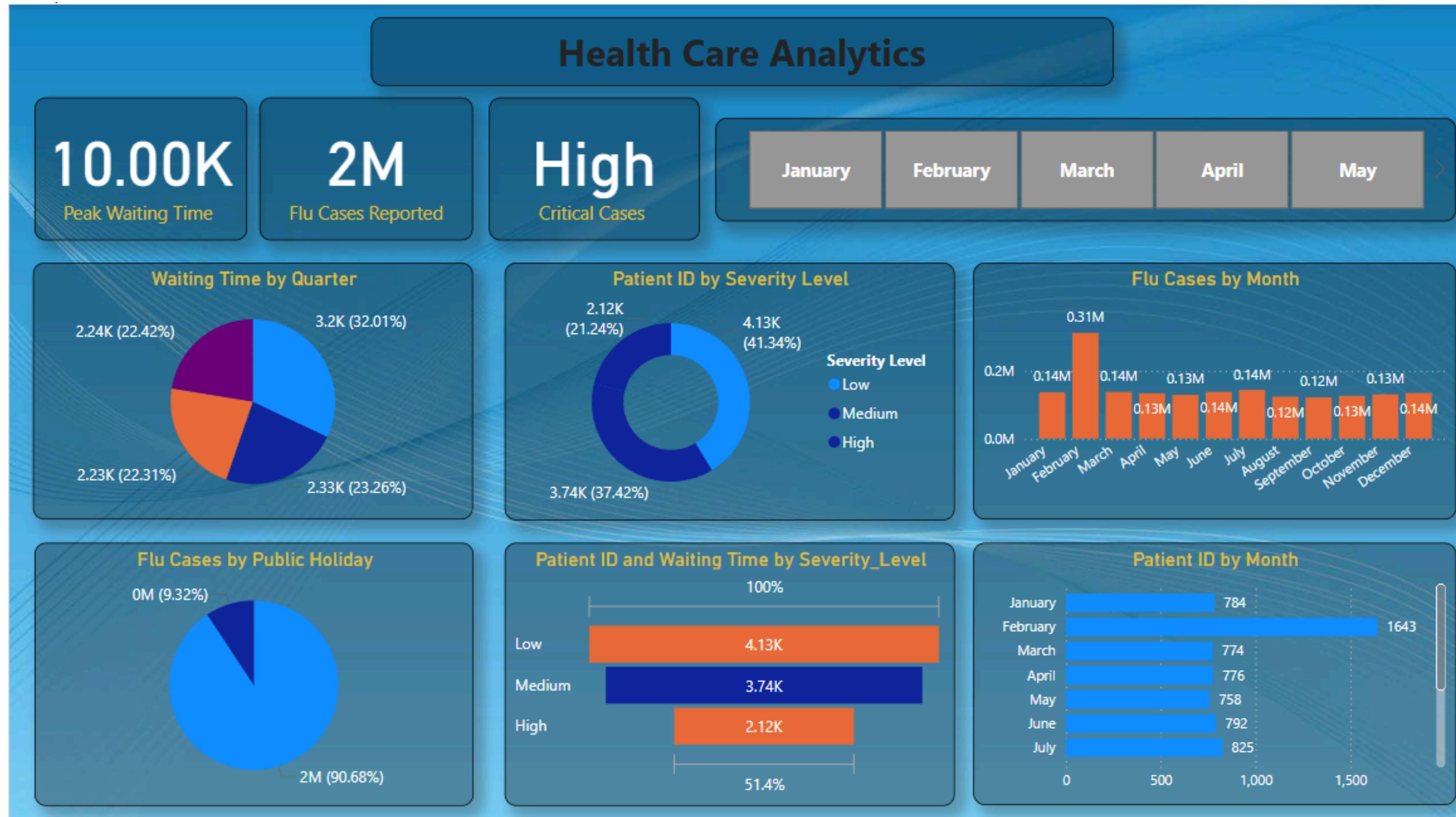
Actual vs Forecasted Waiting Times in the Emergency Room:

- The blue line shows the actual waiting times. It keeps going up and down like a rollercoaster. Sometimes, there are big jumps (like towards the end), which means more patients arrived suddenly.
- The orange line is the forecast (prediction). It doesn't go up and down as much, which means the model is trying to guess a stable trend. But it might predict waiting times slightly higher than reality.

ACTUAL VS FORECASTED



Data Visualization & Dashboard (Power BI)



1 Peak Waiting Time is Extremely High (10K minutes)

- This suggests severe delays in patient care, possibly due to overcrowding or resource shortages.

2 Flu Cases Reported: 2M Cases

- A very high number of cases, with March having the most cases (0.31M), indicating a seasonal spike in flu infections.

3 Severity Levels: Most Patients are in Low & Medium Categories

- 41.34% of patients have Low severity, followed by 37.42% in Medium and 21.24% in High severity.
- This suggests that while many patients visit for flu-related issues, only a small portion require critical care.

4 Public Holidays See the Most Flu Cases (90.68%)

- This trend may indicate higher exposure during gatherings or delayed hospital visits until holidays.

5 Flu Cases and Waiting Time by Severity

- High-severity patients have the lowest numbers (2.12K), but they likely require urgent care.
- Low-severity cases (4.13K) contribute most to patient flow, possibly increasing waiting times.

RECOMMENDATIONS:

1 Adjust Doctor & Nurse Shifts Based on Busy Hours

- Use past data to schedule more staff when ER is busiest.
- Example: Increase nurses during flu season when patient numbers go up.

2 Fast-Track Minor Cases to Reduce Waiting Time

- Quickly check patients and send mild cases to a separate lane.
- Example: A sprained ankle patient doesn't need to wait as long as a heart attack case.

3 Use Data to Manage Beds & Equipment

- Keep track of available beds, ventilators, and other resources.
- Example: If data shows X-ray machines are overused at night, schedule extra support.

4 Predict Overcrowding Before It Happens

- Use AI models to forecast busy days based on past trends.
- Example: If data predicts more patients after a holiday, prepare extra staff.

5 Offer Online Doctor Consultations

- Set up video calls with doctors for minor health issues.
- Example: A patient with mild flu symptoms can get advice without visiting the ER.

6 Use Weather & Flu Data to Prepare in Advance

- Check flu outbreak reports & weather conditions to predict patient spikes.
- Example: If a heatwave is coming, expect more dehydration cases and get IV fluids ready.

THANK YOU

Predicting Emergency room Overcrowding

