

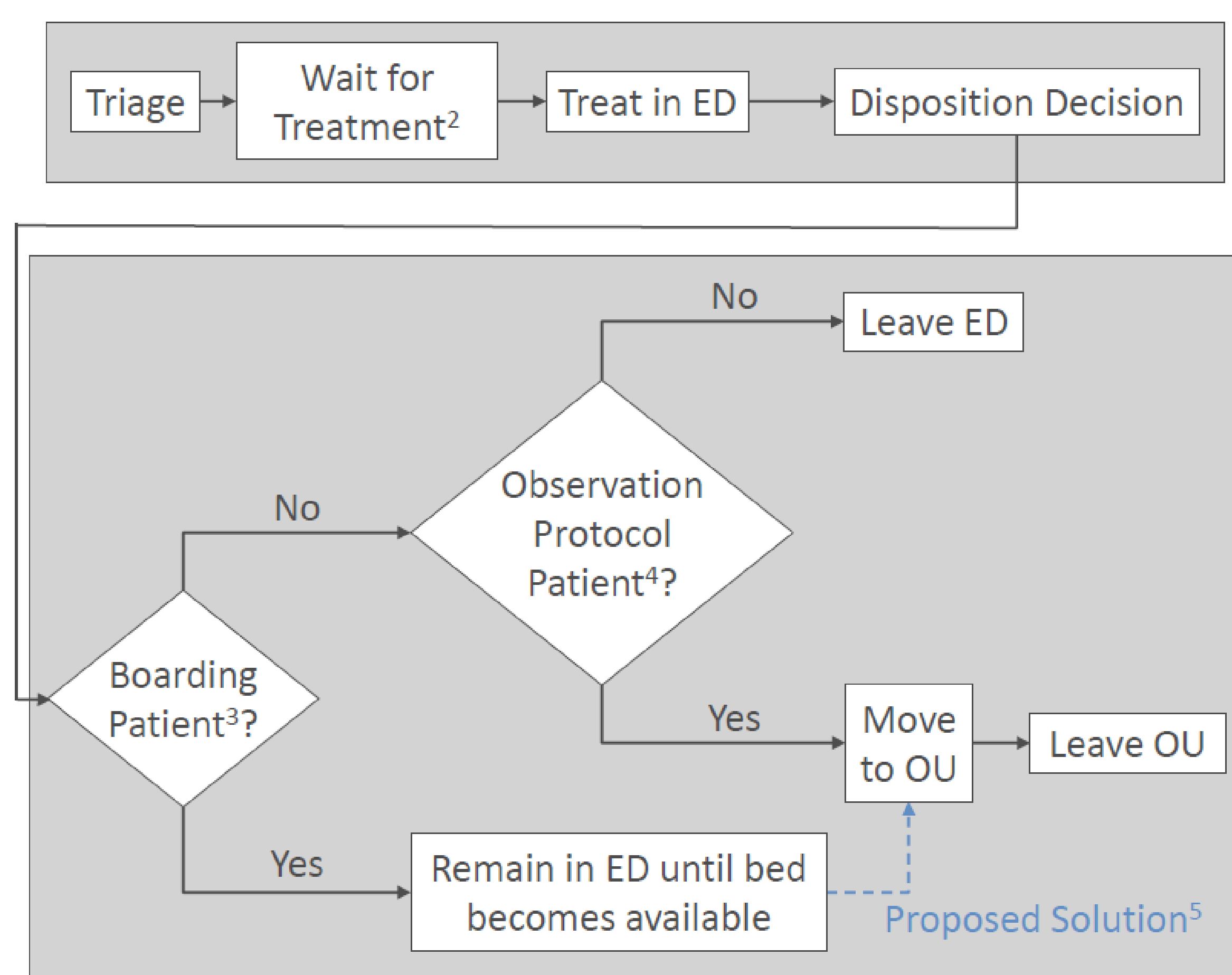
## Problem Statement

Our research focuses on determining the necessity for and optimal size of an observation unit (OU) to help facilitate patient care and improve efficiency at a pediatric emergency department

## Background

### What is an Observation Unit?

- Dedicated area for patients in the ED that need an extended stay (>24 hours)
- Doctors use additional time to further evaluate, monitor and treat patients, resulting in more informed decision-making



### Why is it important?

- ↑ quality of care
- ↓ ED revisits
- ↓ readmission rates
- ↓ lengths of stay
- ↓ health care costs

### Potential benefits

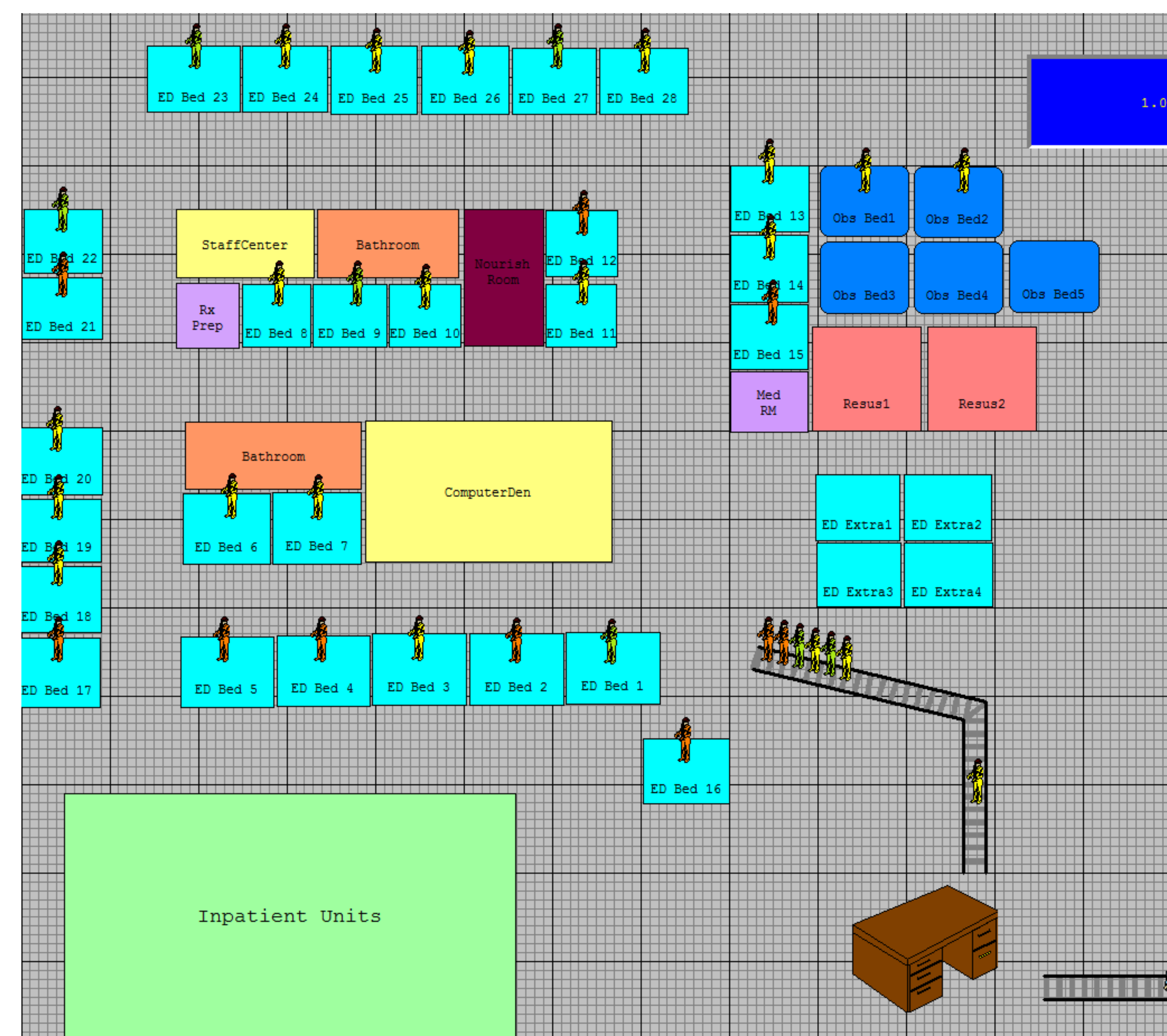
- Higher likelihood of correct disposition decision (i.e. admit vs. discharge)
- Additional time to monitor the patient's condition
- Reduce readmissions into the ED and inpatient unit (IU)
- reduce the delay to treatment for ED patients

## Solution Approach

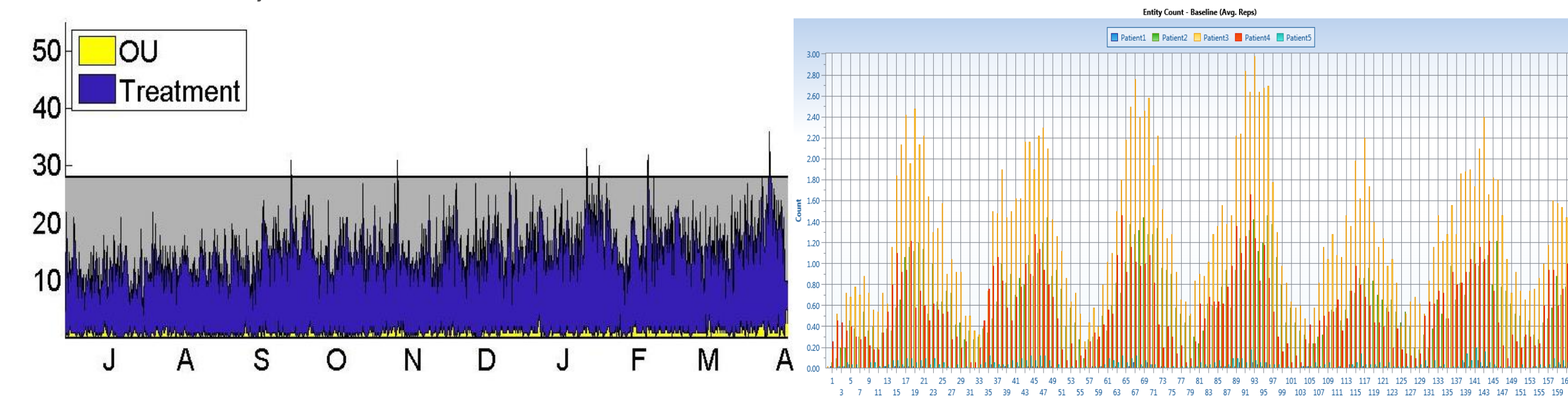
We model the operation of the ED as a multi-stage stochastic network with data from 18000 patient visits:

- Assigned probable Emergency Severity Index (ESI) level and respective treatment time
- After treatment, patients can be (with fitted probability)
  - admitted to an IU,
  - admitted to an OU/stay on Observation protocol
  - sent home

### Simulation model:



- Discrete-event simulation model
- Fitted the model (without OU) to the data collected
  - Validated with Patient arrival comparison (avg 468 pt/week vs. avg 437.6 pt/week)
- Performance Metrics: Time to treatment, Blocked Time by full OU, Utilization of ED & OU beds



Real data vs Simulation data (Pt Arrival)

## Impact/Results

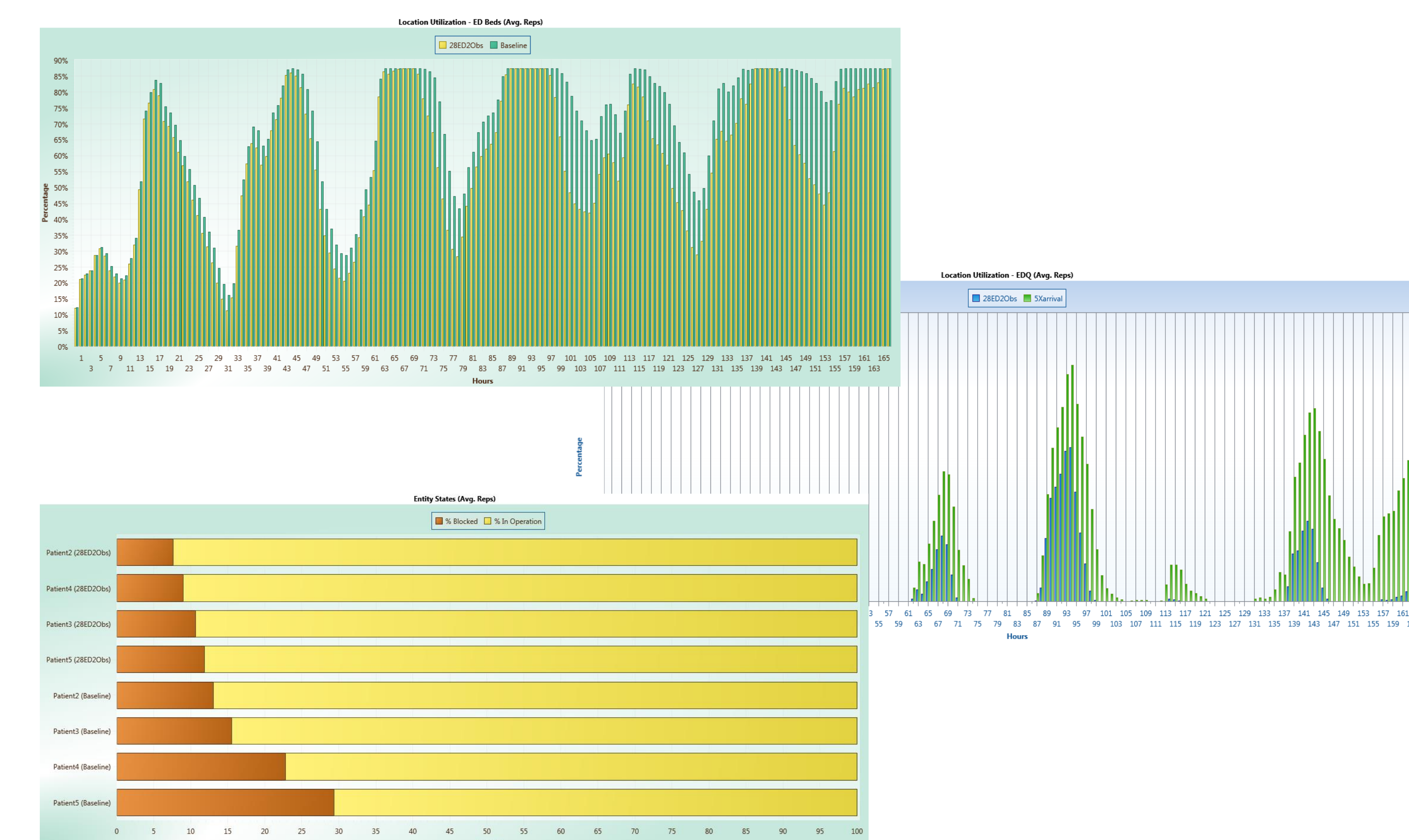
### Simulation scenarios :

**27-32 ED Beds**

**0-5 Observation Beds**

**Original & Elevated Arrival Rate**

- With the result of different scenarios, we were able to determine the more desirable combination of ED bed and OU bed under 5x current arrival rate.
  - Clear reduction of the ED beds utilization/crowding
  - Sharp reduction of Time to Treatment for patients
  - Optimal 2 OU Beds sharply reduce Patient Blocked time



### Future Research

- Optimal OU configurations: Physical layout & floor plan, the number of beds and staff required to achieve desirable operational performance
- Incorporate more data into the model: Staffing information and detailed service times by provider types (nurses, PAs, residents, and attending MDs)

## Acknowledgements

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