Med ECG

Medical Educational Consulting Group

# Using Computational Modeling For Assessing and Improving Operational Management at Michigan Medicine Emergency Department

Abhishek Bhattacharya
Akul Arora
Jeet Das
Blake Duffy
Matthew Friedland
Max Sievers

# Problem Statement

**What is the optimal throughput model of patients in the Michigan Medicine ED?**

# Solutions for Crowding

## Physician in Triage

Skilled personnel at Triage shown to increase efficiency:

- Nurse
- Physician's Assistant
- Attending

## Fast Track

Streamlined treatment of non-urgent patients

- Recently, widely adopted
- Typically staffed by senior staff
- Selectively implemented during peak traffic

## Vertical Treatment

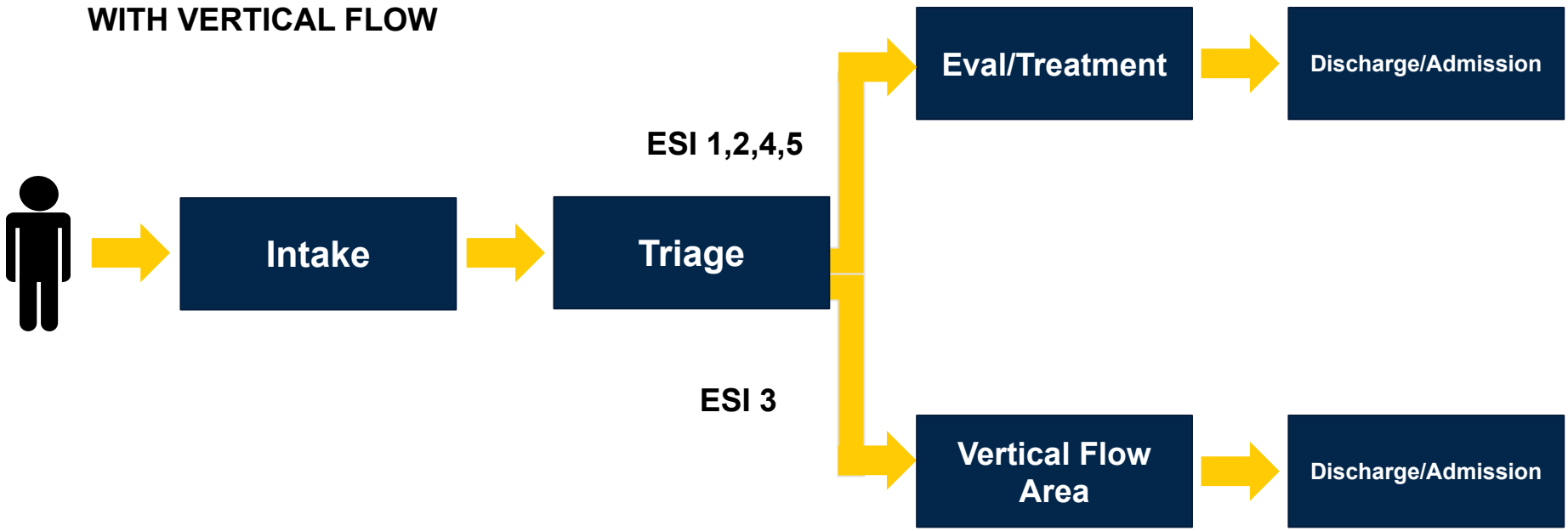
Waiting rooms for mid-acuity (ESI 3) patients

- Less bed utilization
- Allows for ESI escalation

# Patient ED journey pathway without vertical flow

**WITHOUT VERTICAL FLOW**

# Patient ED journey pathway with vertical flow



# Implementation Pathway:

## Data Gather

**Patient Level Data**

- ESI levels
- Timestamps
  - LOS
  - TTP

**ED Flow Data**

- Vertical treatment zone scheme

## Modeling

**Build**

- Ensure proper inputs and outputs
- Incorporate data gathered

**Validate**

- Compare model outcomes with known outcomes

## Presentation

**Provide Final Results**

- Optimal size
- Impact on time and money saved

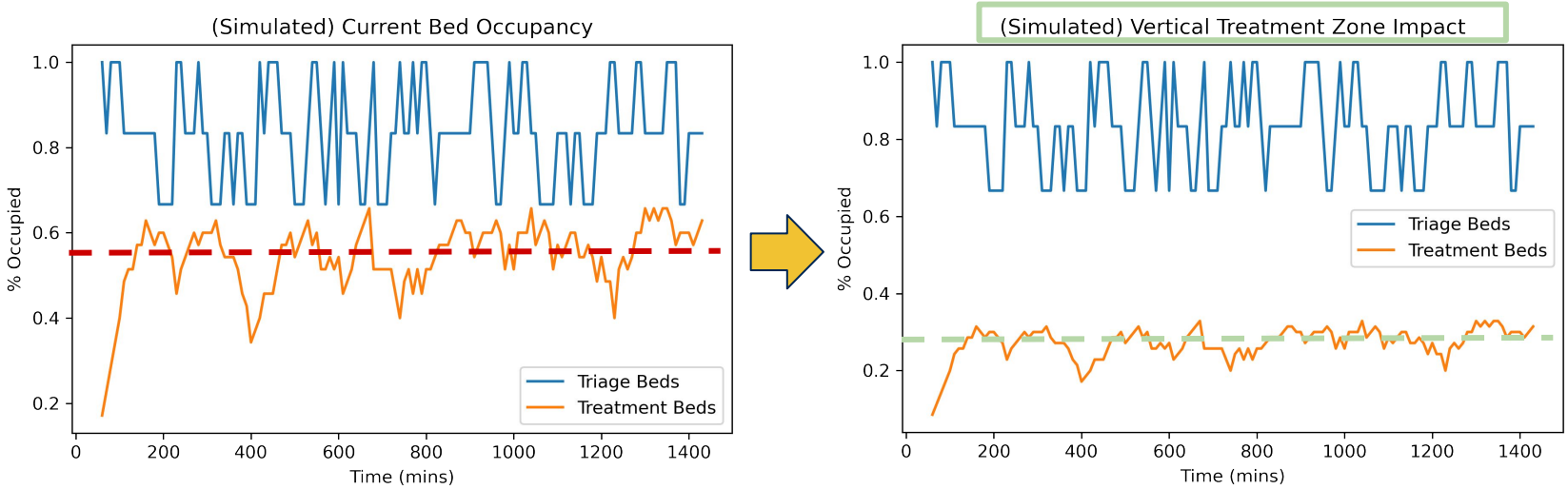
**Deeper Dive**

- Potential U of M collaborations
- Student Involvement
- Professional modeling and consulting

# Patient Flow Modeling Options (Wiler et. al. 2011)

| Modeling Type | Description | Ability to Forecast ED Crowding | Ability to Predict Process Improvement Impact |
|---|---|---|---|
| Formula-Based | Past experiences of ED flow used to posit formulas | Poor | N/A |
| Regression-Based | Statistically predicts dependent variables based on independent variables | Fair | Poor |
| Time-Series Analysis | Statistically uses recent past performance to predict current and immediate future performance | Fair | Poor |
| Queuing Theory | Mathematical formulas derived from system principles, utilizes many underlying assumptions | Poor | Good |
| *Discrete-Event Simulation | Computer-generated model used to sample inputs and generate outputs, *most frequently used in literature | Fair | Good |

# Preliminary Results:



# Our Team

**Akul Arora**

**Abhishek Bhattacharya**

**Jeet Das**

**Blake Duffy**

**Matt Friedland**

**Max Sievers**