Simulating the Flow of Patients with Aortic Dissection Through a Cardiac Intensive Care Unit

**Amanda** Moreno-Hernandez, MSE, Amy Cohn, PhD, Joi-Lynn Mondisa, PhD & Hitinder Gurm, MD

**Industrial & Operations Engineering, University of Michigan** | **Michigan Medicine**

**Introduction:**
Aortic dissection (AD) is an emergency cardiovascular condition affecting the aorta.

Mortality rate for AD increases 1% per hour and 20% of AD individuals die before reaching the hospital.

AD patients receive care among other cardiovascular surgery patients, which represent the most common surgery in the United States.

Preliminary analysis showed that the most common reason for AD patient deferral was due to an unavailable ICU bed.

**Methods:**
- **Current State Simulation**
  - Test Policies to Increase AD Patients’ Access to High Quality Care
  - Educate Clinical Partners About Uncertainty

- **Future State Simulation**
  - Simulation Logic
    - Simulation Framework: Michart, Data Direct, SQL Database
    - Inputs
      - Fixed Inputs: Bed Count, Time Horizon, Replications
      - Random Inputs: Patient Type, Arrival Rate, Length of Stay
    - Metrics
      - Patients: No. Arrival, No. Accepted, No. Denied
      - Length of Stay
    - Assumptions:
      - OR, surgeon and staff are always available
      - Any patient can be denied
    - Analysis:
      - 1 Patient type
      - Arrival rate = 0.31 pt/hr
      - Time horizon = 1 year
      - Replications = 1,000
      - P\text{Transfer} = 0.22
      - P\text{Discharge} = 0.24
      - 32 ICU beds, 52 SD beds
        - 16 Dedicated SD beds
        - 36 Shared SD beds

**Simulation Logic:**
- Patient Arrives
  - Open ICU Bed?
  - Patient Denied
  - ICU Step Down
  - Discharged
- Patient Denied
  - ICU Step Down
  - Discharged

**Analysis:**
- Bed Trade Off Analysis
  - ICU Beds: 28
  - SD Beds: 56

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