Mechanical & Industrial Engineering
UNIVERSITY OF TORONTO

Hospital-Wide Simulation of Patient Flow with both Operational and Tactical Applications

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Summary

The development and application of a hospital-wide patient flow model that can be used for strategic and operational decision making.

Model Design

As shown below, the model includes flow through the Emergency Department, Operating Rooms, and Inpatient Units.

Hospital-specific structures and policies are captured in an excel input file, which is then imported into the SIMUL8 model creating a unique, hospital-specific, discrete event model.

Policies captured include behavioral and operational changes that occur both during steady state operations and during surge - such as expediting discharges and opening additional beds.

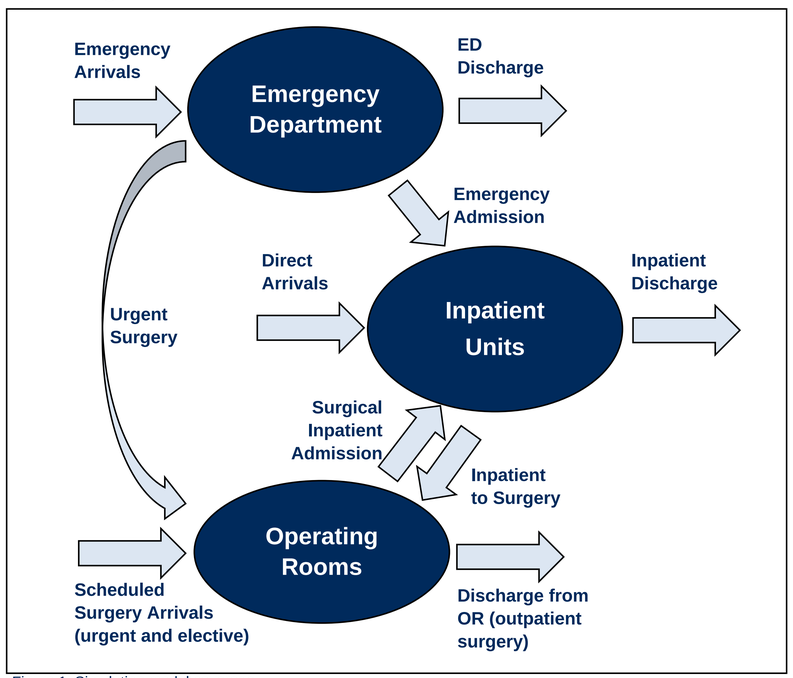

Figure 1: Simulation model coverage

Operational Planning

Allows decision makers to see impact of controllable and uncontrollable variables such as

- OR scheduling
- Bed capacity and allocation decisions
- Surge protocol design
- Arrivals/admissions rate
- Patient length of stay
- Management policies

Output of the model includes

- Throughput
- Wait times
- Unit occupancy
- Surge frequency

Sample Scenarios

Comparison of possible scenarios aiming to reduce average Emergency Department (ED) boarding time, which is defined as: the hours from admission decision to transfer to an inpatient bed.

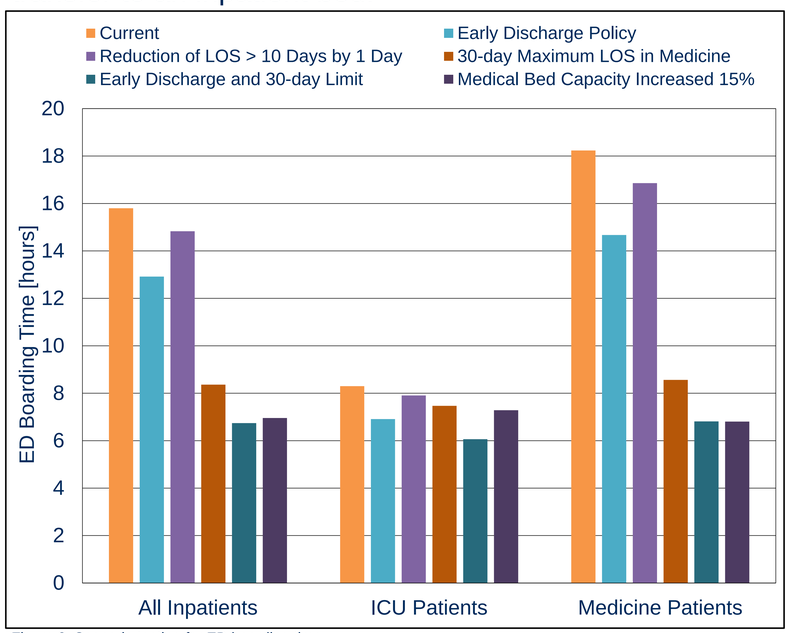

Figure 2: Scenario testing for ED boarding time

Tactical Decision Making

Produces a seven-day prediction of the hospital state based on the following inputs:

- Planned elective surgical schedule
- Forecasted arrival rates
- Actual current inpatient census

Can be used to inform tactical decisions such as:

- Bed capacity required
- Staffing needs
- Expected surge level
- Impacted areas

Use Case

Developed at the University Health Network (UHN) to enable data-driven decision making and increase the planning horizon for the management of patient flow.

Piloted at Toronto General Hospital to create a predictive report with potential future work to integrate into existing operational dashboards.

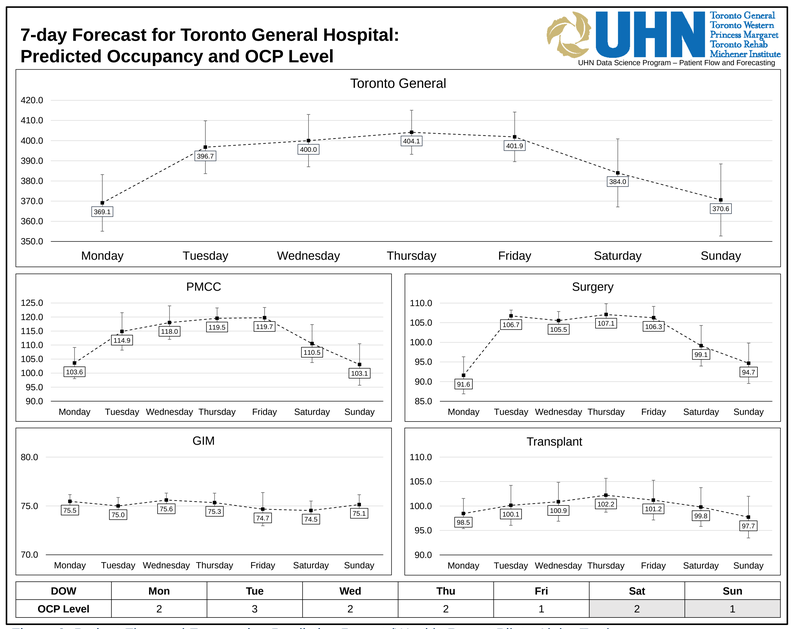

Figure 3: Patient Flow and Forecasting Predictive Report (Weekly Report Pilot - Alpha Test)