A Simulation-Based Perioperative Decision Support System

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In Canada and around the world, there has been increased focus on the efficiency, cost and access to health care services. One area of particular interest is surgical procedures, often associated with government funding and policies aimed at reducing wait times through pay for performance and volume target initiatives. In Ontario, an expert panel (Surgical Process Analysis and Improvement) was assembled in 2007 to provide recommendations to improve access, efficiency and quality. One of the panel's recommendations is the use of simulation-based decision tools to help hospitals inform decisions that can lead to improved surgical processes. The goal of this project was to develop one single generic model that could be tailored to any hospital.

Methodology

The pilot model was developed with Juravinski (Hamilton Health Sciences), St. Michael's and Mount Sinai Hospitals. We initially validated the model against historical performance of throughput and cancellation rates of one service at each hospital, with significant participation from stakeholders at each hospital.

The model was designed to output key measures, such as:

- Throughput, total time, occupancy and utilization
- Surgery cancellation and delay rates
- Wait list size and time (elective and urgent/emergent)

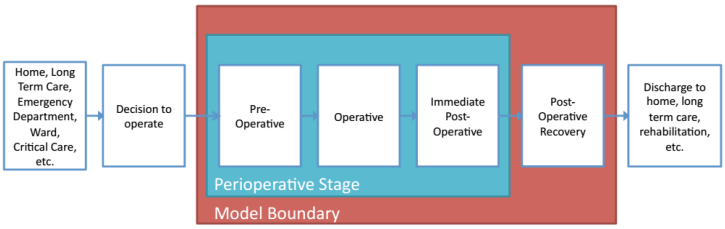
Once validated, the model had the ability to test what-if scenarios, such as:

- Changes in booking policies – shortest cases first, etc.
- Changes in block schedule – longer OR (operating room) days, changes in service or surgeon assignments
- Increase in resources – PACU (post-anaesthesia care unit), ICU (intensive care unit) or ward beds
- Decreased ALC (alternate level of care) LOS (length of stay) times
- Reduced variability between surgeons, or between booked time and actual time

The model has now been applied to all surgical services at Juravinski, Brampton Civic and Etobicoke General (William Osler Health System), Prince Albert (Sask.), Saskatoon Health Region (Saskatoon City,

St. Paul's and Royal University), St. Michael's, Toronto General, Hamilton General and Toronto Western Hospitals. We are currently working with the Scarborough Hospital and MacKenzie Health.

Results and Impact



The result of this project was a generic model based on typical perioperative flow processes and best practices. This generic model is data-driven, allowing for a significant amount of flexibility to accommodate specific characteristics of a hospital and their patients. In addition, the research provided valuable insight into achieving user acceptance of generic tactical decision models.

Finally, the model is a useful application as a decision and demonstrative tool – to tease out inefficiencies in current processes, and to compare and evaluate various possible new processes, schedules and resources. When Juravinski Hospital implemented one of the scenarios tested by the model, it saw approximately 50% reduction in length of stay of emergency patients waiting for inpatient beds. William Osler Health System was also able to use the simulation model to support scheduling changes that resulted in a reduction of cancellations due to no ward beds, and the smoothing and levelling of ward census during the week.

Partner Profile

The Juravinski Hospital is one of three acute hospitals belonging to Hamilton Health Sciences, an academic research centre affiliated with McMaster University. The Juravinski is composed of 228 beds with about 9,000 admissions and nearly 30,000 emergency department visits per year.

Mount Sinai Hospital, part of Sinai Health System, is a 442-bed centre for health sciences affiliated with the University of Toronto. Its clinical strengths include women's and infants' health, chronic disease management, specialized cancer care, emergency medicine, and geriatrics.

St. Michael's Hospital is located downtown Toronto and is one of University of Toronto's teaching hospitals. The hospital has over 480 adult inpatient beds, including around 60 intensive care beds, which together discharge almost 25,000 patients a year.

William Osler Health System services part of the Greater Toronto Area and surrounding areas and is one of the largest hospital organisations in Ontario. William Osler HS is composed of three community hospitals: Brampton Civic Hospital, Etobicoke General Hospital and Peel Memorial Hospital.

Prince Albert Hospital, part of Prince Albert Parkland Health Region, is a small rural hospital in Saskatchewan consisting of only four ORs.

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