CREATEing Leaders in Healthcare Operations Information Management

CRÉATION de dirigeants: Programme d'opérations de soins de santé et information

PI: Vedat Verter, McGill University

NSERC CRSNG

DESAUTELS Faculty of Management Faculté de gestion

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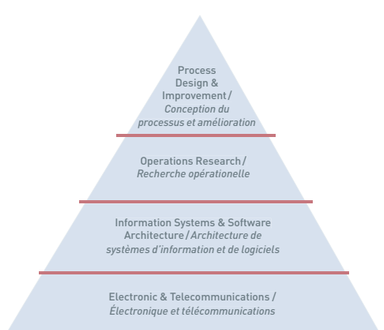
CREATE
HEALTHCARE OPERATIONS & INFORMATION MANAGEMENT

The Program

- The program is structured to drastically improve the collective capacity of the partner universities for training doctoral students and post-doctoral fellows, who will become significant contributors to healthcare research, practice and policy making.
- Brings together engineering, management, and clinical perspectives by building on the expertise of partner universities and supporting healthcare organizations.
- Fosters system thinking by emphasizing an interdisciplinary approach.
- Supports the improvement and reorganization of healthcare delivery operations with training in the key areas and strong exposure and connections to decision makers in the healthcare sector.



Scheduling Surgical Cases with Stochastically-Ordered Durations

Yun Zhou, Mahmut Parlar, Vedat Verter and Dr. Shannon Fraser

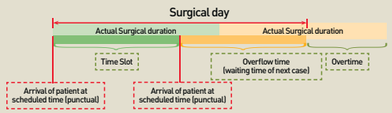
MOTIVATION

- The operating theatre is often the major cost driver in a hospital, accounting for more than 40% of a hospitals revenue.
- Ineffective scheduling leads to long patient waiting time, cancellation of surgical cases, and significant cost due to idle resources and overtime of surgical teams.
- To obtain optimal sequencing policies of better performance.

THE MODEL

- Daily surgical sequencing for elective surgeries with random durations where the surgical day is divided into time slots;
- Two types of surgical cases to be scheduled:
- The random duration of one type is stochastically shorter than the other
- Performance measures:
  (A) Total patient waiting time; (B). Operating room overtime;

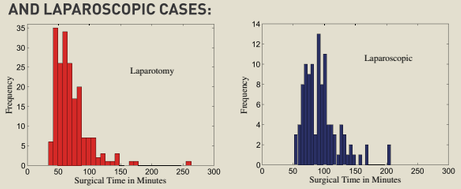
AN EXAMPLE OF TWO SURGICAL CASES TO BE SCHEDULED:



CASE STUDY

- Data set Jewish General Hospital: Hernia repair surgeries: 305 inguinal cases
  - 198 laparotomy cases and 107 laparoscopic cases

THE DISTRIBUTIONS OF DURATIONS OF LAPAROTOMY AND LAPAROSCOPIC CASES:



Observation: The duration of the Laparotomy surgery is stochastically shorter than the Laparoscopic surgery

COMPARE THE TWO POLICIES P1 AND P2

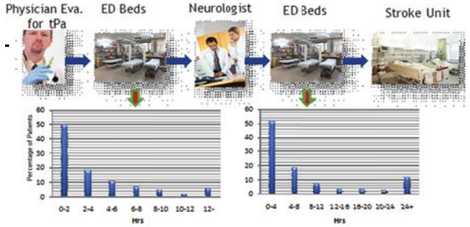
- Waiting time: 660 minutes under P1, 1199 minutes under P2
- 205 minutes under P1, 212 minutes under P2

Improving Health Outcomes through Operational Policies

Saied Samiedaluie, Beste Kucukyazici, Vedat Verter and Dan Zhang

MOTIVATION

- For every minute delay in treating a stroke, the average patient loses 1.9 million brain cells.
- Each hour in which treatment does not occur, the brain loses as many neurons as it does in almost 3.6 years of normal aging.



Data

- All ischemic patients admitted to Montreal Neurological Hospital between 2005 and 2008

EMPIRICAL ANALYSIS

- Whether the congestion in the ward leads to longer waiting times in the ED?
- Whether the longer LOS in the ED worsens the functionality of the patient at the time of discharge from hospital?
- Whether the longer LOS in the ED leads to longer in-hospital LOS?
- What is the overall capacity implication of worsened health outcomes?

OPTIMIZATION OF PATIENT ADMISSION POLICIES

- Limited number of beds in neurology ward
- Multiple types of patients with different medical characteristics (severe/ moderate stroke and non-stroke patients)
- Admission to neurological ward to continue receiving acute care or transfer to another hospital
- Solve a mathematical model to find the best admission and transfer policy, which minimizes the long run average waiting cost of all types of patients.

CONCLUSIONS

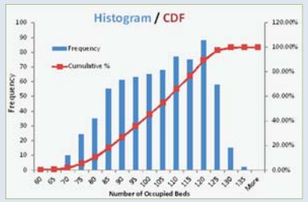
- Inaccessibility to appropriate care has a clear and negative effect on patient's health outcomes.
- The dynamic bed allocation policies give better improvements.

Surgical Block-Scheduling: A Systematic Approach for Surgical Bed Management

Mohammad Mehdi Ghotboddini, Vedat Verter, Dr. Lawrence Rosenberg and Valerie Vandal

MOTIVATION

- Absence of a systematic approach for utilizing the bed resources of a surgical unit
- Cancellation and rescheduling of elective surgeries as a formidable challenge
- Significant increases in hospital costs as well as patient and surgeon dissatisfaction
- Surgical procedures cancellation due to bed unavailability
- Incorporation of expected bed availability in the planning process



Flexible units policy

	Service Level	Separate Surgical Units							Pooling Strategy			
		Cardiac	Gén-ortho	E.N.T.	General surgery	Gynecology	Orthopedics	Urology	Pure Orthopedics	Pure General surgery	Flexible Units	Dedicated Units
Number of Beds	100%	25	19	15	52	14	30	14	22	63	135	169
	90%	21	14	12	42	9	25	9	18	53	120	132
Utilization	100%	0.73	0.57	0.40	0.69	0.41	0.67	0.39	0.51	0.74	0.77	0.61
	90%	0.86	0.76	0.48	0.85	0.61	0.79	0.59	0.61	0.87	0.86	0.76

Summary of simulation analyses results

CONCLUSION AND FUTURE WORK

- Providing 90% service level under the Dedicated Units policy versus serving 100% of patients under the Flexible Units policy requires the same number of beds.
- Developing an optimization based on simulation model to find a robust block-schedule for the OR under alternative pooling policies and the available downstream surgical beds at each division.

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CO-RESEARCHERS / *CO-CHERCHEURS*

Vedat Verter, Program Director, McGill
Steven Blostein, Queens University
Mike Carter, University of Toronto
Michel Gendreau, École Polytechnique
Bernard Gendron, Université de Montréal
Armann Ingolfsson, University of Alberta
Wojtek Michalowski, University of Ottawa
Alain Pinsonneault, McGill University
Marty Puterman, University of British Columbia

RESEARCH COLLABORATORS / *COLLABORATEURS*

Dr. Mark Afilalo, Montreal Jewish General Hospital
Dionne Aleman, University of Toronto
Dr. Preeti Anand, Royal Victoria Hospital
Gillian Bartlett-Esquilant, McGill University
Dr. Marc Beique, McGill University Health Center
Oded Berman, Rotman School of Management
Dr. Mark Blostein, Montreal Jewish General Hospital
Adalsteinn Brown, Ontario Ministry of Health
Timothy Chan, University of Toronto
Dr. Khaled El Emam, Children's Hospital of Eastern Ontario
Jacques Ferland, Université de Montréal
Dr. John French, BC Cancer Agency
Viviane Gascon, Quebec à Trois-Rivières
Beste Kucukyazici, MIT-Zaragoza
Dr. Eddy Lang, University of Calgary
Nadia Larichi, École Polytechnique Montréal
Wendy Lou, University of Toronto
Dr. Jeffrey Minuk, Montreal Jewish General Hospital
Dr. Chris Nguan, Vancouver General Hospital
Jonathan Patrick, University of Ottawa
Dr. Richard Riopelle, Montreal Neurological Hospital
Dr. Lawrence Rosenberg, Montreal Jewish General Hospital
Pablo Santibanez, BC Cancer Agency
Dr. Brian Schwartz, Sunnybrook Health Science Center
Dr. Eli Segal, Urgence Santé Montreal
Steven Shechter, University British Columbia
Robert Smith, UBC Centre Healthcare Mgmt
Patrick Soriano, HEC Montréal
Phil Troy, Decision Support Systems Analyst
Dr. Samara Zavalkoff, Montreal Children's Hospital

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