UNIVERSITY OF TWENTE.

Implementing algorithms to reduce ward occupancy fluctuations through advanced planning

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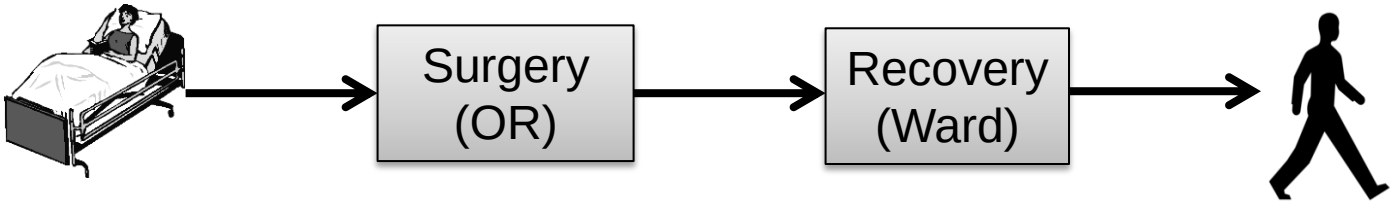
CHOIR- Center for Healthcare Operations Improvement and Research

Netherlands Cancer Institute – Antoni van Leeuwenhoek Hospital

PROBLEM



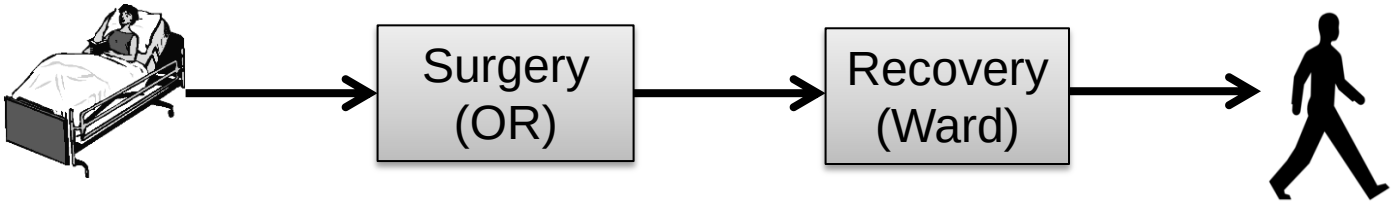
Surgical Schedule

	Mon	Tue	Wed	Thu	Fri
OR1	Chi (KLM)	CHI (VWL)	CHI (vwl/rur) HIPEC	Chi (nie)	Chi (VRP)
OR2	KNO	CHI (RUT)	Urologie (hbs)	RT	Urologie (MND)
OR3	KNO	Plas Chi	KNO	KNO	Plas Chi
OR4	CHI (COR)	Gyne	Chi Mamma	Plas Chi	Gyne
OR5	RT	CHI (SND/WOS)	RT (vwl/rur)	Urologie (pel/bex)	Urologie (P&B)
OR6	Urologie (P&B)	CHI (VWL)	Gyne	Chi (ODB)	Chi (Cor/rur)

Design Questions:

- Which specialty when?
- Which recovery ward?
- …
- How many “blocks” per specialty?
- Full day or half day blocks?
- …

PROBLEM



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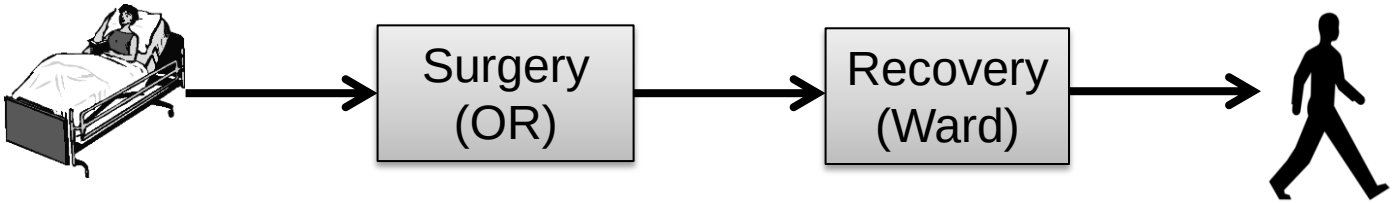
Design Challenges:

- Surgeon availability
- Equipment availability
- Impact on the ward(s)

PROBLEM



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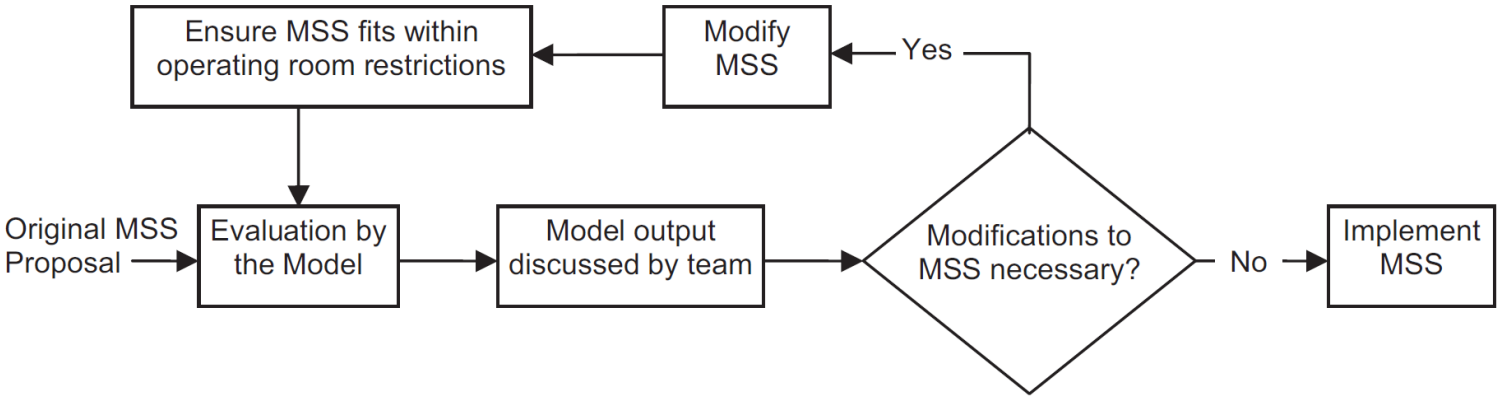
Predicting the ward impact

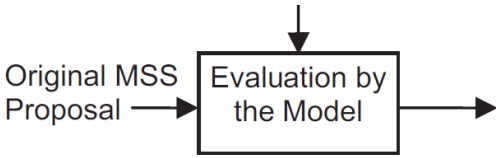
- Depends on the Surgical Schedule
- Number of admission is uncertain
- Length or recovery is uncertain

SOLUTION APPROACH



- Right people at the table
- Representative data
- Valid model for predicting the ward capacity

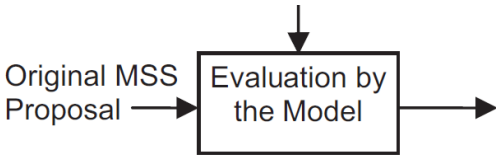
SOLUTION APPROACH



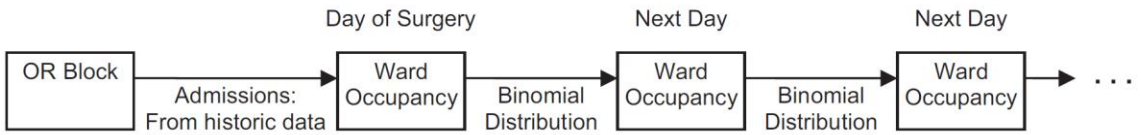
	Mon	Tue	Wed	Thu	
48 staffed beds	9.6%	21.8%	25.7%	63.3%	
49 staffed beds	5.7%	16.1%	19.6%	55.1%	
50 staffed beds	3.1%	11.2%	14.3%	46.6%	
51 staffed beds	1.5%	7.4%	9.8%	38.4%	
52 staffed beds	0.6%	4.5%	6.3%	31.1%	
53 staffed beds	0.2%	2.5%	3.8%	24.6%	
54 staffed beds	0.1%	1.2%	2.1%	19.0%	
55 staffed beds	0.0%	0.6%	1.1%	14.1%	
56 staffed beds	0.0%	0.2%	0.6%	10.1%	
57 staffed beds	0.0%	0.1%	0.2%	6.8%	
58 staffed beds	0.0%	0.0%	0.1%	4.2%	
59 staffed beds	0.0%	0.0%	0.0%	2.4%	

- Mean and median ward occupancies
- Probability of exceeding ward capacity
- Frequency of calling-in additional staff
- Fluctuations in ward occupancies

SOLUTION APPROACH

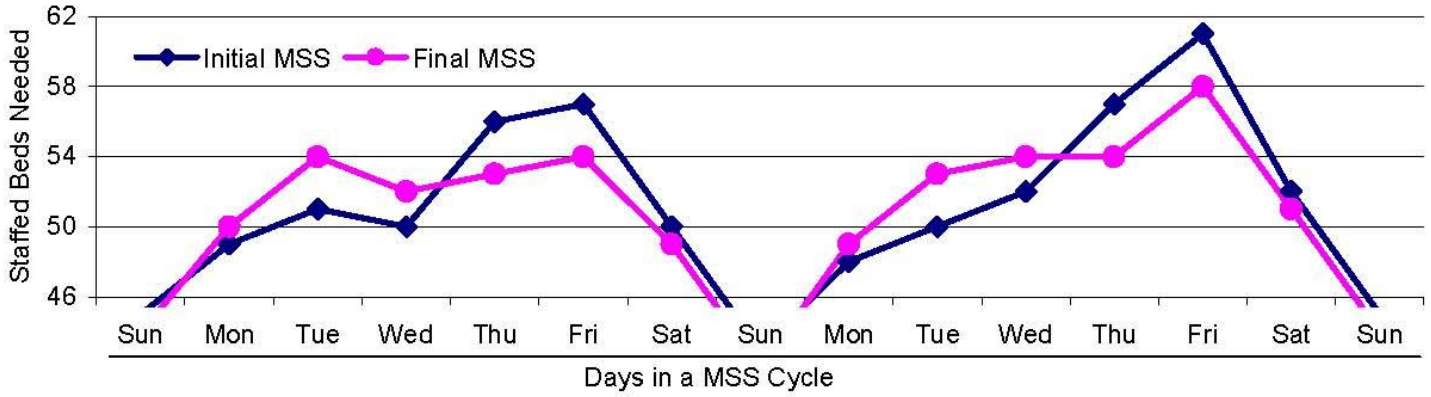


- Using historic data we know admission trends
- After admission a patient either stays or is discharged
  - i.e. each day can be modelled with a binomial distribution
- Since patients do not interfere with each other (i.e. they are independent) they can be “added” to compute the ward occupancy



RESULTS: NKI-AVL

- Peaks in ward occupancy are highly dependent on the surgical schedule
- Peaks are troublesome because
  - Difficult to staff
  - Increases risk of exceeding capacity
  - Causes hospital congestion



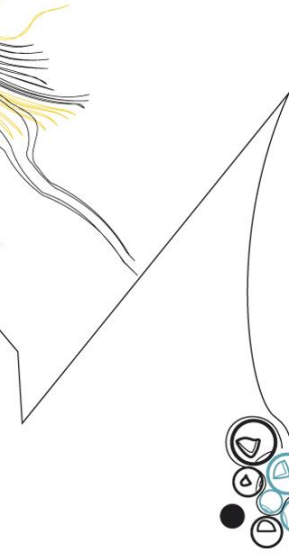
RESULTS: NKI-AVL

NKI-AVL
The Netherlands Cancer Institute
Antoni van Leeuwenhoek Hospital

- A surgical schedule was designed through consensus building
- An additional OR was opened without expanding the wards
- Algorithm implemented in NKI-AVL business intelligence software

- Proof of concept
  - Designed and implemented a new MSS
  - Post implemented review of bed use further validated the model

RESULTS: OTHER HOSPITAL



LUMC
Leiden University Medical Center

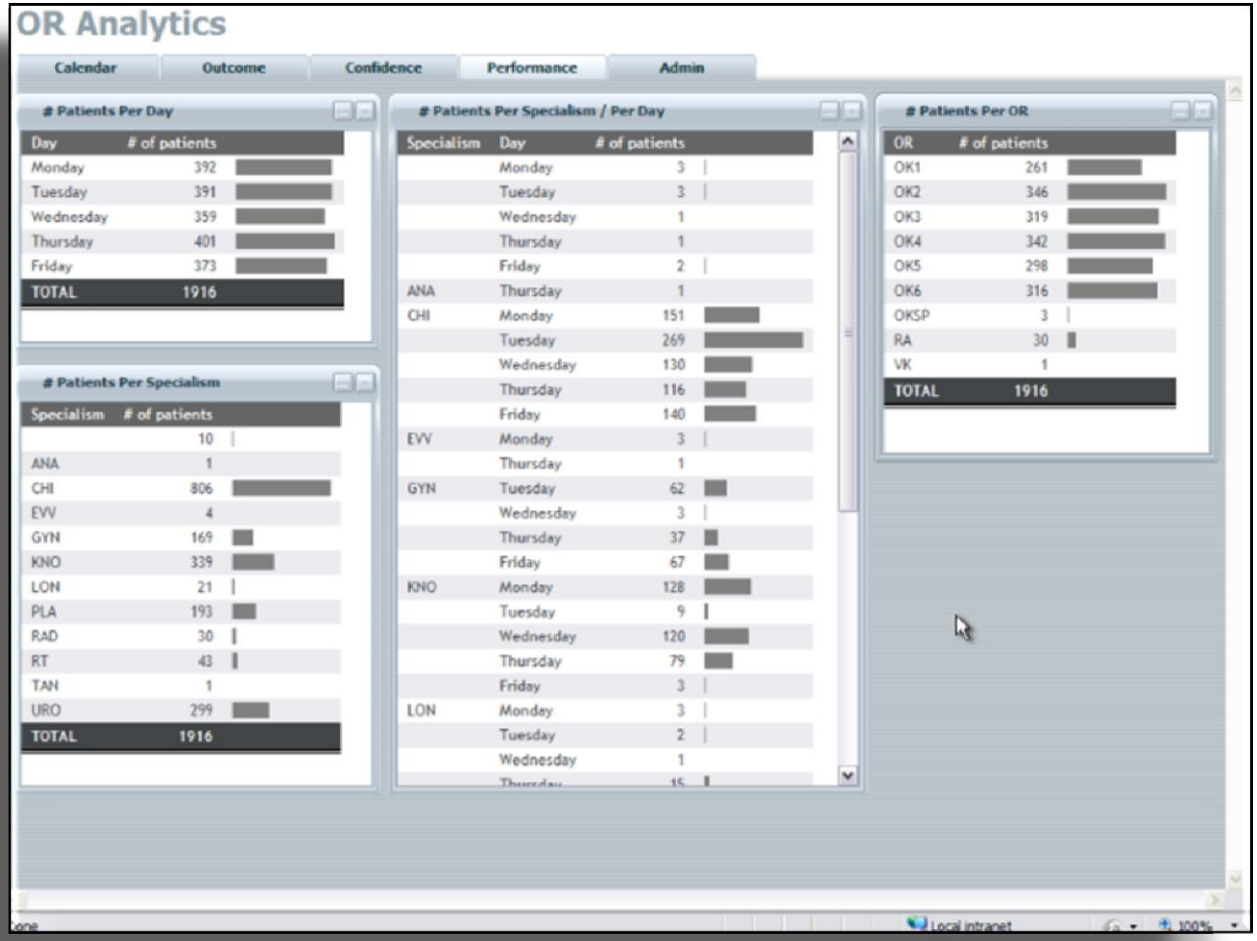
amc
Academisch Medisch Centrum

Isala klinieken

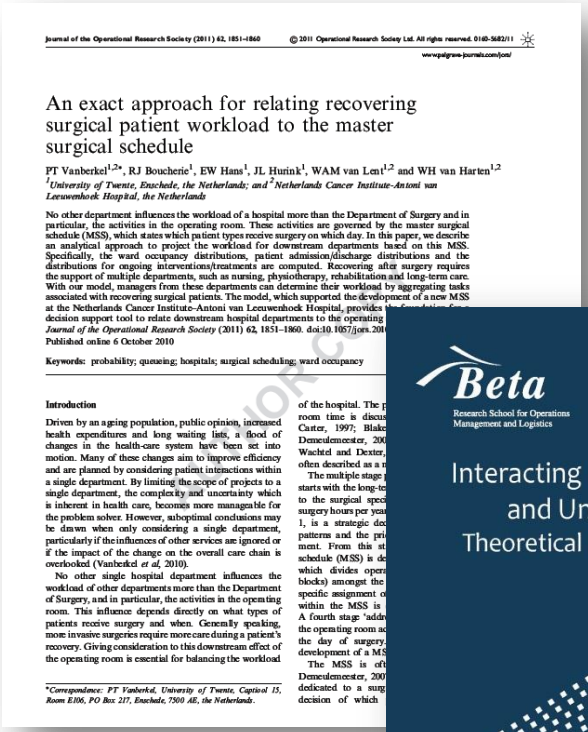
gelre ziekenhuizen

TECHNISCHE UNIVERSITÄT MÜNCHEN

RESULTS: COMMERCIALIZATION



RESULTS: ACADEMIC



An exact approach for relating recovering surgical patient workload to the master surgical schedule

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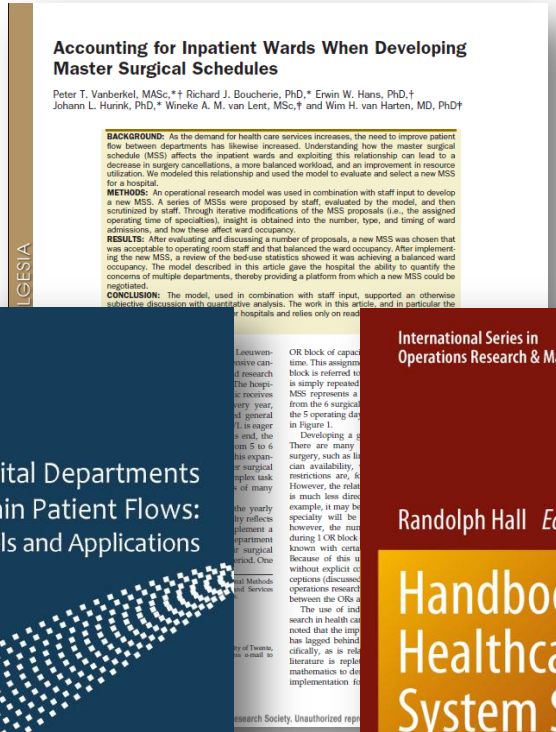
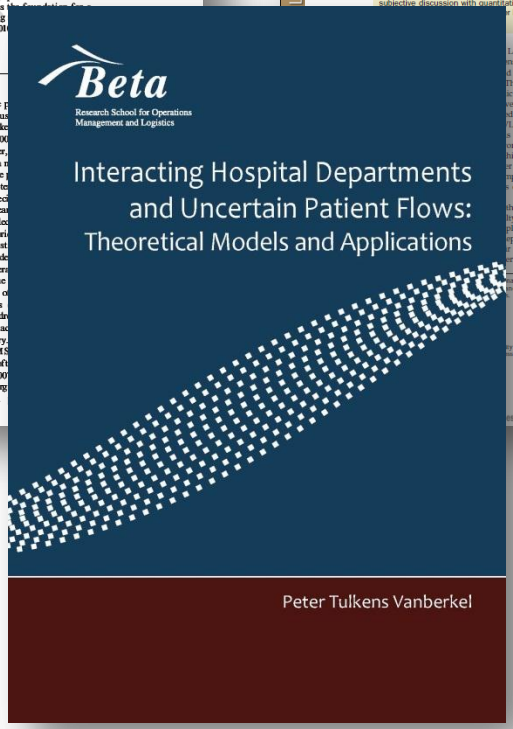
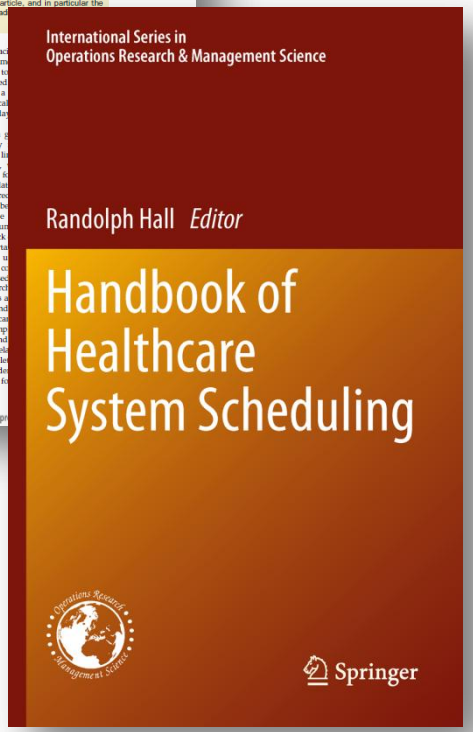
[1]University of Twente, Enschede, the Netherlands; and [2]Netherlands Cancer Institute-Antoni van Leeuwenhoek Hospital, the Netherlands



Accounting for Inpatient Wards When Developing Master Surgical Schedules

Peter T. Vanberkel, MASc,*† Richard J. Boucherie, PhD,* Erwin W. Hans, PhD,† Johann L. Hurink, PhD,* Wineke A. M. van Lent, MSc,† and Wim H. van Harten, MD, PhD†





RESULTS: PARTNERSHIP

Information Builders

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Inspiring Minds

Questions?

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