



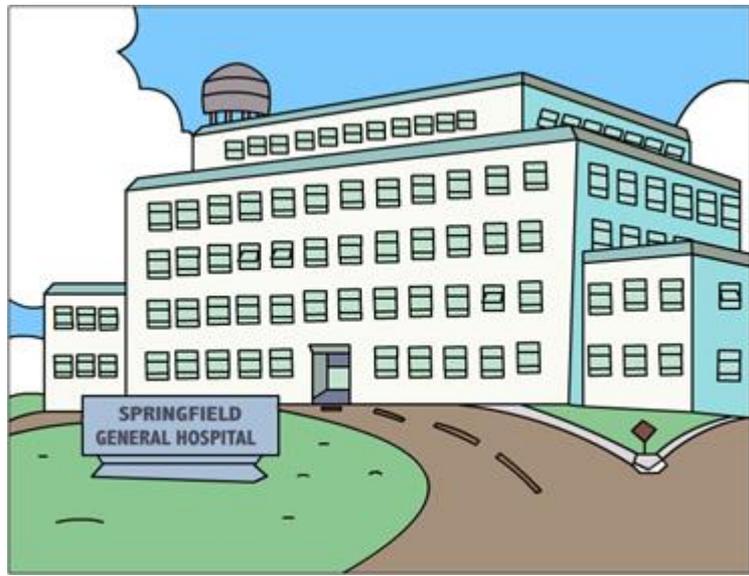
The optimal allocation of server time slots over different classes of patients

Stefan Creemers (IESEG)

Jeroen Beliën (HUB)

Marc Lambrecht (KU Leuven)





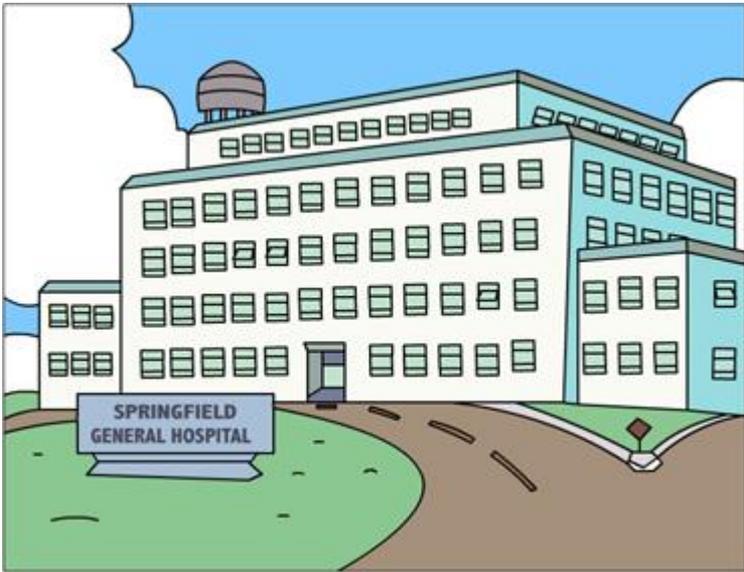
HOSPITAL



HOSPITAL

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

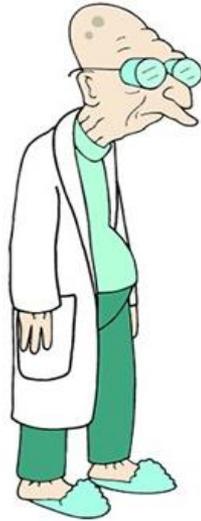
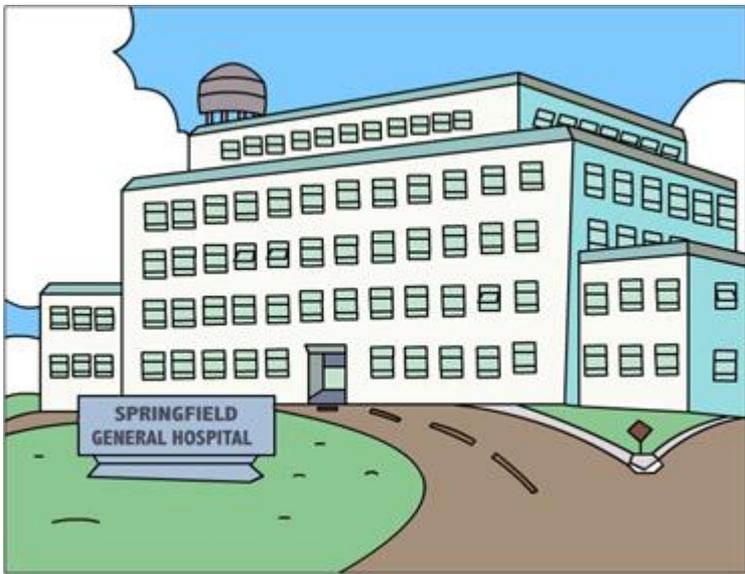


HOSPITAL

ORTHOPEDIC SURGERY

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN



HOSPITAL

ORTHOPEDIC SURGERY

DENTAL SURGERY

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN



HOSPITAL



ORTHOPEDIC SURGERY



DENTAL SURGERY



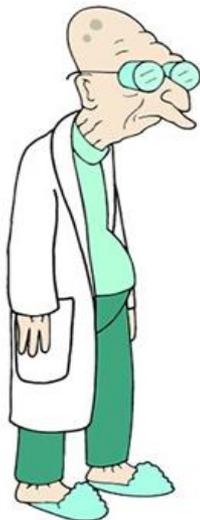
NEUROLOGICAL SURGERY

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN



HOSPITAL



ORTHOPEDIC SURGERY



DENTAL SURGERY



NEUROLOGICAL SURGERY

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN



HOSPITAL



ORTHOPEDIC SURGERY



DENTAL SURGERY



NEUROLOGICAL SURGERY

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN



HOSPITAL



ORTHOPEDIC SURGERY



DENTAL SURGERY



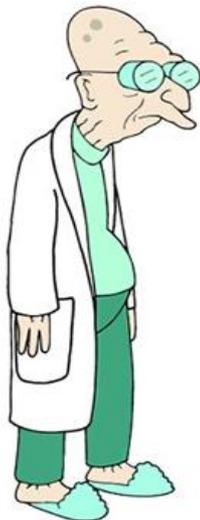
NEUROLOGICAL SURGERY

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN



HOSPITAL



ORTHOPEDIC SURGERY



DENTAL SURGERY

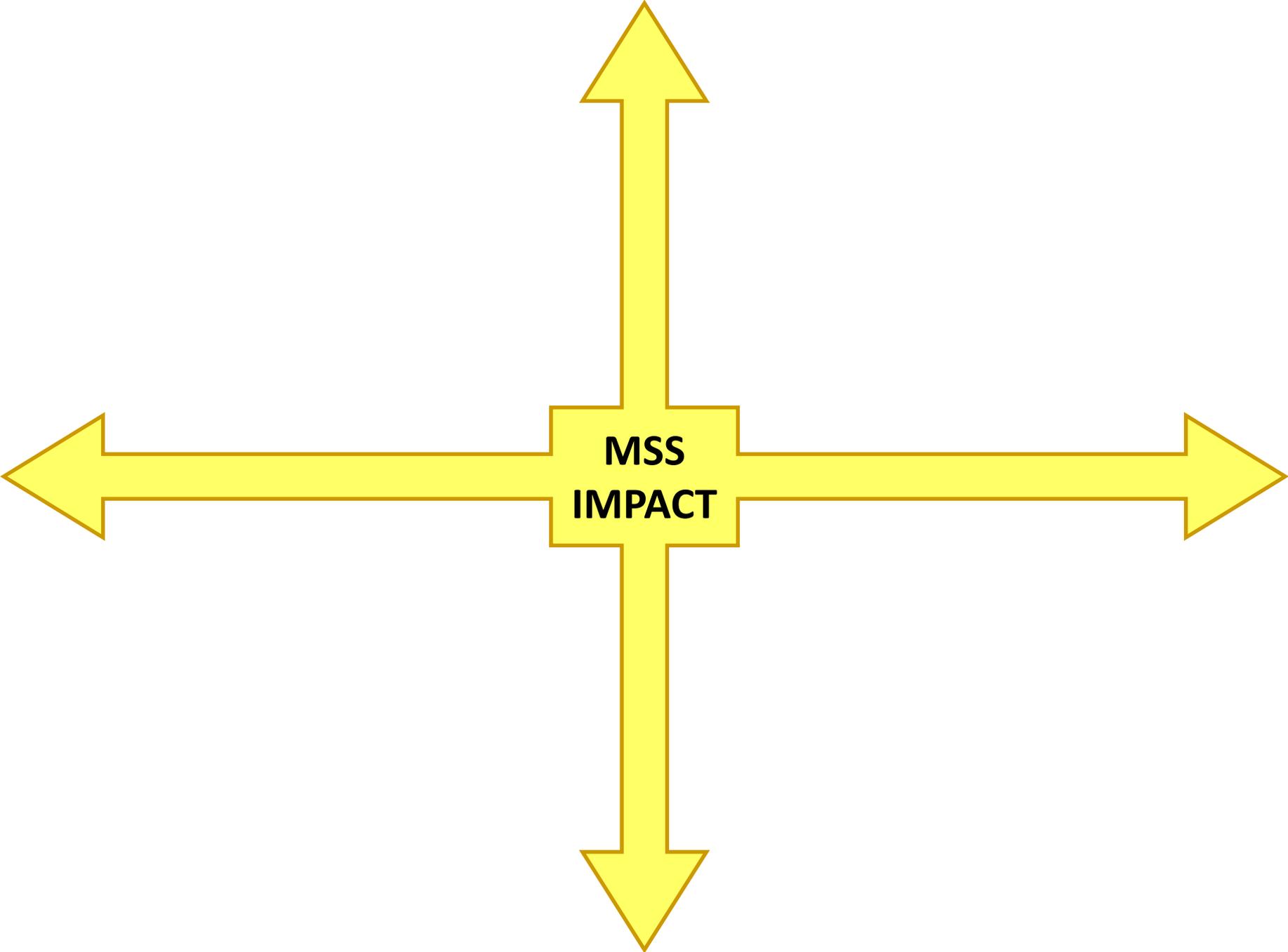


NEUROLOGICAL SURGERY

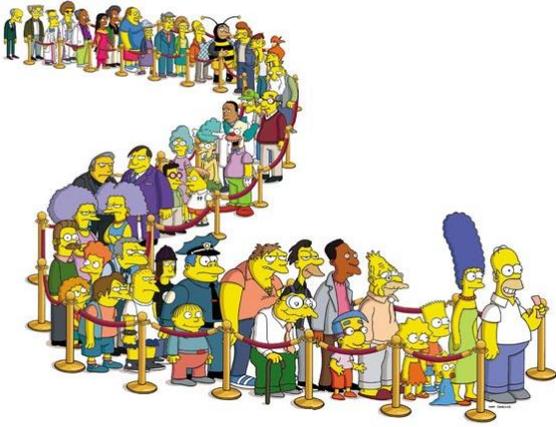
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

MASTER SURGERY SCHEDULE (MSS)

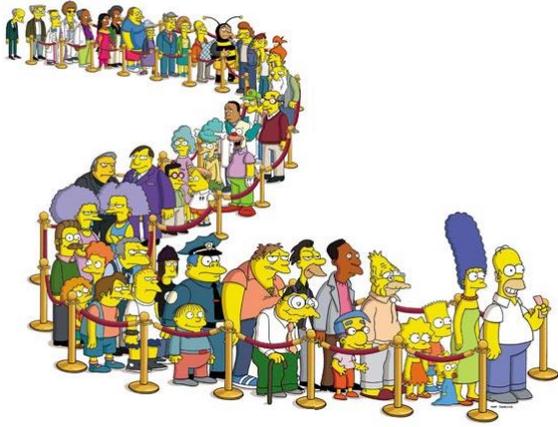


**MSS
IMPACT**



Patient waiting time / waiting list

**MSS
IMPACT**

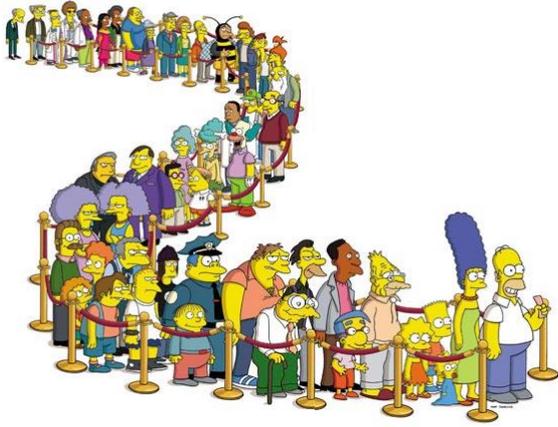


Patient waiting time / waiting list



Staffing /equipment requirements

**MSS
IMPACT**



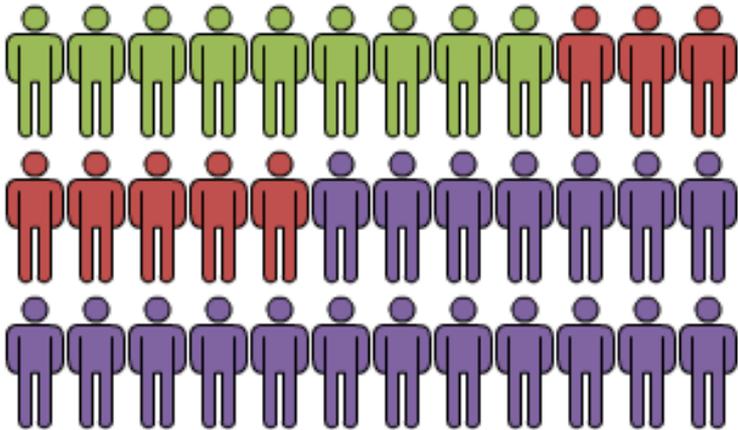
Patient waiting time / waiting list

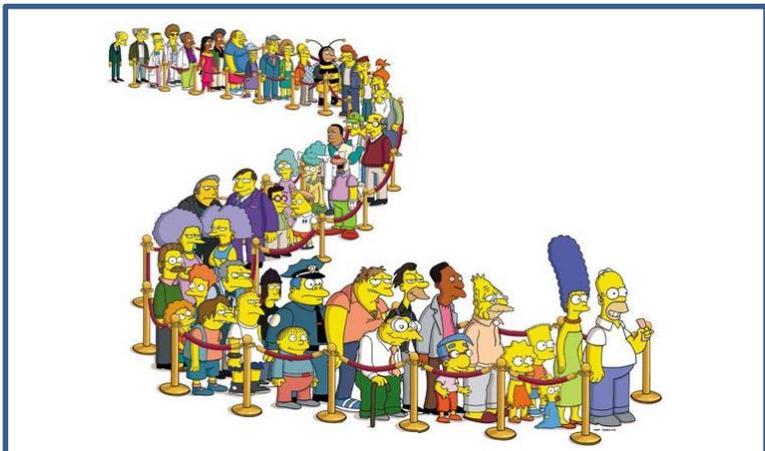


Staffing /equipment requirements

**MSS
IMPACT**

Patient mix





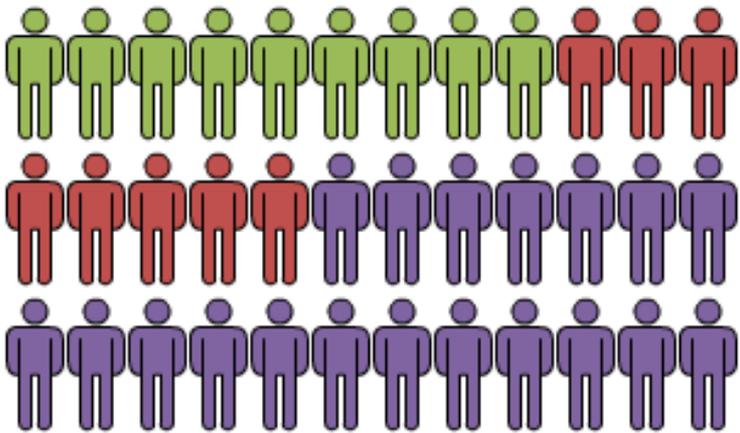
Patient waiting time / waiting list



Staffing /equipment requirements

**MSS
IMPACT**

Patient mix



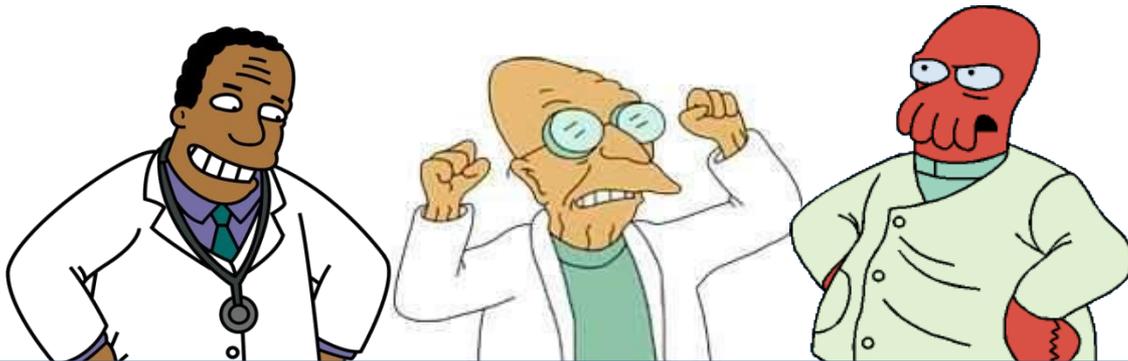
Hospital profitability



**WHO
SETS THE
MSS?**

**WHO
SETS THE
MSS?**

Surgeons ?

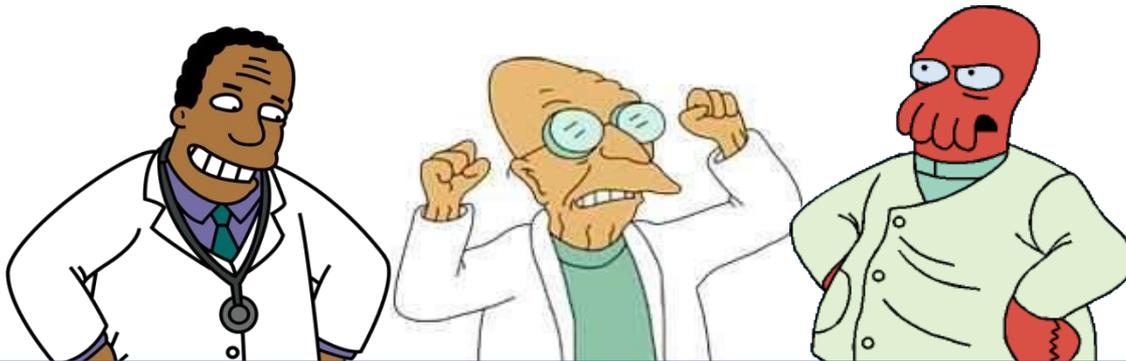


**WHO
SETS THE
MSS?**



Hospital management ??

Surgeons ?



**WHO
SETS THE
MSS?**

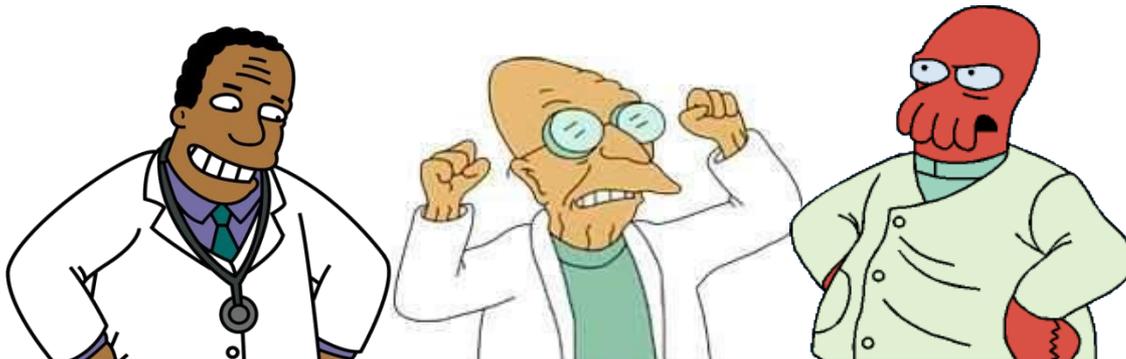


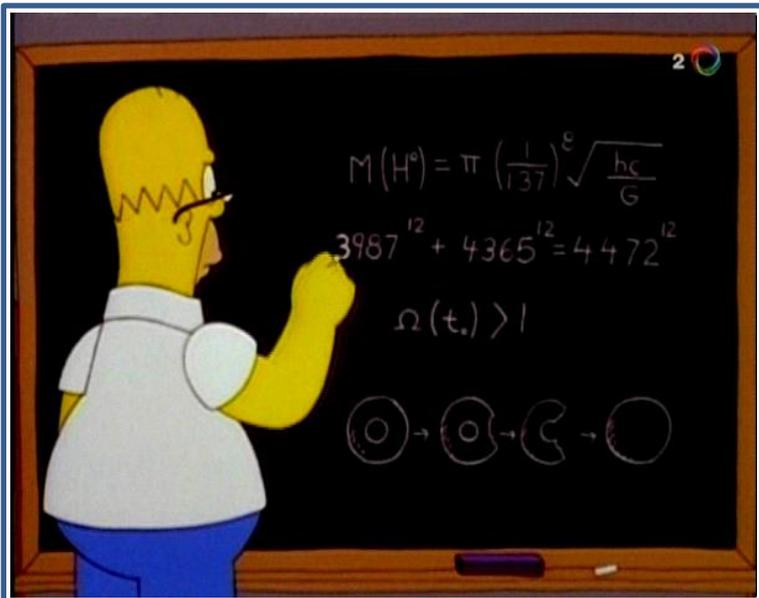
Hospital management ??

The patient ????



Surgeons ?





A mathematical model ????????

**WHO
SETS THE
MSS?**

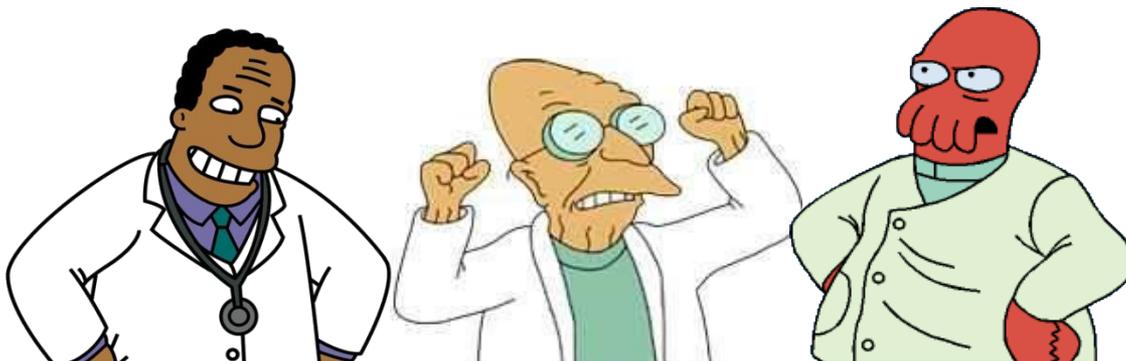


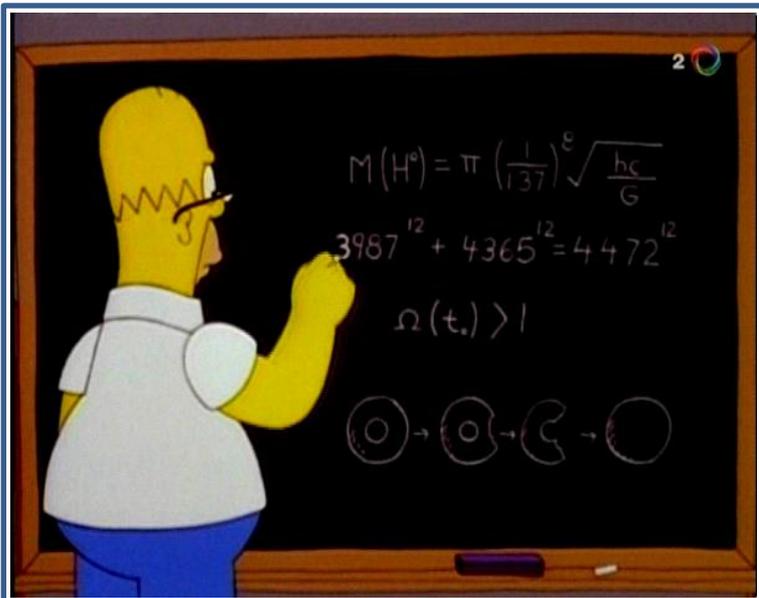
Hospital management ??

The patient ????



Surgeons ?





A mathematical model ????????

**WHO
SETS THE
MSS?**

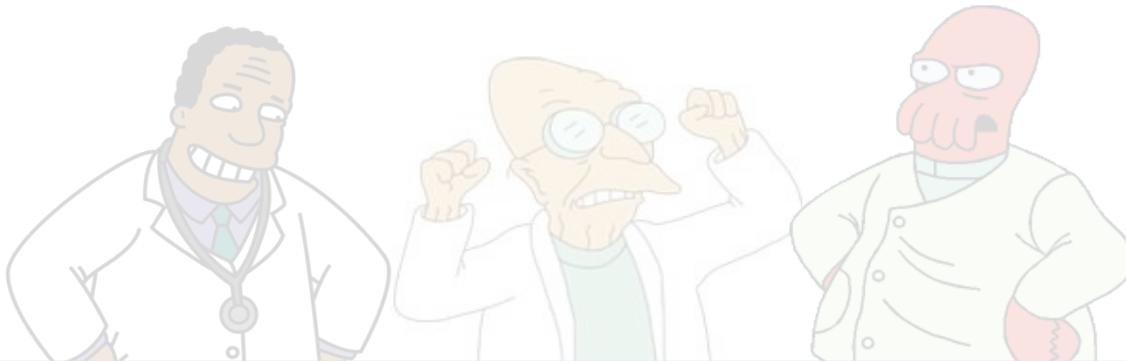


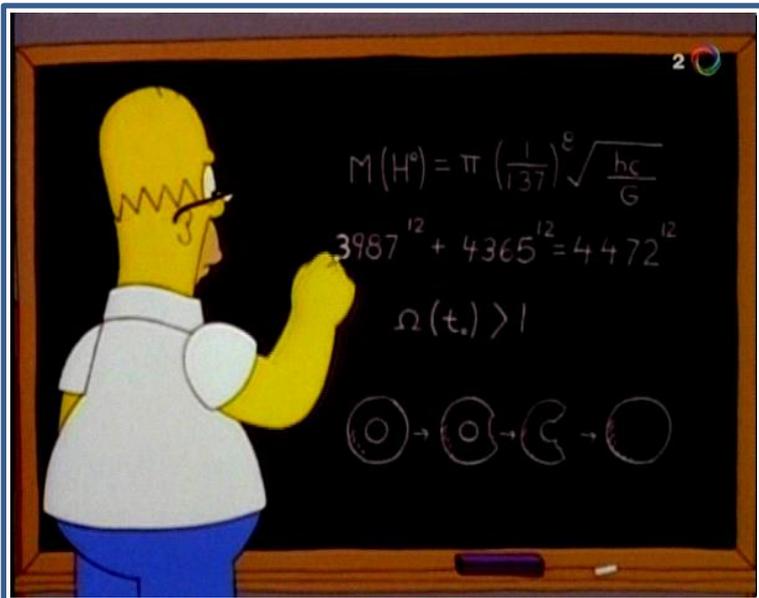
Hospital management ??

The patient ????



Surgeons ?





A mathematical model ????????



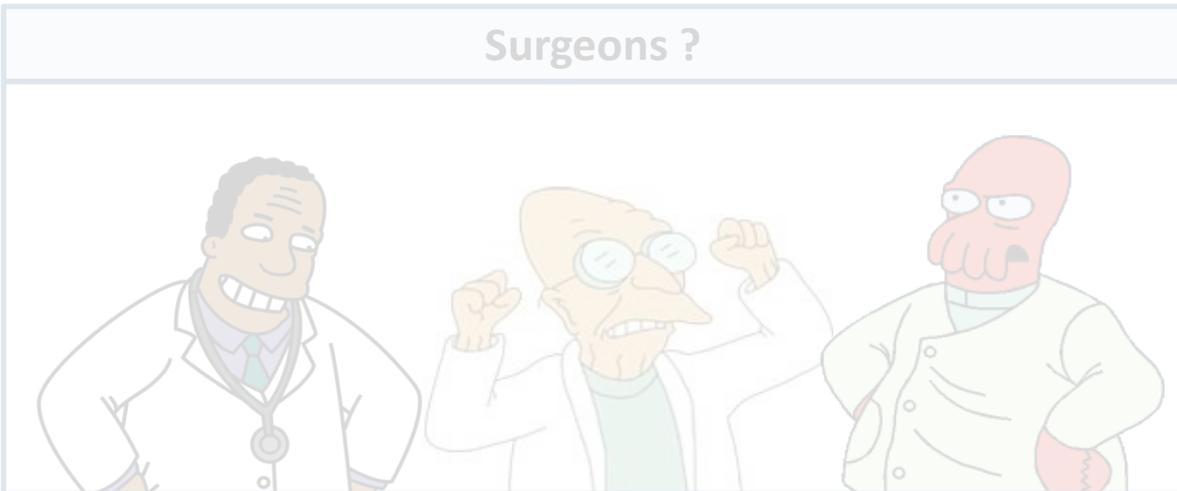
WHO
SETS THE
MSS?

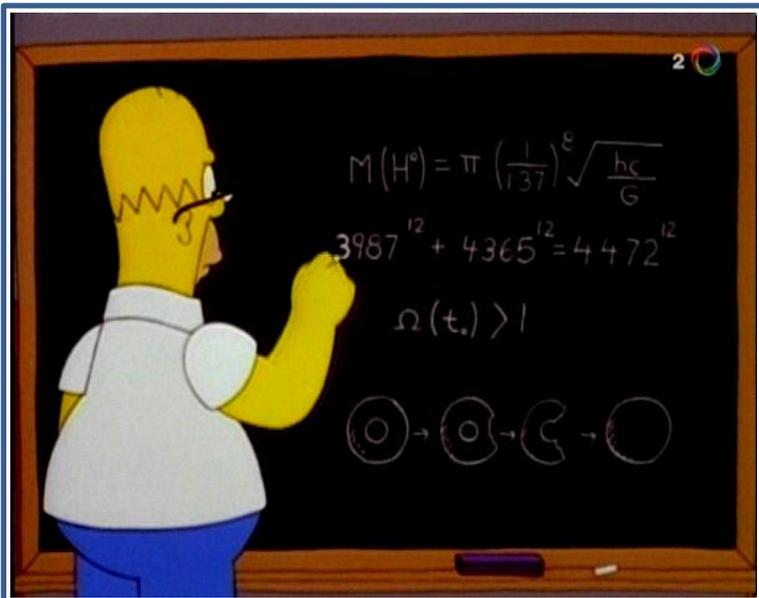


Weighted patient waiting time

The patient ????

Surgeons ?





A mathematical model ????????



WHO
SETS THE
MSS?



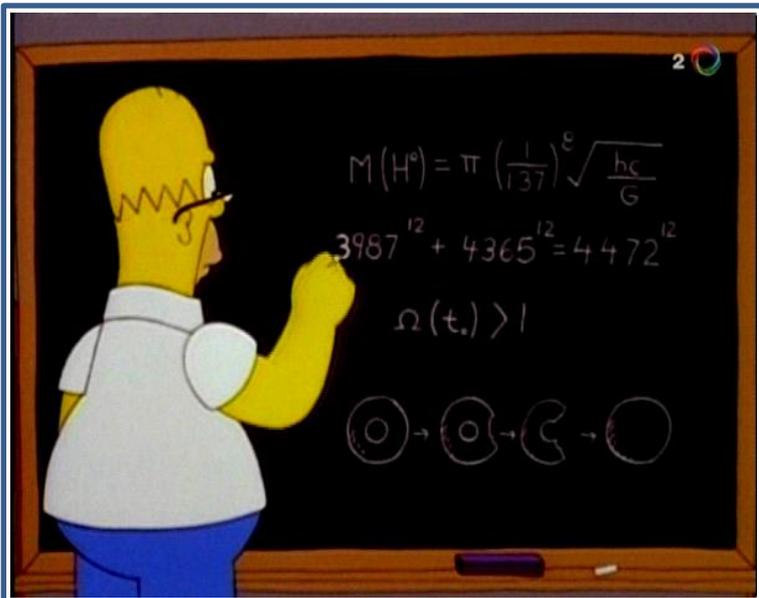
Weighted patient waiting time

The patient ????

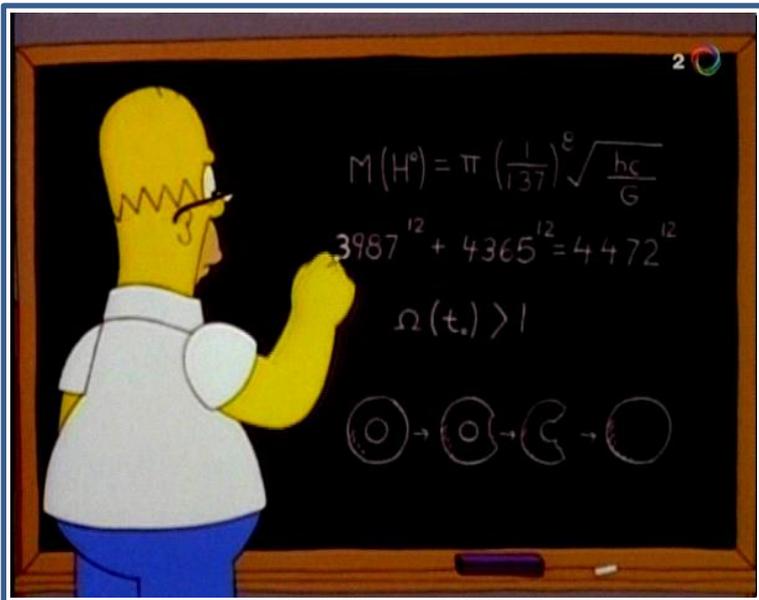
McKinsey & Company

41% of US patients choose a hospital based on nonclinical factors (e.g., waiting time, ease of making an appointment etc.)

75% of patients are willing to switch hospitals based on the timely conduction of scheduled appointments



A mathematical model ????????



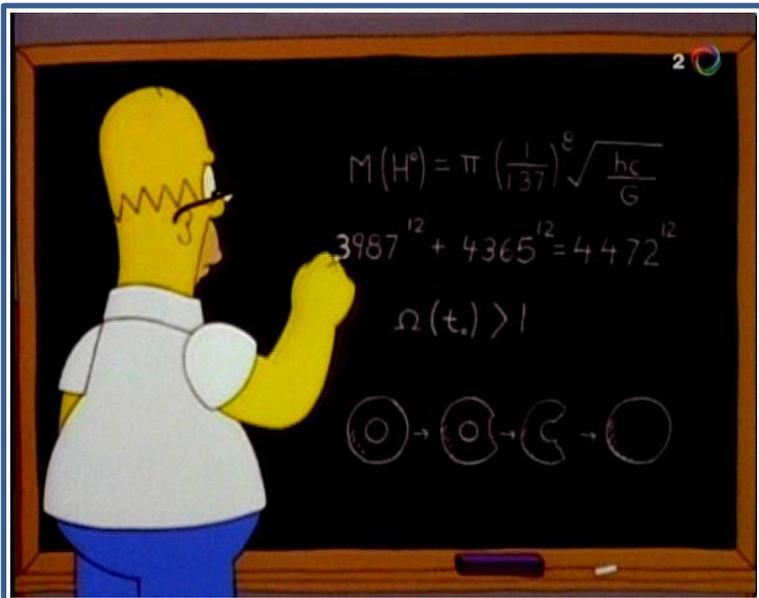
A mathematical model ????????

Any given MSS or block allocation

OPERATING THEATRE 1							OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN



Markov model



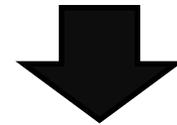
A mathematical model ????????

Any given MSS or block allocation

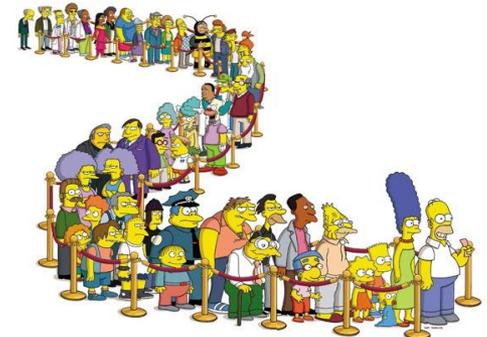
OPERATING THEATRE 1							OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN

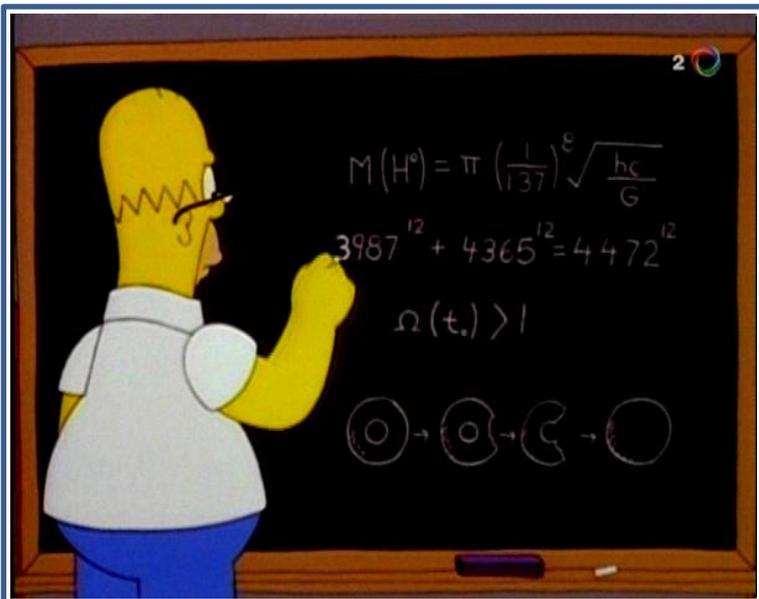


Markov model

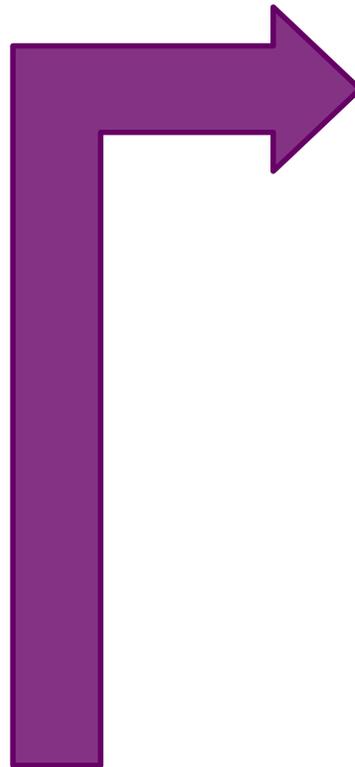


Waiting time for each patient type





A mathematical model ????????

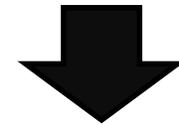


Any given MSS or block allocation

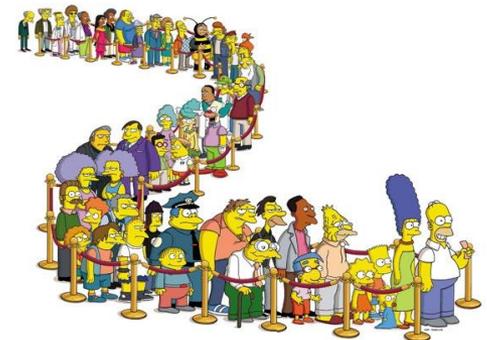
OPERATING THEATRE 1							OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN



Markov model



Waiting time for each patient type



Optimization procedure generates MSS until optimal weighted patient time has been found



A mathematical model ????????



Any given MSS or block allocation

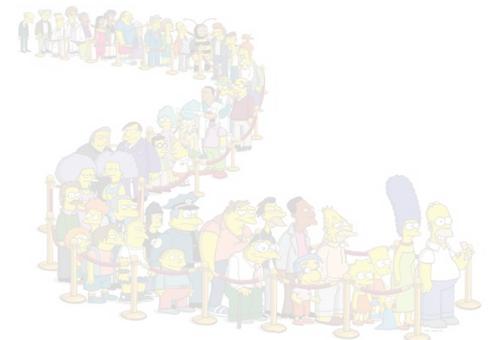
OPERATING THEATRE 1							OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN



Markov model



Waiting time for each patient type



Optimization procedure generates MSS until optimal weighted patient time has been found



ORTHOPEDICS

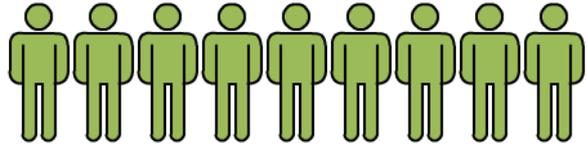
ORTHOPEDIC HISTORY

ORTHOPEDIC PHYSICIAN

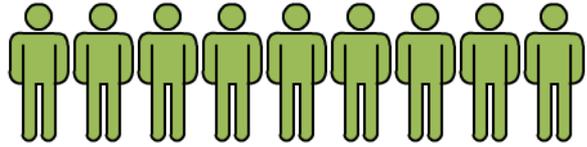
ORTHOPEDIC SURGEON

ORTHOPEDIC PHYSICIAN

WAITING LIST (ORTHOPEDICS)



WAITING LIST (ORTHOPEDICS)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	Black
Green	Green	Green	Green	Red	Red	Black

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	Black
Red	Purple	Purple	Purple	Purple	Purple	Black

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	Black
Green	Green	Green	Green	Red	Red	Black

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	Black
Red	Purple	Purple	Purple	Purple	Purple	Black

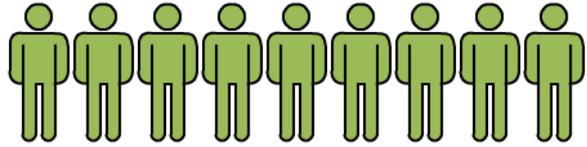
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WEEK 45

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	Black
Green	Green	Green	Green	Red	Red	Black

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	Black
Red	Purple	Purple	Purple	Purple	Purple	Black

WAITING LIST (ORTHOPEDICS)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
						
						

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
						
						

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

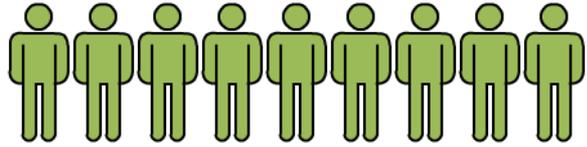
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WEEK 45

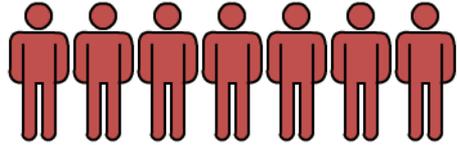
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
						
						

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



WAITING LIST (DENTIST)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

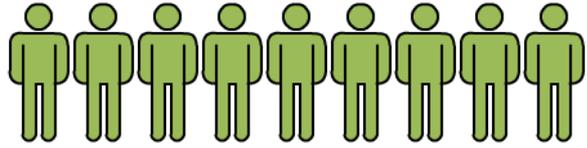
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WEEK 45

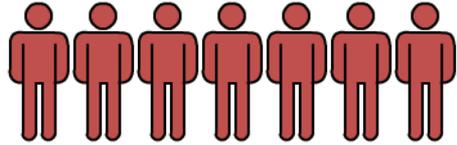
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 45

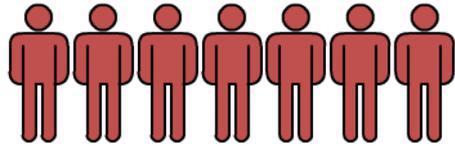
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (ORTHOPEDICS)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

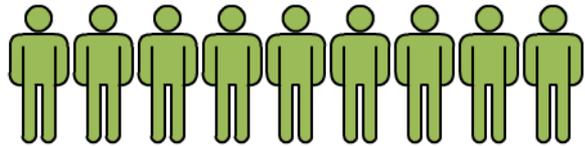
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WEEK 45

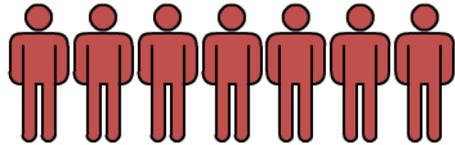
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



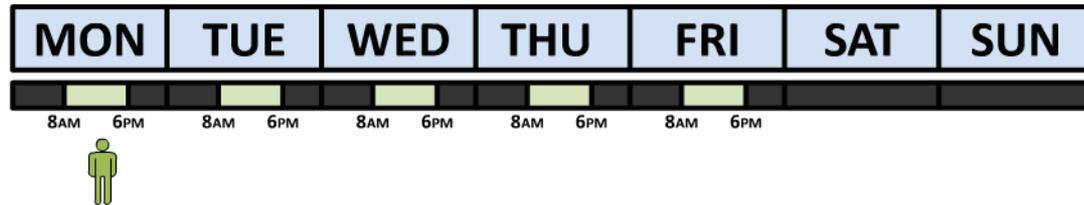
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (ORTHOPEDICS)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	
Green	Green	Green	Green	Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	
Red	Purple	Purple	Purple	Purple	Purple	

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	
Green	Green	Green	Green	Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple				
Red	Purple					

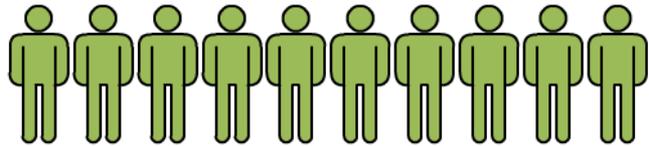
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WEEK 45

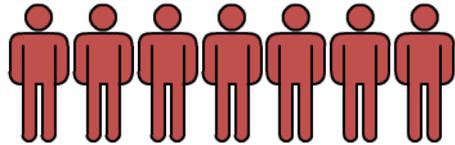
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green			Red	Red		
Green				Red		

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



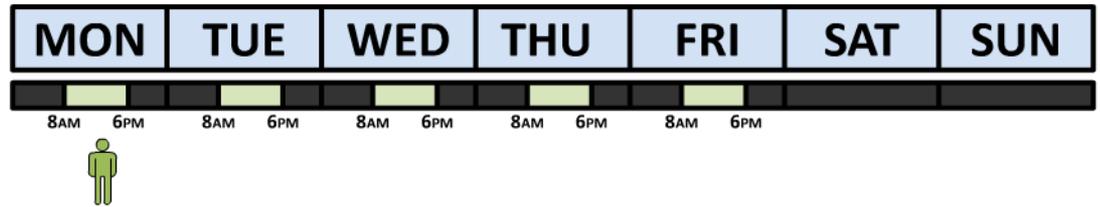
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (ORTHOPEDICS)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	
Green	Green	Green	Green	Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	
Red	Purple	Purple	Purple	Purple	Purple	

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	
Green	Green	Green	Green	Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple				
Red	Purple					

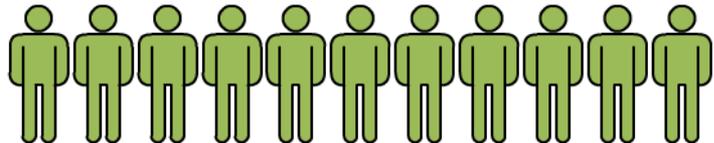
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WEEK 45

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green		Red	Red		
Green				Red		

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



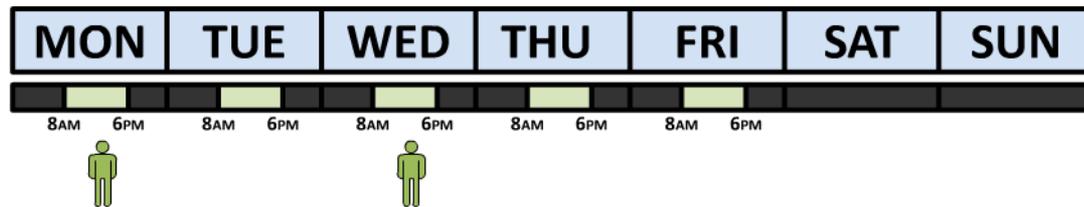
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (ORTHOPEDICS)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 patient	1 patient	1 patient	1 patient	1 patient	1 patient	
1 patient	1 patient	1 patient	1 patient	1 patient	1 patient	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 patient	1 patient	1 patient	1 patient	1 patient	1 patient	
1 patient	1 patient	1 patient	1 patient	1 patient	1 patient	

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 patient	1 patient	1 patient	1 patient	1 patient	1 patient	
1 patient	1 patient	1 patient	1 patient	1 patient	1 patient	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 patient	1 patient	1 patient				
1 patient	1 patient					

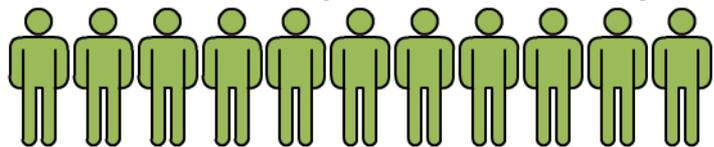
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WEEK 45

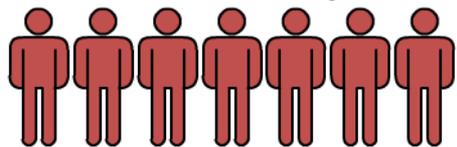
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 patient	1 patient		1 patient	1 patient		
1 patient	1 patient			1 patient		

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



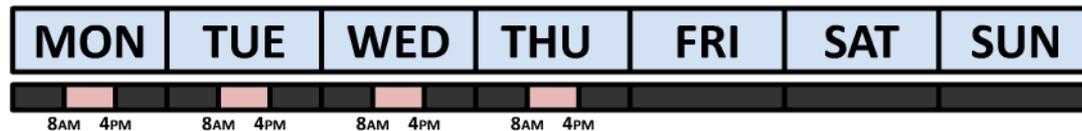
WAITING LIST (DENTIST)



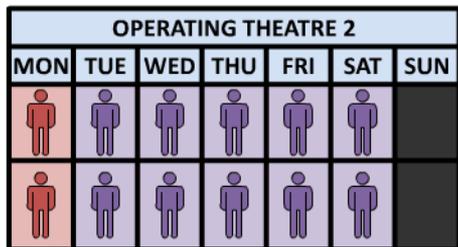
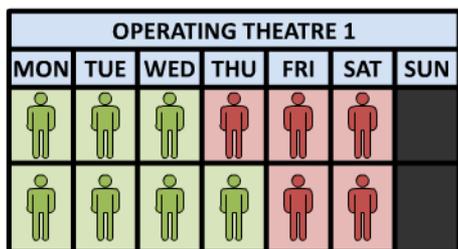
WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (DENTIST)

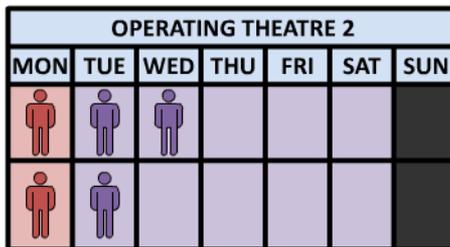
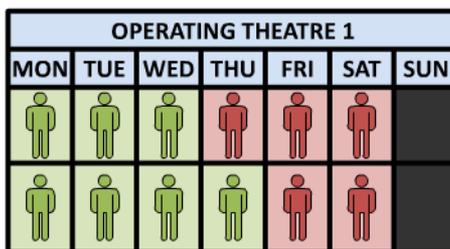


WEEK 1



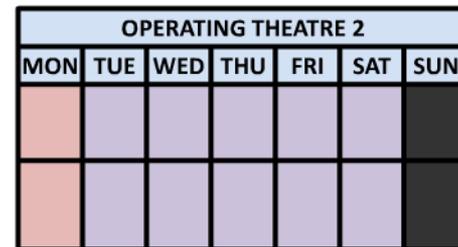
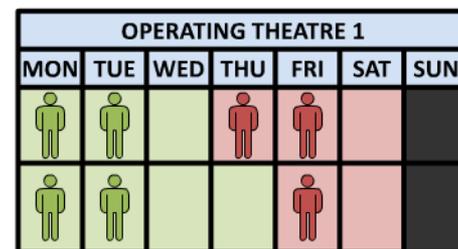
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WEEK 34



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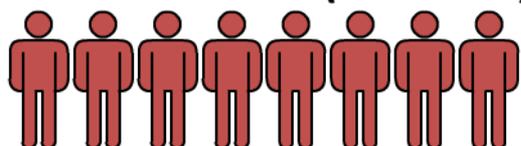
WEEK 45



WAITING LIST (ORTHOPEDICS)



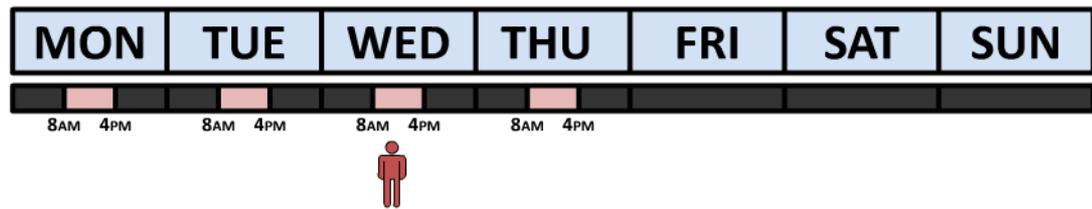
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (DENTIST)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 Green	1 Green	1 Green	1 Red	1 Red	1 Red	
1 Green	1 Green	1 Green	1 Green	1 Red	1 Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 Red	1 Purple					
1 Red	1 Purple					

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 Green	1 Green	1 Green	1 Red	1 Red	1 Red	
1 Green	1 Green	1 Green	1 Green	1 Red	1 Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 Red	1 Purple	1 Purple				
1 Red	1 Purple					

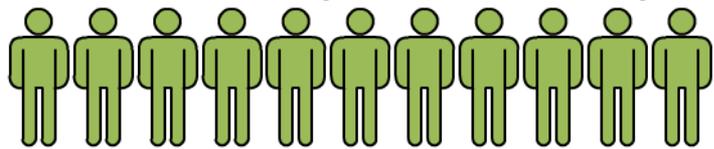
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WEEK 45

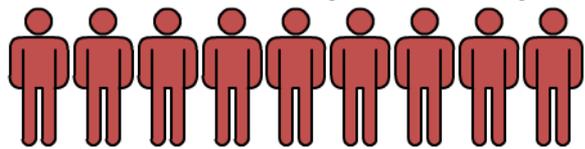
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 Green	1 Green		1 Red	1 Red	1 Red	
1 Green	1 Green			1 Red		

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



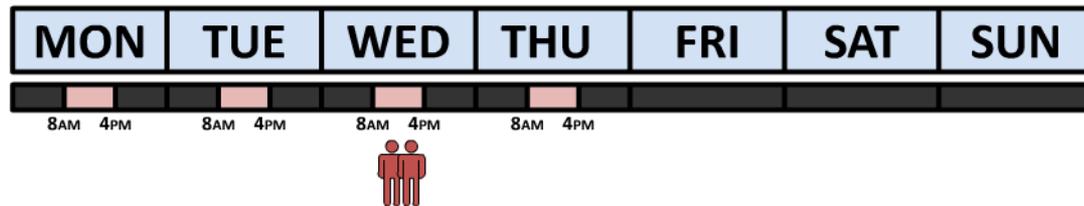
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (DENTIST)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	
Green	Green	Green	Green	Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	
Red	Purple	Purple	Purple	Purple	Purple	

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	
Green	Green	Green	Green	Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple				
Red	Purple					

...

WEEK 45

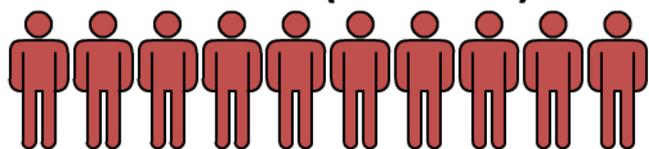
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green		Red	Red	Red	
Green	Green			Red	Red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	
Red	Purple	Purple	Purple	Purple	Purple	

WAITING LIST (ORTHOPEDICS)



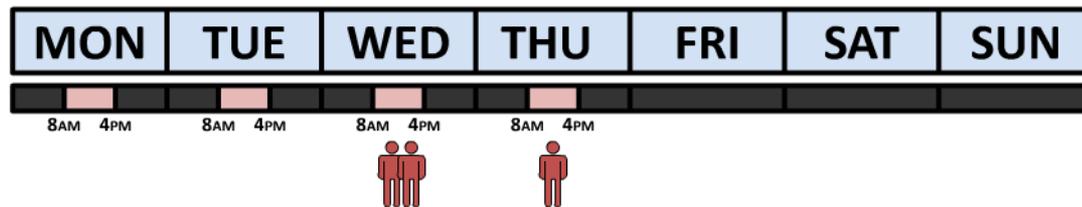
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (DENTIST)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	Black
Green	Green	Green	Green	Red	Red	Black

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple	Purple	Purple	Purple	Black
Red	Purple	Purple	Purple	Purple	Purple	Black

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green	Green	Red	Red	Red	Black
Green	Green	Green	Green	Red	Red	Black

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red	Purple	Purple				Black
Red	Purple					Black

...

WEEK 45

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
Green	Green		Red	Red	Red	Black
Green	Green			Red	Red	Black

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
Red						Black
						Black

WAITING LIST (ORTHOPEDICS)



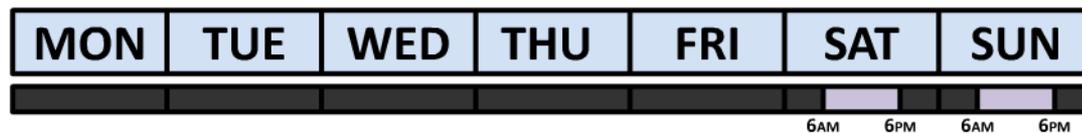
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (NEUROLOGY)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

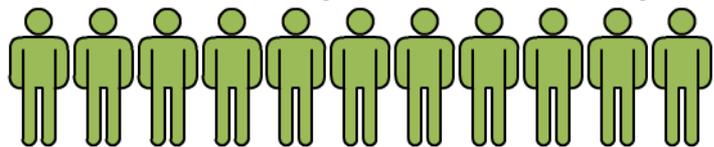
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WEEK 45

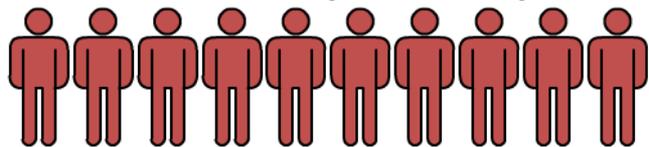
OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

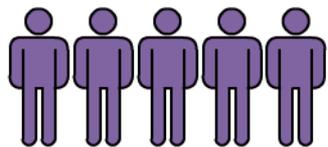
WAITING LIST (ORTHOPEDICS)



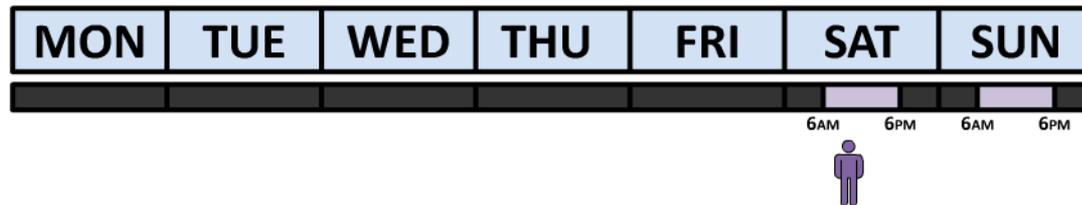
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (NEUROLOGY)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

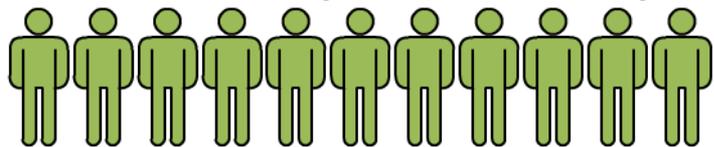
...

WEEK 45

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN

WAITING LIST (ORTHOPEDICS)



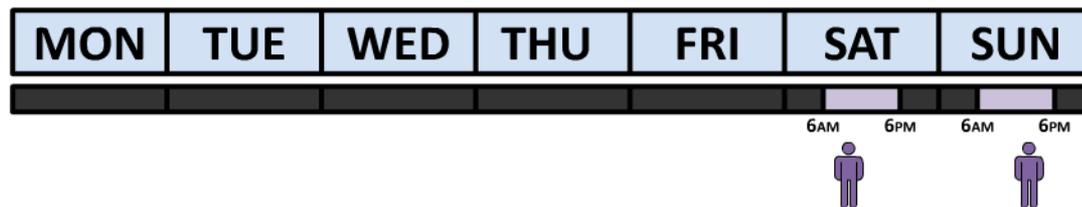
WAITING LIST (DENTIST)



WAITING LIST (NEUROLOGY)



WEEK 1: PATIENT ARRIVAL (NEUROLOGY)



WEEK 1

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 green	1 green	1 green	1 red	1 red	1 red	
1 green	1 green	1 green	1 green	1 red	1 red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 red	1 purple					
1 red	1 purple					

...

WEEK 34

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 green	1 green	1 green	1 red	1 red	1 red	
1 green	1 green	1 green	1 green	1 red	1 red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 red	1 purple	1 purple	1 purple			
1 red	1 purple	1 purple				

...

WEEK 45

OPERATING THEATRE 1						
MON	TUE	WED	THU	FRI	SAT	SUN
1 green	1 green		1 red	1 red	1 red	
1 green	1 green			1 red	1 red	

OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN
1 red						

MON	TUE	WED	THU	FRI	SAT	SUN
-----	-----	-----	-----	-----	-----	-----

PATIENT ARRIVAL (ORTHOPEDICS)



PATIENT ARRIVAL (DENTIST)



PATIENT ARRIVAL (NEUROLOGY)



OPERATING THEATRE 1



OPERATING THEATRE 2



Naïve approach requires 4 dimensions

- 1. The number of patients in queue for each patient type**
- 2. The phase of the arrival process for each patient type (we allow general interarrival times)**
- 3. The current system state (i.e., what events can take place?)**
- 4. The phase of the process that keeps track of system state transitions**

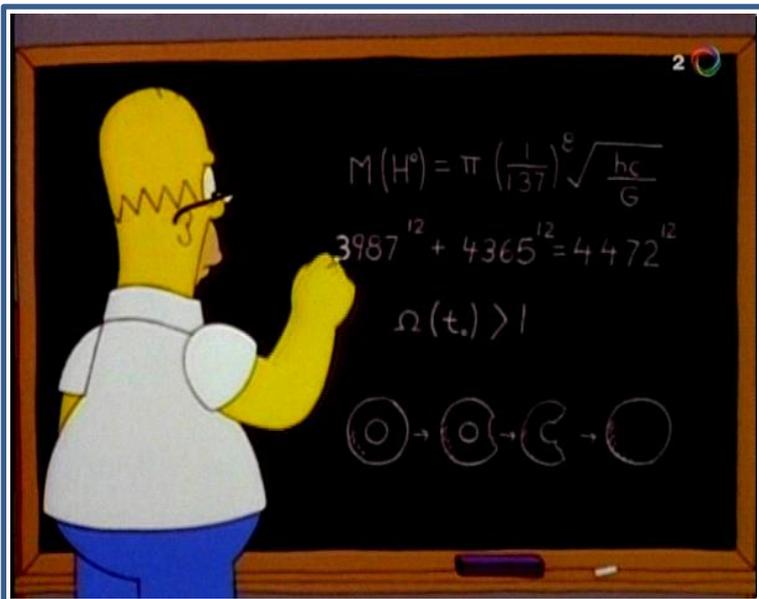
Naïve approach requires 4 dimensions

1. The number of patients in queue for each patient type
2. The phase of the arrival process for each patient type (we allow general interarrival times)
3. The current system state (i.e., what events can take place?)
4. The phase of the process that keeps track of system state transitions

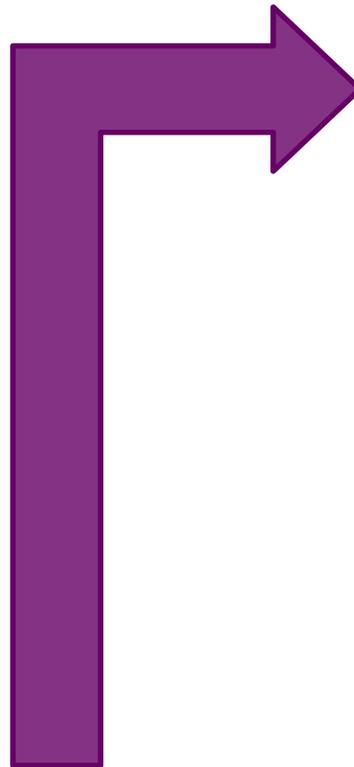
Our approach

1. Uses sets of two-dimensional Markov chains.
 2. Very fast!
 3. Exact!
- => Can be used for optimization purposes!





A mathematical model ????????



Any given MSS or block allocation

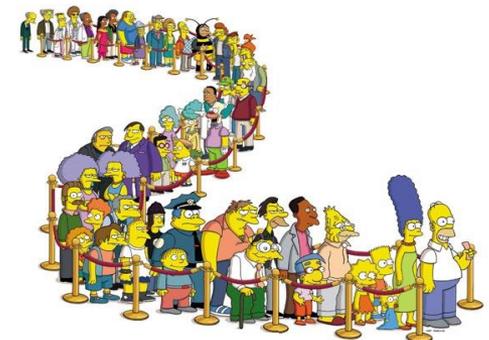
OPERATING THEATRE 1							OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN



Markov model



Waiting time for each patient type



Optimization procedure generates MSS until optimal weighted patient time has been found





A mathematical model ????????



Any given MSS or block allocation

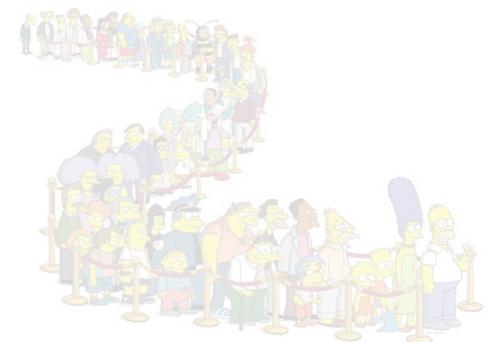
OPERATING THEATRE 1							OPERATING THEATRE 2						
MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN



Markov model



Waiting time for each patient type



Optimization procedure generates MSS until optimal weighted patient time has been found

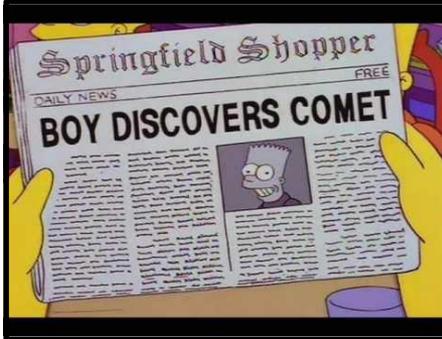


Optimal procedure for small problems

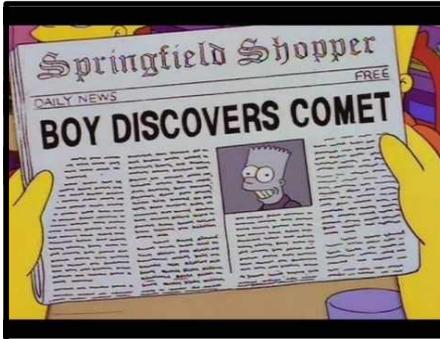


Step-wise heuristic for large problems





Creemers S., Beliën J. & Lambrecht M. (2012). The optimal allocation of server time slots over different classes of patients. European Journal of Operational Research, 219(3), pp. 508-521.

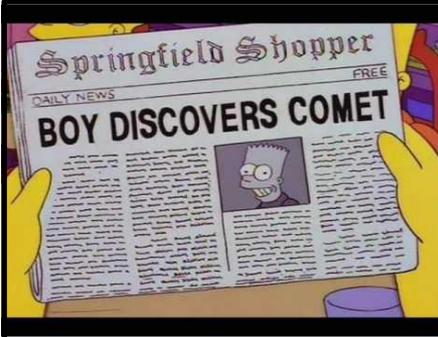


Creemers S., Beliën J. & Lambrecht M. (2012). The optimal allocation of server time slots over different classes of patients. *European Journal of Operational Research*, 219(3), pp. 508-521.

Contribution

We developed a new queueing model that allows to identify the optimal block allocation such that the weighted patient waiting time is minimized





Creemers S., Beliën J. & Lambrecht M. (2012). The optimal allocation of server time slots over different classes of patients. *European Journal of Operational Research*, 219(3), pp. 508-521.

Contribution

We developed a new queueing model that allows to identify the optimal block allocation such that the weighted patient waiting time is minimized



Future research

1. Also observe what happens during service itself => include server idle time, overtime etc.
2. Add additional constraints (staffing/equipment)



