Appointment Scheduling at an Outpatient Clinic

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Introduction

SCOPES: System Concepts for Optimization and Personalization of Endoscopy Scheduling

Objective: Develop a tool to evaluate several outpatient scheduling templates and policies based on but not limited to:

- Minimize overtime
- Minimize waiting
- Minimize doctor idleness
- Maximize patient access to healthcare
- Maximize appointment (appt.) slot utilization

Terminology

Template
A set of appt. slots of different patient types to be scheduled for a time.
Example:

- Type A appt. slot length: 30min
- Type B appt. slot length: 45min
- No between-slot buffer

Start Time	Appt. Type	
8:00 AM	Type A	8 Type A Slots
8:30 AM	Type A	
⋮	⋮	
11:30 AM	Type A	
12:00 PM	Type B	5 Type B Slots
12:45 PM	Type B	
⋮	⋮	
4:00 PM	Type B	
5:00 PM	Closed	

Policy
Rules to determine how to schedule patients in a template

Schedule
A template with patients assigned to appt. slots

Example Simulation

Dynamic Outpatient Scheduling Simulation (DOSS) Tool
The team developed a DOSS Tool in Excel to evaluate and compare several scheduling templates and policies.

Template:
The template evaluated in this example is the one described in the Terminology section

Policy:
Assign patient to first available appt. slot designated to their type independent of their preference

Assumptions:

- The # of appt. requests per day is the # of available appt. slots (13)
- The probability of a Type *X* request is:

$$\frac{\textit{\# of Type X Appt. Slots per Day}}{\textit{Total \# of Appt. Slots per Day}}$$

- In lieu of historical data, our example assumes:

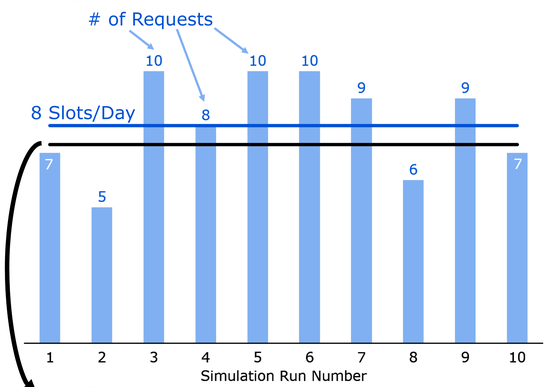
Appt. Type	# of Available Slots per Day	Determine Probability	Appt. Type Probability
Type A	8	8/13	0.62
Type B	5	5/13	0.38
Total	13	1.00	1.00

One Simulation Run

Request #	1	2	...	12	13
Request Type Probability (random number)	0.33	0.01	...	0.89	0.98
Determine Request Type	0.33≤0.62, so Type A	0.01≤0.62, so Type A	...	0.89>0.62, so Type B	0.98>0.62, so Type B
Request Type	Type A	Type A	...	Type B	Type B

Results of 10 Simulation Runs

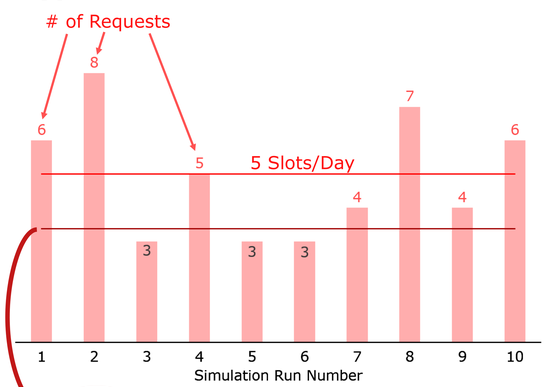
Type A Slot Utilization



91%

- Range of Requests: 5-10 per day
- In 4/10 runs, type A appt. slots were underutilized
- Overall utilization of type A is 91%

Type B Slot Utilization



68%

- Range of Requests: 3-8 per day
- In 5/10 runs, type B appt. slots were underutilized
- Overall utilization of type B is 68%

Conclusion

The DOSS Tool:

- Is useful for evaluating scheduling templates and policies
- Determines utilization of appt. slots for every patient type
- Is helpful for visualizing steps of project and for conceptualizing pseudocode
- Can be expanded to accommodate multiple and/or consecutive days, more patient types, and a variety of request rates

Future Work

- Collect data on the number of patient types
- Collect data on the appt. request rate for each patient type
- Evaluate several scheduling templates
- Evaluate several scheduling policies
- Create a simulation scheduling tool in Python
- Convert simulation model into a scheduling tool to determine optimal template-policy pairing for any clinic
- Set the foundation for outpatient scheduling research of multiple patient types

Acknowledgements

- Professor Amy Cohn
- Center for Healthcare Engineering & Patient Safety Staff & Students
- SCOPES Team: Trevor Hoffman, John Cima, Karmel Shehadeh, Julia Warner
- Summer Research Opportunity Program Staff

BRADLEY University

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