5-4-2006

Patient Scheduling & Flow in the IUMG 4th Floor Outpatient Clinic

Ronald Rardin
Purdue University, University of Arkansas, rrardin@uark.edu

PURDUE UNIVERSITY

Applying the principles of Engineering, Management & Science to improving Healthcare delivery.

Project Overview: Patient Scheduling & Flow in the IUMG 4th Floor Outpatient Clinic

Professor Ron Rardin

May 4, 2006

REGENSTRIEF CENTER FOR HEALTHCARE ENGINEERING

Project Team

Investigators

Ron Rardin
Mark Lawley
Kumar Muthuraman
Leyla Ozsen
Hong Wan
Julie Ann Stuart

Students

Renata Kopach
PoChing DeLaurentis
Xiuli Qu
Lisa Tieman

IUMG Collaborators

Dr. DeDe Willis
Dr. John Fitzgerald
Marc Rosenman
Felgrace James
Dr. Ann Zerr
Mindy Rosa

Project Goals

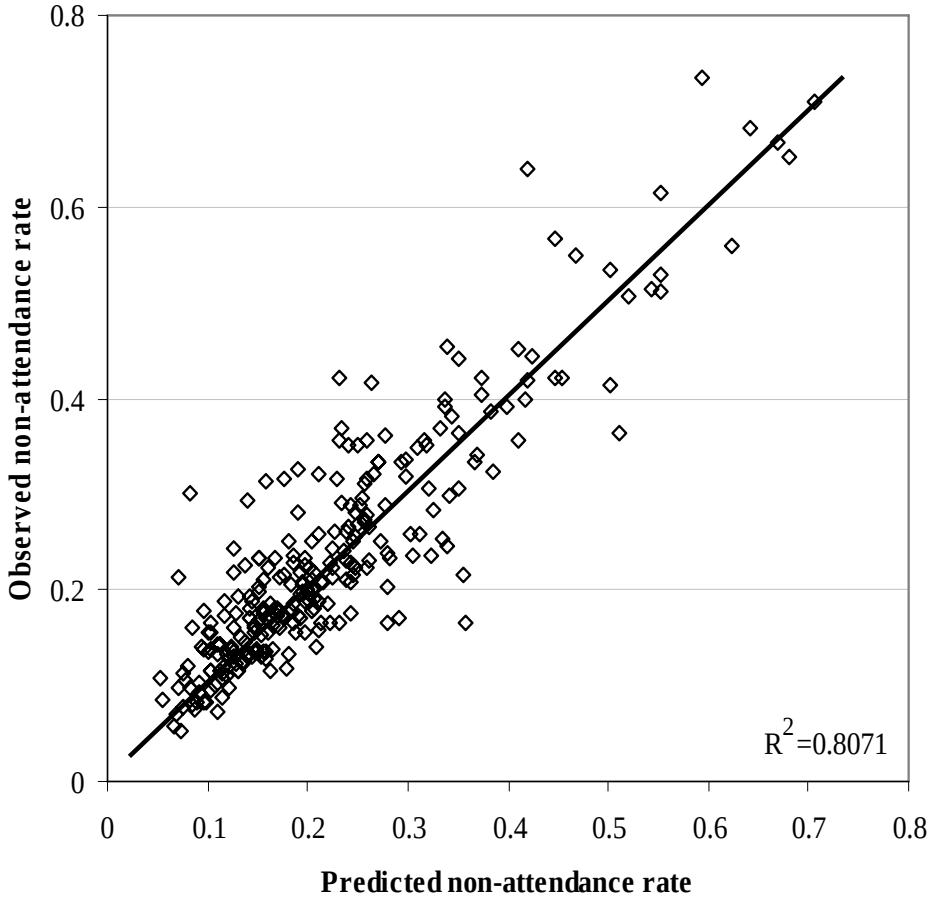
- Investigating application of quantitative tools from industrial engineering to understand and improve the appointment scheduling and patient flow within the 4th floor general medicine (outpatient) IUMG clinic. Special emphasis on
  - Investigate open or same-day patient scheduling in outpatient clinics
  - Persistent problems of patient noshows for scheduled appointments waste capacity and introduce unwanted volatility

Project Evolution

- During the period of the project, the 4th floor clinic has both installed and then largely abandoned a version of open access scheduling
  - Quick abandonment is not unusual
  - Information generated by the team has been directed to tools & guidelines for addressing when & how open scheduling can be effectively used in different kinds of clinics

Noshow Prediction Model

- 69K appointments from RI
- Factors: Screen/Return, AM/PM, Patient History, Weather, Insurance, Age
- Non-attendance rates of appointment categories with at least 30 scheduled appointments each
- Implication: can forecast noshow probabilities for management or double booking

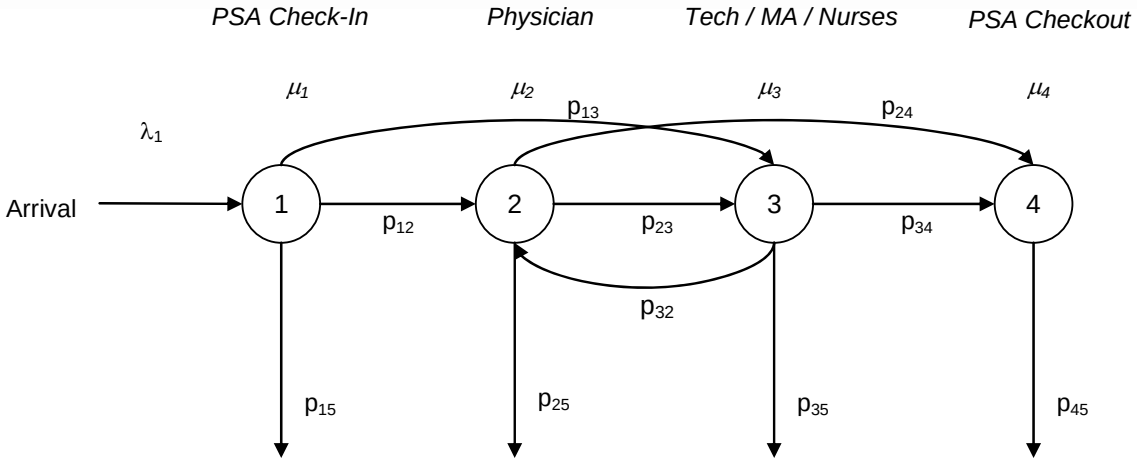


Prescheduled vs. Open Slots

- Given parameters
  - probability distribution of demand for fixed and open slots
  - predicted noshow rates for fixed and open slots
  - total number of slots
- We would like to know the number of slots reserved for fixed appointments that maximizes the average number of patients consulted
- Result: formula for optimal number in terms of the parameters

Patient Flow Rough Cut Capacity

- Patient flow queueing models are useful for quick understanding the effects of capacity and scheduling policies
  - Yield basic service efficiency measures such as patient waiting time, patient total time in clinic



Expected Total Time in System Subject to Staff at Different Stations

Min = (1,5,3,1)

# of servers	Δc						
(c_1,c_2,c_3,c_4) = (I, P, N, O)	3	2	1	0	-1	-2	-3
(2,6,8,3)	57.53						
(2,8,7,2)	54.49						
(3,6,7,3)	56.56						
(3,6,8,2)	56.58						
(3,7,7,2)	54.23						
(2,7,7,2)		55.22					
(3,5,7,3)		66.71					
(3,6,7,2)		56.59					
(2,5,7,3)			67.70				
(2,5,8,2)			67.72				
(2,6,7,2)			57.57				
(3,5,7,2)			66.74				
(2,5,7,2)				67.73	**Baseline**		
(2,6,6,2)				57.61			
(2,5,6,2)					67.77		
(2,5,7,1)					68.31		
(1,5,7,2)					96.93		
(2,5,5,2)						67.97	
(2,5,6,1)						68.35	
(1,5,6,2)						96.97	
(1,5,7,1)						97.51	
(2,5,4,2)							68.88
(2,5,5,1)							68.55
(1,5,6,1)							97.56

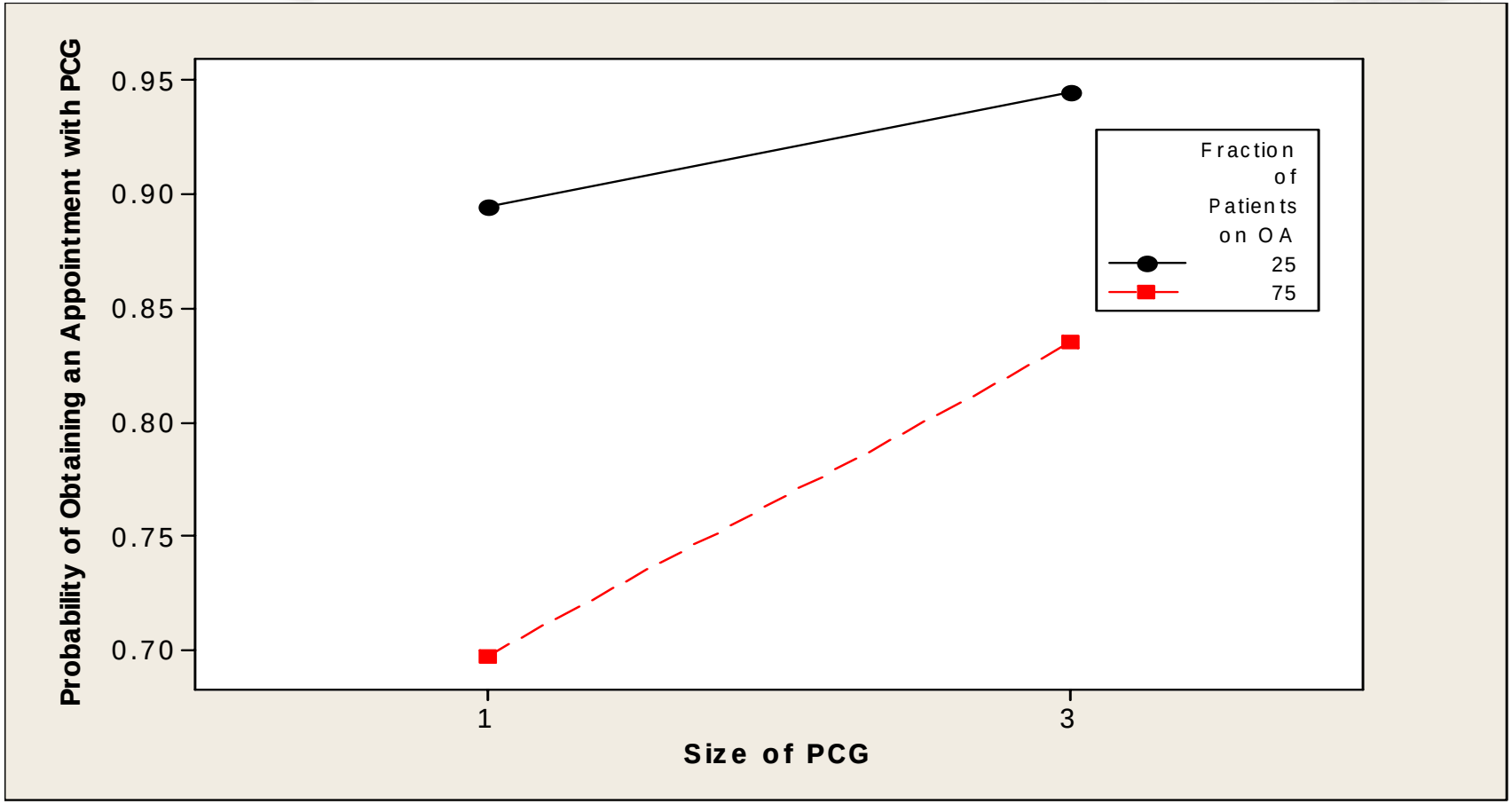
System Simulation Modeling

- Develop a tool which is able to *identify* and *estimate* the interrelationships among various factors and their impact on open access scheduling and patient flow
  - Steps through operations within a computer program
- Performance measures
  - Showup rates
  - Continuity of care

Policies Examined in Simulation

1. Grouping of Physicians into Primary Care Groups
2. Booking Horizons
3. Percentage of patients using Open Access
4. Double Booking Procedures

Factors Affecting Continuity of Care



Directions of Future Research

- Followup at IUMG with test implementation of scheduling procedures shown promising by our analyses
- Develop a set of tools to design how open access should be implemented in terms of the characteristics of the particular environment
  - Noshow rates, patient demographics, physician work patterns, care groups, etc.
  - Proposal submitted to NSF

PURDUE UNIVERSITY

Applying the principles of Engineering, Management & Science to improving Healthcare delivery.