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

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

Professor Ron Rardin

May 4, 2006
Project Team

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Xiuli Qu
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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 4\textsuperscript{th} 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

![Scatter plot with observed and predicted non-attendance rates](image)

\[ R^2 = 0.8071 \]
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)

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Baseline

Δc

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68.35
96.97
97.51
68.88
68.55
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

The graph shows the probability of obtaining an appointment with PCG (Primary Care Group) against the size of the PCG. The data suggests that as the size of the PCG increases, the probability of obtaining an appointment also increases. The fraction of patients on OA (Office Attendance) is represented by different markers: 25% and 75%, with 75% having a higher probability compared to 25%.
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
Phase I: System Design

Characteristics of Clinic Environment

Rough-Cut Design
- Queueing Network Model
- Slot Allocation Model
- No-Show Analysis Model
- Overbooking Model
- Patient Care Grouping Model
- Optimal Backlog Accommodation Model

Implementation of Design

Performance Evaluation
- Efficiency
- No-Show Rates
- Continuity of Care

Simulation Analysis

Refined Configuration
- Scheduling Horizons
- Session of Slots
- Overbooking Policy

Continuous Monitoring & Reconfiguration

Continuous Modeling Feedback

Rough-Cut Modeling Feedback