Improving Patient Flow in an Outpatient Cancer Center

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Introduction

Patient visit to an outpatient Cancer Center
- Often long, multi-step process
- Can take anywhere from 30 min to 8 hrs
- Requires coordination of multiple departments
- Many opportunities for disruptions and delays
- Delay domino effect

Concerns
- Very long visit lengths
- Added stress and risk to patients
- Increase in provider overtime

Current State
- Nearly all infusion patients enter the system through phlebotomy
- Blood drawn for labs needed:
  - By provider before clinic appointment to assess patient
  - By pharmacy to initiate drug preparation
- Multi-step, multi-wait process, increasing patient wait times
- Non-uniform volume throughout the day
  - In order to fit in all following appointments, much higher patient volume in the morning

Problem Statement
- Determine changes in patient flow, phlebotomist work flow and/or staffing decisions to improve efficiencies and decrease wait times
- Unable to actually implement various changes in the working environment in order to test and assess effectiveness

Phlebotomy

Figure 2: Phlebotomy flow overview.

Current State
- Phlebotomy
  - Check-In
  - Phlebotomy
  - Blood Draw
  - Waiting Area
  - Phlebotomy
  - Lab Processing
  - Clinic
  - Pharmacy

Leveling Patient Arrival
- Nearly uniform
- Many opportunities for disruptions and delays
- Can assess impact of policy changes before actual implementation
- Maintain a growing queue of events that occur throughout the day, sorted by time of occurrence

Discrete Event Simulation

Approach
- Developed using C++
- Can manipulate input parameters to observe effect on various metrics
- Manipulability of simulation models allows users to explore the impact of changes without the risk of implementation
- Can assess impact of policy changes before actual implementation
- Maintain a growing queue of events that occur throughout the day, sorted by time of occurrence
- Model both patient and phlebotomist actions

Level system variability

Figure 3: Simulation process overview.

“What-If” Analysis

Current State
- Phlebotomy
  - Check-In
  - Phlebotomy
  - Blood Draw
  - Waiting Area
  - Phlebotomy
  - Lab Processing
  - Clinic
  - Pharmacy

Figure 4: Effect of leveling variable on wait times.

Patient volumes increase

1. Can current capacity handle increased volume?

Figure 5: Effect of increased volume on wait times.

2. How could staffing changes help accommodate?

Figure 6: Effects of staffing changes on wait times.

Future Work

- Continued improvement towards representing reality (current state)
  - More accurate service time distributions
  - More accurate arrival rate data
  - Non-instantaneous service transitions
  - Incorporation of additional roles
  - Incorporation of dynamic roles/staffing
  - Exploration of additional “what-if” scenarios
  - Implementation of improvements
  - Additional applications (outside of Phlebotomy) of model functionalities

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