Reducing Patient Wait Times & Improving Resource Utilization at the BC Cancer Agency’s Ambulatory Care Unit

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Outline

- The Ambulatory Care Unit
  - Process
  - Problems & opportunities
- Data, Analysis & Modelling
- Scenario Analysis
- Conclusions
The Ambulatory Care Unit
Background

- BC Cancer Agency, Vancouver Centre:
  - Three programs: radiation, medical and surgical oncology
  - Referral centre for provincial programs

- Ambulatory Care unit (ACU):
  - Multiple visit types:
    - New patients diagnosed with cancer
    - Follow-up patients (in active treatment or regular check-up)
    - Consults (inter-program consultations)
  - Multiple physicians: oncologists, residents, students
  - Average of 200 patient visits per day, 50,000+ visits in 2007/2008
Problems

- Lack of exam rooms, physicians’ space and patient waiting area

- Increasing patient volumes: 9% annual increase over last five years

- Increasing demand for resources due to:
  - clinical trials
  - academic / teaching duties
  - new information technology assisted care (i.e. electronic charts and tele-health)

- Concern about the patient experience (i.e. excessive wait times during visit to the centre)
The Ambulatory Care Unit: Process

1. Patient arrives and checks in ACU Reception
2. Patient goes to Waiting Room until called for appointment
3. Nurse calls patient into Exam Room
4. Physicians (oncologist and/or resident/student) go into Exam Room and interact with patient
5. Physicians prepare patient Orders
6. Orders are sent to Nursing Station to be processed (or filed if processed off-line)
7. Patient leaves Exam Room and may go back to Waiting Room for Appointment Card
8. Nurse brings Appointment Card to patient
9. Patient leaves ACU
Data, Analysis & Modelling
Data Analysis

- Available data:
  - Historical bookings (appointments)
  - Clinic schedules
  - Room capacity

Base for preliminary analyses
Unbalanced Schedules Throughout the Week

Average # Appointments per Day of Week
FY 2007/08

Data source: Scheduling warehouse (April 1, 2007 to November 30, 2008)
Unbalanced Schedules Throughout the Day

ACU Patients per Activity Group and Time of the Day

Data source: Scheduling warehouse (April 1, 2006 to March 31, 2007)
Data Analysis

- No process data!

- Need to better understand process:
  - Resource utilization
  - Patient wait times

Data collection:
- Determined key points in process
- Observed selected clinics for 2 weeks
- Collected up to 14 time stamps for 600+ appointments
- Hard and expensive, but extremely useful
Exam Room Utilization

Only when a physician is in the room
On average throughout the day, in 56% of the occupied rooms there is patient-doctor interaction.

Patient-doctor interaction time calculated from first doctor in to last doctor out.
Patient Wait Time

25% of patients wait >28 minutes and 10% of the patients wait > 46 minutes
Methodology Selection

- Complex system with different programs & patient types
  - Variable process times and arrival rates
  - Multiple patient paths

- Several interacting resources
  - Oncologists
  - Student / residents
  - Exam rooms

- Difficult to determine realistic analytical solution; want to test many “what-if” scenarios and assess impact of changes

- Decided on simulation
Model Basics

- Discrete event simulation (Arena)

- Focus of the model: patients
  - From patient arrival until departure from exam room

- Various processes during the ACU visit
  - Seize & queue for exam rooms, oncologists, residents/students
Simulation Model
Validation

- **Verification:**
  - Test system response under extreme scenarios
  - Corroborate model logic

- **Validation:**
  - Wait time
  - Doctor interaction time
  - Room utilization
  - Total system time

Results from model inputs and logic
Scenario Analysis
Simulation Parameters

- Actual ACU schedules from historical data:
  - January 2008 (highest monthly volume in fiscal year)
- All ACU clinics considered
- Replications: 100 one-month periods
Scenarios & Metrics

- Changes in the processes:
  - Clinic Delay
  - Appointment Order
  - Appointment Duration
  - Appointment Adjustment
  - Schedule Add-ons

- Resource utilization:
  - Exam room allocation

- Performance metrics:
  - Patient wait time (average, percentiles)
  - Clinic duration
  - Doctor idle time
  - Exam / wait room utilization
Results

Unique combination of:
• Physician Delay
• Appt Order
• Appt Duration increase
• Appt Duration Adjust
• Schedule Add-ons

Efficient Frontier

Decreased Wait time and Clinic end time

Current State
Results

Wait Time and Clinic Duration for Selected Scenarios

Changes to Current State

- Significant reductions in wait time can be achieved with minor impact on current clinic durations
Room Allocation: Dynamic (proposed)

# rooms

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<th>Clinic</th>
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Impact of Dynamic Room Allocation

- When pooling exam rooms
  - Up to 6 rooms can be reduced in Systemic
  - Up to 4 rooms can be reduced in Radiation Therapy
Conclusions
Conclusions

- Up to 70% reduction in patient wait times can be achieved with only limited increase in clinic duration

- Result of not one but multiple strategies:
  - Clinic punctuality
  - Schedule add-ons (avoid double-booking)
  - Accurate appt. booking

- Potential to reduce 26% exam room requirements by using dynamic room allocation
Next Steps

- Additional scenarios:
  - More balanced (smoother) schedule
  - JIT exam room allocation

- Patient wait time survey: full study

- Implementation:
  - Try changes in some clinics and evaluate results
Thank you!

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