Analyzing Patient Scheduling, No Shows, and Cancellations in a Specialty-Care Clinic

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Analyzing Patient Scheduling, No-Shows, and Cancellations in a Specialty – Care Clinic

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Goals of the Talk

• Investigate access in a specialty care setting
  – Michigan Weight Management Program (WMP)
• Utilize a longitudinal database to capture dynamics of WMP
  – Understand how the database is built
• Analyze issues relevant to the program
  – Booking rates
  – Cancellations
  – Refill of emptied slots due to cancellations
Research Team

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The University of Michigan Weight Management Program (WMP) is a two-year program
  - Intense caloric restriction & behavioral change
- Geared towards individuals with critical health risk
- Patients must attend ≥80% of scheduled appointments
  - First month of program requires more frequent visits

Problem Statement

- Clinic booked at or near capacity, so patients must schedule far into the future, where personal schedules are less certain

- Last-minute cancellations leave appointments slots unused

- Insufficient capacity for patients to adhere to program timeline
Database Approach

• Build a temporal MySQL database to evaluate the dynamic clinic schedule

• Data: 2 spreadsheets received every working day
  o Prospective appointment schedules
  o Provider availability data

• Store information on a rolling horizon basis in the form of a snapshot

• Compare consecutive appointment snapshots
  o Evaluate and capture the changes in clinic dynamics
Conceptualizing the Database

1. Slot
2. Appointment Opportunity
3. Provider Template
4. Appointment Schedule
5. Appointment Schedule Snapshots
1. Slot

- Basic building block of the database
- Represents single 15 minute time period
- Corresponds to a single record in the database
- Defined by:
  - Provider Name
  - Slot Date
  - Slot Begin Time
2. Appointment Opportunity

- **Appointment Opportunity** can be represented by single **Slot** or group of **consecutive Slots**
- Represents single placeholder for a patient appointment
- **Appointment Opportunity** is typically created expecting:
  - New Patient (multiple slots)
  - Return Visit (single slot)
- Defined by:
  - Appointment Length
  - Appointment Type
  - Slot Number in Appointment
  - Total Number of Slots in Appointment
3. Provider Template

- Represents all possible *Appointment Opportunities* over a given timeframe

- This template is a compiled schedule of each provider’s general availability to see patients

- This excludes information about intermittent unavailability, e.g.
  - Out of office for conference
  - Vacation leave
  - Administrative duty
4. Appointment Schedule

• Represents *Provider Template* overlaid with:
  1. Each provider’s intermittent unavailability
     a. Out of office for conference
     b. Vacation leave
     c. Administrative duty
  2. Patient appointment data

• Some *Appointment Opportunities* are occupied by patient appointments

• Rest of *Appointment Opportunities* remain either:
  – Available for scheduling appointments
  – Unavailable due to provider unavailability to see patients
5. Appointment Schedule Snapshots

- On each day (M-F), we view the Appointment Schedule.
- Each day’s view represents an Appointment Schedule Snapshot.
- We compare two consecutive Appointment Schedule Snapshots and capture changes from one to another, e.g.
  - Creation of appointment
  - Cancellation of appointment
  - Rescheduling
  - Provider availability
# A Sample View of the Database

<table>
<thead>
<tr>
<th>Appointment</th>
<th>Snapshot Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Time</td>
</tr>
<tr>
<td>7/28</td>
<td>10:00</td>
</tr>
<tr>
<td>10:15</td>
<td>A</td>
</tr>
<tr>
<td>10:30</td>
<td>B</td>
</tr>
<tr>
<td>10:45</td>
<td>B</td>
</tr>
<tr>
<td>11:00</td>
<td></td>
</tr>
<tr>
<td>11:15</td>
<td></td>
</tr>
</tbody>
</table>
Our Approach vs. Traditional Approach

Traditional View of Appointment Schedules
• Often looks at a static view of the calendar.
• No visibility about information between two time points
  – Suppose we look at two static views of an appointment calendar (e.g. July 1st and July 8th)
  • What happens in between these two time points?

Our View of Appointment Schedules
• Temporal database offers many advantages:
  – Capture and quantify information at multiple levels (e.g. appointment type, provider, day of week, etc.)
  – See how multiple opportunities used for one appointment
  – Aggregating snapshots allows us to solve problem seen in traditional approach
Patient Case Study

Snapshot Date

Provider A cancels
Reschedules for Provider B
Patient cancels
Refilled

Sept 24  25  26  27  28

Key highlights:
1. Multiple opportunities were used for one appointment
2. Late cancellations hurt opportunities for rescheduling
How Booked is the Clinic?

Booked Rate = \frac{\text{Number of Appointments Scheduled}}{\text{Number of Appointment Opportunities Available}}
Who is Cancelling?

- Provider Cancellations account for over 28% of all cancellations

- Consider Automated Reminder System and MyUofMHealth Portal to be "Patient" Cancellations
When do Cancellations Occur?

How late do patients cancel their appointments?

Over 65% of all cancellations occur within 5 days of the scheduled appointment.
Are Cancelled Slots Getting Refilled?

Refilled Slots vs. Total Number of Cancellations

Frequency

Cancellation Interval (Net Workdays)

Total
Refilled
Are Cancelled Slots Getting Refilled?

Probability of Refilling a Cancelled Slot

Probability of Refill

Cancellation Interval (Net Workdays)
What’s Next?

• Use the database to investigate other issues related to the clinic
• Create a scheduling dashboard for short term booking
• Develop a waitlist simulation tool that provides easier appointment access
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