IMPROVING PATIENT FLOW IN AN OUTPATIENT CHEMOTHERAPY INFUSION CENTER

Pamela Martinez Villarreal
Matthew Rouhana
Agenda

• The Team
• Cancer Background
• Infusion Overview
• Project Initiatives
The Team

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Industrial and Operations Engineering Student
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Supervisor, Department of Pathology
Industrial and Operations Engineering
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Manager, Department of Pathology
Industrial and Operations Engineering
Nursing Graduate
Associate Supervisor, Department of Pathology
Nursing Graduate
Nurse Manager, Infusion
Operations Manager, Infusion
Medical Director, UMCCC
Pre-Medical Student
Cancer Statistics

– Second leading cause of death in the United States

– In 2015, there will be an estimated 1,658,370 new cancer cases diagnosed and 589,430 cancer deaths in the US.

Source:
In 2014, over 50% of outpatient visits in the UMCCC resulted in chemotherapy infusion treatments:

- 97,147 outpatient visits
- 58,419 infusion treatments

Variable infusion treatment times (30 min – 8 hr)

Source: U of M Comprehensive Cancer Center (2015)
http://www.mcancer.org
Our Goal

Reduce patient waiting times and improve their full-day experience
Infusion Overview

Patient Arrives

8 AM

Phlebotomy

9 AM

Clinic

10 AM

Infusion

Patient Discharged

Lab Processing

Pharmacy

Patient Flow

Information Flow

Material Flow
Infusion Overview

Patient Arrives -> Phlebotomy -> Clinic -> Infusion -> Patient Discharged

Lab Processing

Pharmacy

- Patient Flow
- Information Flow
- Material Flow
On average, patients wait ~45 minutes after arrival at infusion until they are seated in a chair.

Project Initiative:
Improved Scheduling of Infusion Patients
Improved Scheduling of Infusion Patients:

1) Stochastic Optimization


- Allow extra time for highly variable treatments
- Increase appointment lengths in the middle of the day
Improved Scheduling of Infusion Patients:

2) Patient Acuity Model
   • Reduce variability in patient appointment lengths

3) Appointment Templating
   • Schedule appointments more effectively using templates for different care cycles
Drugs not being ready could delay a patient’s appointment

Project Initiative:
Pre-Mixing Drugs
Pre-mixing Drugs:

- Pharmacy prepares drugs for infusion
  - Some are very expensive
  - Risk of waste

- Drugs prepared once patient arrives at infusion
Pre-mixing Drugs:

- “Pre-mixing” may help improve patient waiting times/workload balance
- Evaluate trade-offs of improved wait/workload vs. risk of drug waste
- Optimizing which Chemotherapy Drugs to Pre-Mix and When
  - Donald Richardson
  - **FA08** - Friday, 8:00-9:30 AM session, Student Research Projects in Healthcare Operations
Lab results needed:

- by **provider** before clinic appointment to assess patient
- by **pharmacy** to initiate drug preparation

**Project Initiative:**

**Uncoupling Appointments**
Uncoupling Appointments

- Option to have labs done at least one day prior to clinic appointment at any MLab facility

<table>
<thead>
<tr>
<th>Driving Duration</th>
<th>% of Patients to Closest Lab Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 15 min</td>
<td>32%</td>
</tr>
<tr>
<td>15 – 30 min</td>
<td>20%</td>
</tr>
<tr>
<td>30 – 60 min</td>
<td>23%</td>
</tr>
<tr>
<td>1 – 2 hours</td>
<td>15%</td>
</tr>
<tr>
<td>2 – 4 hours</td>
<td>7%</td>
</tr>
<tr>
<td>Over 4 hours</td>
<td>3%</td>
</tr>
</tbody>
</table>
Project Initiatives: **Discrete Event Simulation**

Phlebotomy goal is to consistently have lab results in a **one-hour turnaround** window (from patient arrival to phlebotomy and their next appointment)
### Discrete Event Simulation

#### Pre-Examination Blood Draw

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient waits to be checked-in</td>
<td>13 min</td>
</tr>
<tr>
<td>Check-In</td>
<td>2.55 min</td>
</tr>
<tr>
<td>Patient waits to be called to the back</td>
<td>16 min</td>
</tr>
<tr>
<td>Blood Draw</td>
<td>3.52 min</td>
</tr>
<tr>
<td>Batch</td>
<td>20 min</td>
</tr>
<tr>
<td>Prepare and send capsule</td>
<td>1.43 min</td>
</tr>
</tbody>
</table>

**Total (Value Added):** 7.5 min

**Total (Non-Value Added):** 49 min

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- 2014 PHLEBOTOMY TIME STUDIES
Discrete Event Simulation

1) Computer Simulation Tool:

- Can help visualize and analyze current operations
- Test and measure the impact of different “what if" scenarios without having to carry them out
  - What if patients were able to check themselves in?
  - What if we add a permanent medical assistant to the staff?
Phlebotomy Layout and ProModel Simulation
Discrete Event Simulation

2) Table-Top Simulation:
   - Hands-on activity
   - Engage the whole team
   - Educational component
   - Brainstorm ideas
Future Work

**Improved Scheduling of Infusion Patients:**
- Incorporate acuity and improve scheduling templates and protocols

**Pre-mixing Drugs Tool:**
- Assist in deciding which drugs to prepare and when

**Discrete Event Simulation:**
- Simulate different “what if” scenarios to test and measure their impact in the process
Thank you!

QUESTIONS?

CONTACT INFORMATION:

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Appendix

Value Stream Map for Processing of CBCD STAT Specimens from the Cancer Center

Last Updated: 9/5/2014

Lab Information System (SOFT)

Results uploaded from SOFT to MiChart directly

About 20% of tubes require additional processing

Data Sources:
阅读全文内容。
## Pre-Examination Blood Draw

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean (Standard Deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient waits to be checked-in</td>
<td>--</td>
</tr>
<tr>
<td>Check-In</td>
<td>3.12 min (2.10 min)</td>
</tr>
<tr>
<td>Patient waits to be called to the back</td>
<td>--</td>
</tr>
<tr>
<td>Blood Draw</td>
<td><strong>Vein:</strong> 4.99 min (2.38 min)</td>
</tr>
<tr>
<td></td>
<td><strong>Port:</strong> 13.60 min (4.44 min)</td>
</tr>
<tr>
<td>Batch</td>
<td>17.63 min (3.92 min)</td>
</tr>
<tr>
<td>Prepare and send capsule</td>
<td>--</td>
</tr>
</tbody>
</table>

**Value Added**

**Non-Value Added**

- 2015 PHLEBOTOMY TIME STUDIES
Appendix

- Phlebotomy – 253 patients per day
- Clinic (7 Total) – 311 patients per day
- Infusion – 123 patients per day
  - 20% of infusion appointments are coupled
### Appendix

- **Staff Schedule**

<table>
<thead>
<tr>
<th></th>
<th>6:30</th>
<th>7:00</th>
<th>7:30</th>
<th>8:00</th>
<th>8:30</th>
<th>9:00</th>
<th>9:30</th>
<th>10:00</th>
<th>10:30</th>
<th>11:00</th>
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<tbody>
<tr>
<td><strong>Front Desk</strong></td>
<td>-2</td>
<td>-3</td>
<td>-3</td>
<td>-3</td>
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<td>-2</td>
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<tr>
<td><strong>Greeter</strong></td>
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<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
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<tr>
<td><strong>Clinic Sweep</strong></td>
<td>-1</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td><strong>Breaks/Lunches</strong></td>
<td>-1</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
<td>-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Part Time/Day Off</strong></td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
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<td>-1</td>
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<tr>
<td><strong>Available to Draw</strong></td>
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<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>11</td>
<td>10</td>
<td>11</td>
<td>10</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>11:30</th>
<th>12:00</th>
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<th>14:00</th>
<th>14:30</th>
<th>15:00</th>
<th>15:30</th>
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<th>16:30</th>
<th>17:00</th>
<th>17:30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Available to Draw</strong></td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>3</td>
<td>3</td>
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