Improving Patient Flow in an Outpatient Infusion Center

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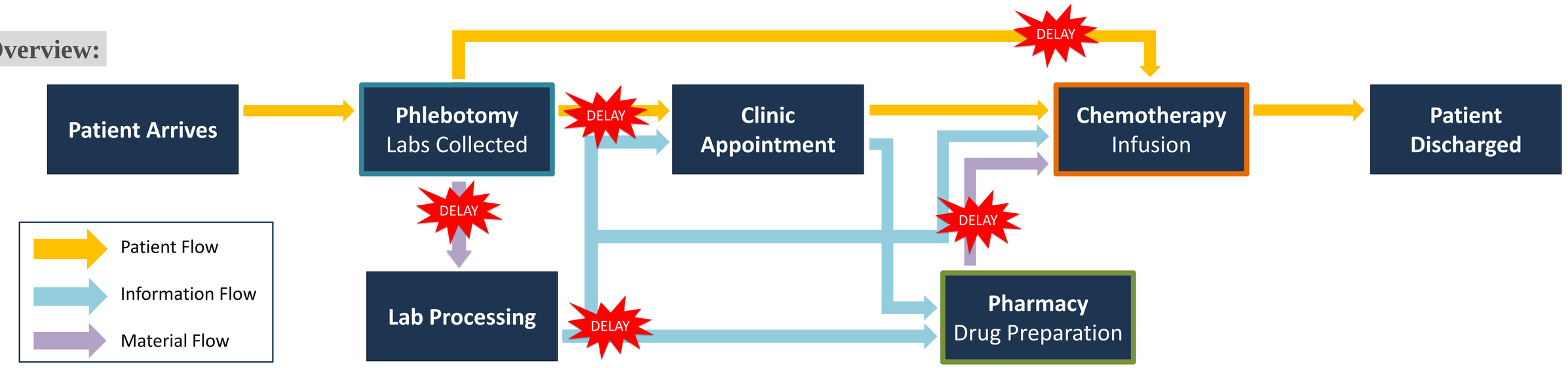
Overview:



Lab Process Analysis

Background:

- Lab results needed: (1) by provider before clinic appointment to assess patient and (2) by pharmacy to initiate drug preparation/infusion process
- Concerned about: (1) patient waiting time, (2) balanced phlebotomist workload, and (3) lab results being available within 1 hour

Methods:

- Workflow analysis and time study of blood draw area
- Discrete event simulation of patient flow through area

Event List

Event Type	ID#	Time
Phlebotomist becomes Available	0962	7:15:00
Patient becomes Available (Check-In)	5541	7:16:09
Patient becomes Available (Check-In)	8737	7:20:33

Generate Service Time: 2 minutes 51 seconds

List of Available Phlebotomists

ID#	Time

List of Patients Available for Check-In

ID#	Time
3948	7:03:42
2084	7:06:12

Current Work:

- Continued improvement towards representing current state
- Verification with clinicians and validation against data
- Evaluate potential alternative workflows

Pharmacy Pre-mix Tool

Background:

Pre-mix is defined as the preparation of a drug before any patient is deemed ready to receive it. Generally, the Cancer Center does not pre-mix chemo drugs due to high cost and risk of patient deferral. However if there are multiple patients scheduled to receive the drug and their probability of deferral is low enough, it may be advantageous to pre-mix. We consider the tradeoff between waste cost and reduced patient waiting time.

Methods:

- Integer Programming Model
- Objective: Max E[Reward]-E[Waste Cost]
- Constrains: (1) Drugs must be completed in 2 hour window. (2) Only can mix a finite number of drugs. (3) No preemptions are allowed.

Results:

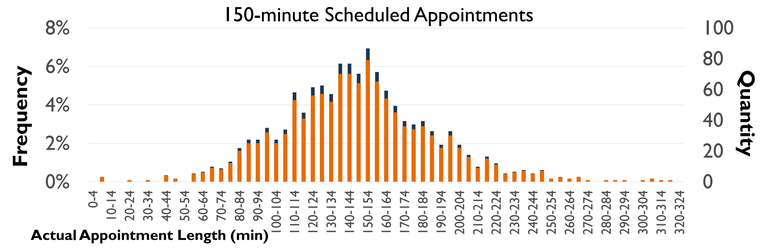
DRUGS	COST	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4
A	$1.61	1	1	—	—
B	$2.52	1	1	—	—
C	$4.10	2	1	1	—
D	$6.80	1	1	1	—
E	$16.56	—	1	—	—
F	$83.40	—	—	—	—
G	$91.54	1	1	1	—
H	$155.56	1	1	—	—
I	$367.02	—	—	1	2
J	$698.60	—	—	1	1
K	$879.00	—	—	1	1
L	$1,158.84	—	—	—	—
M	$2,389.39	—	—	—	2
N	$4,637.21	—	—	—	1
O	$6,516.00	—	1	—	—
Expected Waste ($)		**1.46**	**9.58**	**0.40**	**1.10**
Expected Saved Wait (min)		**236.08**	**224.15**	**238.85**	**239.92**

Table 1: Here we have the solution to our model. We label each drug A-O with their cost. The results show how many doses of each drug we should pre-mix. We define the following four scenarios: (1) There are two patients scheduled for each drug. Both drug mixing times and patient probability of deferral vary for all drugs. (2) We change the probability deferral to have inverse relationship to cost of drug. (3) Now we change the patient probability of deferral back to varying for all drugs and have 2 patients scheduled for lower cost drug but 3-5 for high cost drugs. All other parameters stay the same. (4) We change the probability deferral to have inverse relationship to cost of drug.

Chemotherapy Infusion Scheduling

Background:

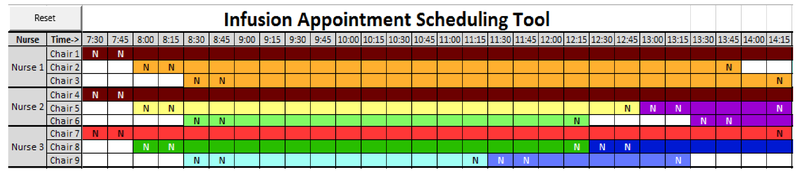
- Patients wait ~45 minutes after arrival at infusion until being seated in a chair, due to high treatment time variability



- *Possible Solution:* Improved scheduling of infusion patients could result in reduced total length of operations and patient wait time

Methods:

- Considering patient acuity, age, and other characteristics can be used to tailor appointment lengths to each patient
- Appointment templating:



Next Steps:

- Incorporate patient acuity into model, develop and implement scheduling guidelines

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