CENTER FOR HEALTHCARE ENGINEERING & PATIENT SAFETY
UNIVERSITY OF MICHIGAN

2015 Healthcare Engineering and Patient Safety Symposium

Improving Patient Flow in an Outpatient Infusion Center

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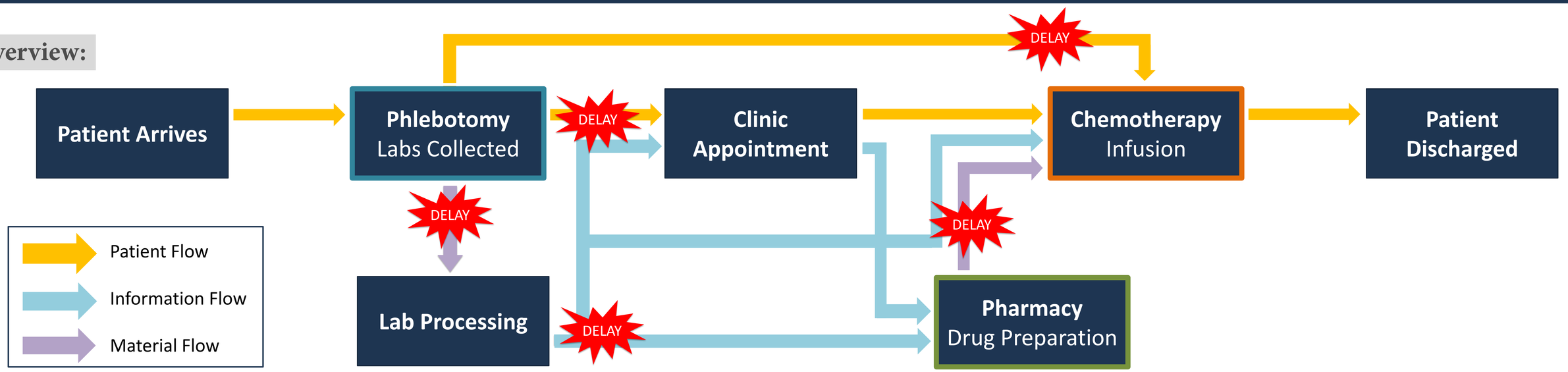
Overview:



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 (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
- Table Top Simulation for education and brainstorming

Findings:

Step	Mean Time (Std Dev) in Minutes
Patient waits for check-in	2.67 (3.92)
Check-in	3.27 (2.15)
Patient waits for call back	4.38 (5.64)
Blood draw	**Vein**: 5.11 (3.75) **Port**: 13.28 (4.64)
Batch	15.16 (4.15)
Prepare and send capsule	1.49 (1.03)

- Total processing time (blood draw and lab analysis) exceeds one hour threshold (blood draw alone accounts for **34.12 min**, on average)
- *Current Work:* Simulation will allow us to test and measure the impact of different "what if" scenarios on the patient flow

Pharmacy Pre-mix Tool

Background:

- Infusion drugs are expensive and their use uncertain (e.g. patient cancellation). Thus, pharmacy does not prepare most drugs in advance
- "Pre-mixing" may help improve patient waiting times/workload balance

Methods:

- Collected and analyzed data on prices, treatment times, deferral rate, etc.

Factor	Effect on Priority
Drug cost	Low cost → Higher priority
Probability of deferral or dosage change	Low probability → Higher priority
Number of patients receiving drug	Higher number of patients → Higher priority

- *Current Work:* Developing optimization model to determine which drugs should be prepared in advance

Maximize:
Trade-off between projected savings (wait time and workload) vs. risk of drug waste

Subject to:
Capacity: You can only make X amount of drugs at a time
Production: Each dose can only be made once
Time: Drugs have to be made within the pre-mix period

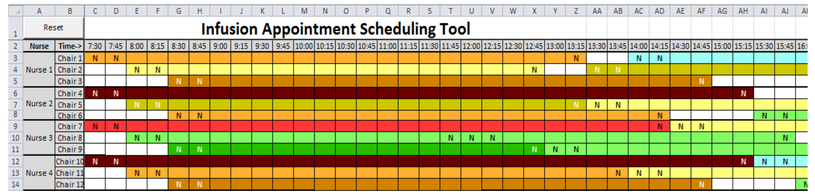
Chemotherapy Infusion Scheduling

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
- Using appointment templating, more consistent and reliable schedules can be created for patients



Findings:

- Allowing extra time for highly variable treatments and increasing appointment lengths in the middle of the day help to prevent and recover from propagating delays
- *Next Steps:* Incorporate patient acuity into model, develop and implement scheduling guidelines

Acknowledgements:

This research is generously supported by the Center for Healthcare Engineering and Patient Safety, the Seth Bonder Foundation, the Doctors Company Foundation, the U of M College of Engineering SURE Program, and the UMHS Comprehensive Cancer Center.

Clinical Collaborators: Dr. Marian Grace Boxer, Diane Drago, Corinne Hardecki, Jennifer Mathie, Carol McMahon, Harry Neusius, Kelly Procailo, Renee Stoklosa, Irene Turkewycz, Dr. Alon Weizer
Student Collaborators: Hassan Abbas, Jeremy Castaing, Ajaay Chandrasekaran, Chhavi Chaudhry, Madalina Jiga, Jonathon McCormick, Donald Richardson, Stephanie See, Brooke Szymanski, Jonathan Zhou