Agenda

- The Team

- Cancer Background

- Infusion Overview

- Project Initiatives

The Team

Hassan Abbas	Nursing Student
Jeremy Castaing, Ph.D Candidate	Industrial and Operations Engineering
Ajaay Chandrasekaran	Computer Science Student
Chhavi Chaudhry	Industrial and Operations Engineering Student
Amy Cohn, Ph.D.	Associate Director, CHEPS
Diane Drago	Patient & Family Advisory Board (PFAB)
Marian Grace Boxer, MD	Professor, Internal Med., Hematology/Oncology
Corinne Hardecki, RN	Clinical Care Coordinator, Infusion
Madalina Jiga	Nursing Student
Jennifer Mathie	Supervisor, Department of Pathology
Jonathon McCormick	Industrial and Operations Engineering

The Team

Carol McMahon, RN	Nurse Supervisor, Infusion
Harry Neusius	Manager, Department of Pathology
Donald Richardson, Ph.D Pre-Candidate	Industrial and Operations Engineering
Stephanie See, RN	Nursing Graduate
Renee Stoklosa	Associate Supervisor, Department of Pathology
Brooke Szymanski, RN	Nursing Graduate
Irene Turkewycz, RN	Nurse Manager, Infusion
Carolina Typaldos, MHSA	Operations Manager, Infusion
Alon Zadok Weizer, MD, MS	Medical Director, UMCCC
Jonathan Zhou	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:
Centers for Disease Control and Prevention (2015) http://www.cdc.gov
American Cancer Society (2015) http://www.cancer.org

U of M Comprehensive Cancer Center

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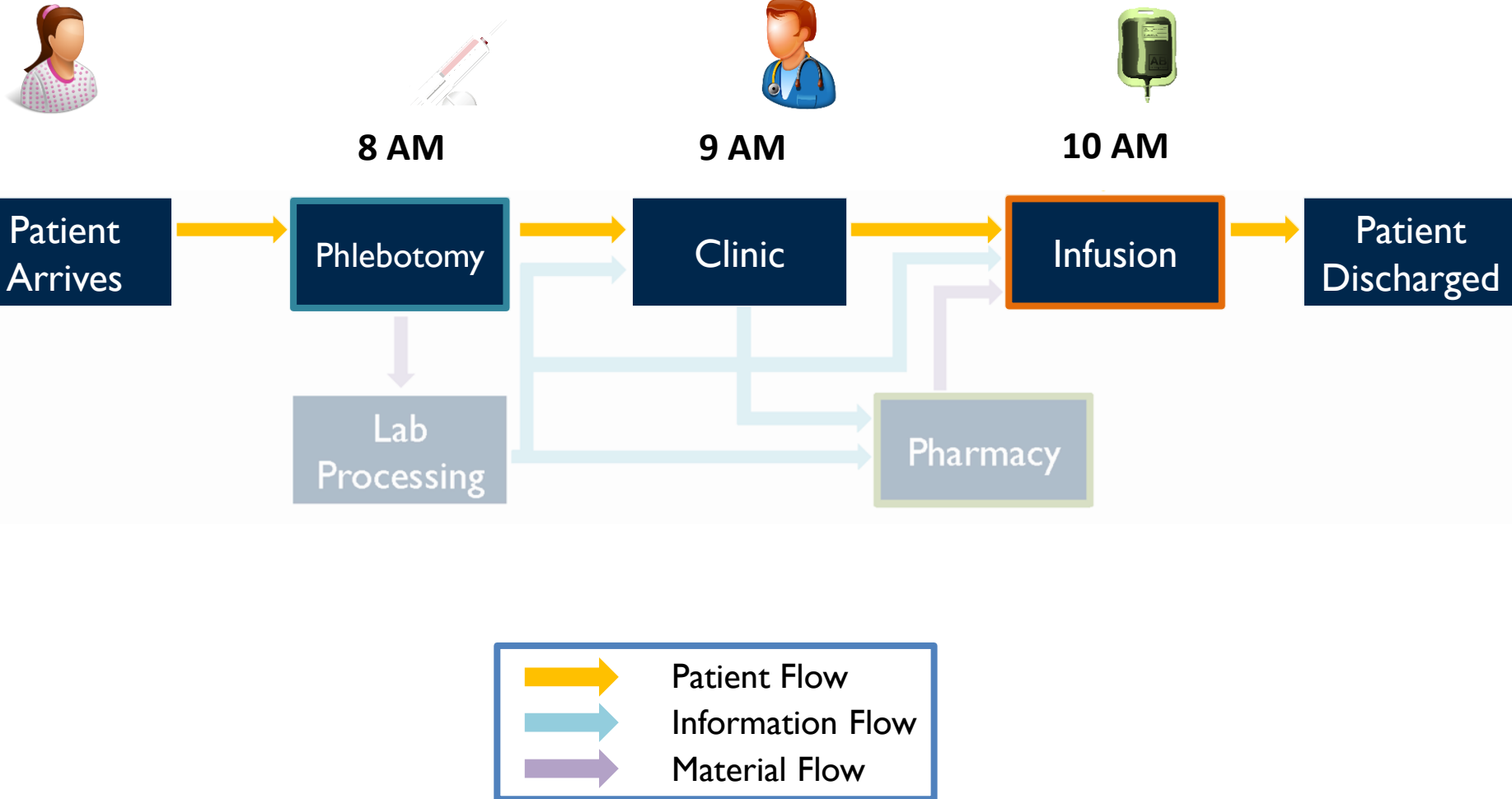
Source:
U of M Comprehensive Cancer Center (2015)
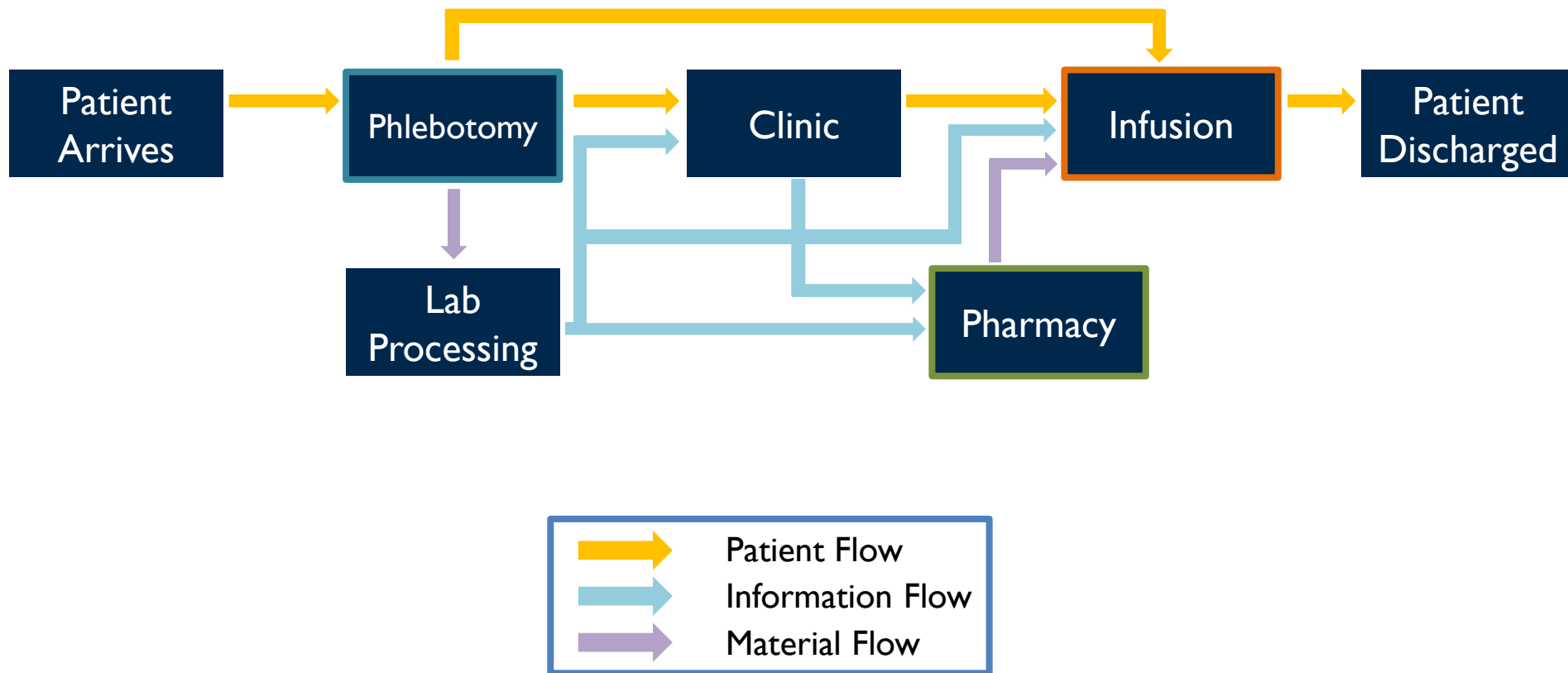http://www.mcancer.org

Our Goal

Reduce patient waiting times
and improve their full-day experience

Infusion Overview

Infusion Overview

Chemotherapy Infusion

On average, patients wait **~45 minutes** after arrival at infusion until they are seated in a chair
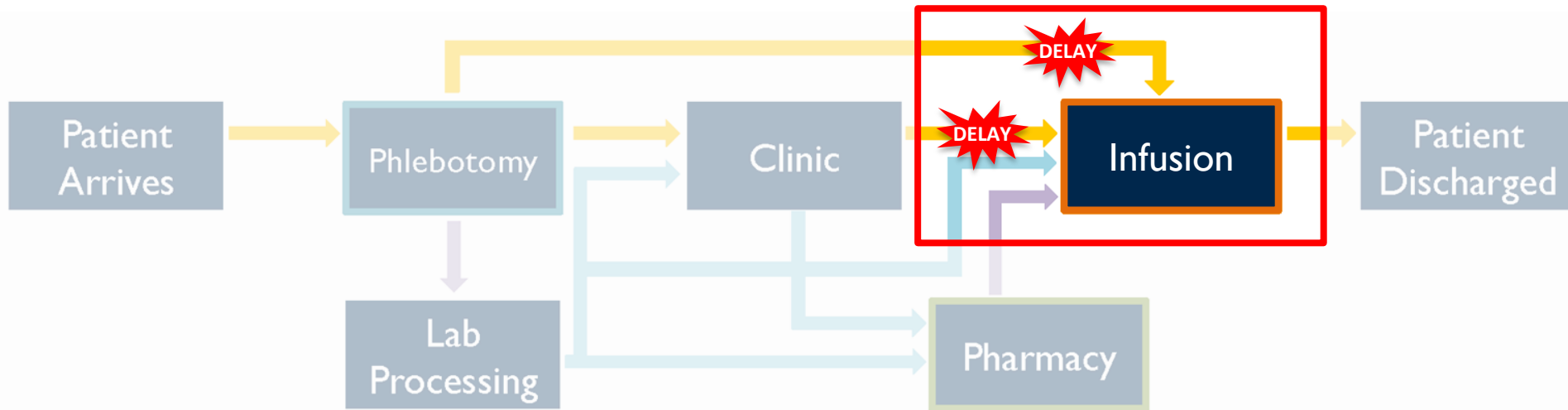
Project Initiative:
Improved Scheduling of Infusion Patients

Chemotherapy Infusion

Improved Scheduling of Infusion Patients:

1) Stochastic Optimization

Castaing, J., Cohn, A., & Denton, B. (2015). Stochastic Programming Approach to Reduce Patient Wait Times and Overtime in an Outpatient Infusion Center (Working Paper)

- Allow extra time for highly variable treatments
- Increase appointment lengths in the middle of the day

Chemotherapy Infusion

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

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Drugs not being ready could delay a patient's appointment
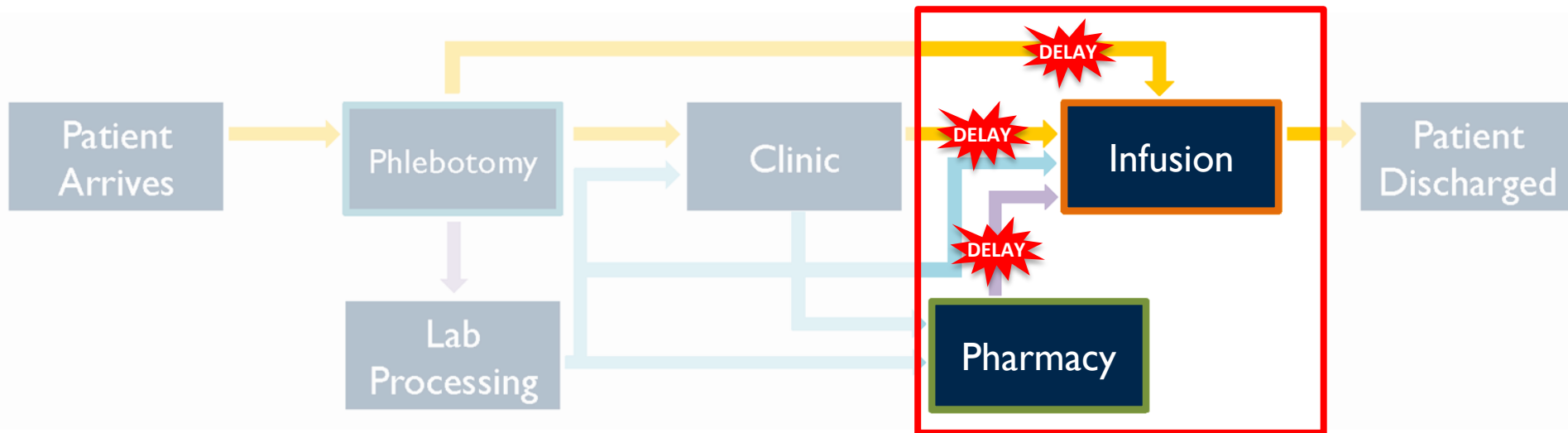
Project Initiative:
Pre-Mixing Drugs

Pre-mixing Drugs:

– Pharmacy prepares drugs for infusion

  • Some are very expensive

  • Risk of waste

– Drugs prepared once patient arrives at infusion

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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

Phlebotomy

Lab results needed:

- by **provider** before clinic appointment to assess patient
- by **pharmacy** to initiate drug preparation
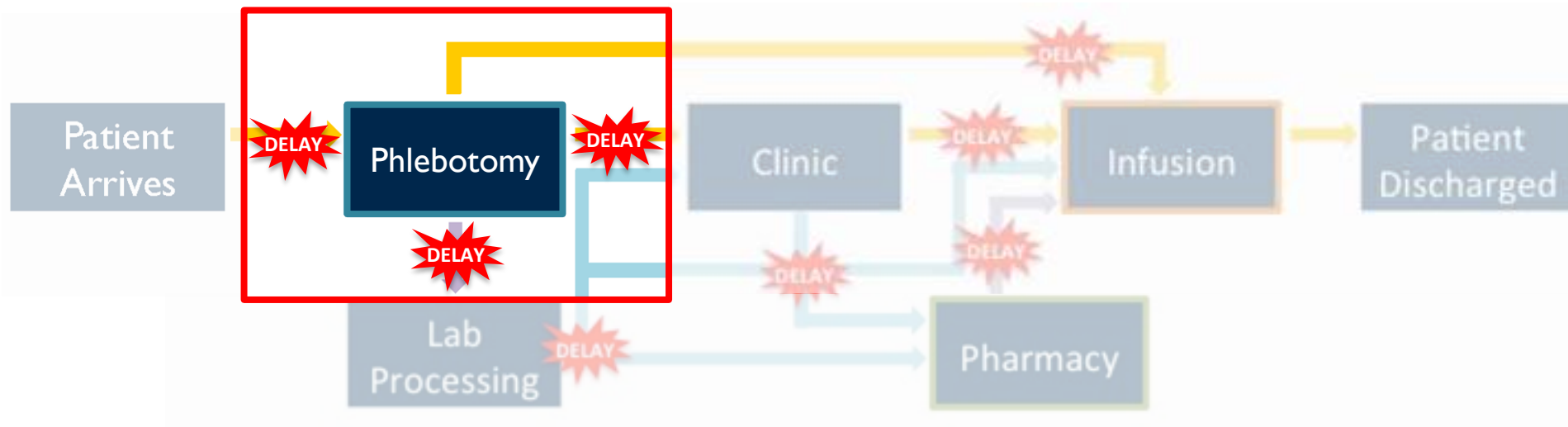
Project Initiative:
Uncoupling Appointments

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Phlebotomy

Uncoupling Appointments

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

Driving Duration	% of Patients to Closest Lab Facility
Less than 15 min	32%
15 – 30 min	20%
30 – 60 min	23%
1 – 2 hours	15%
2 – 4 hours	7%
Over 4 hours	3%
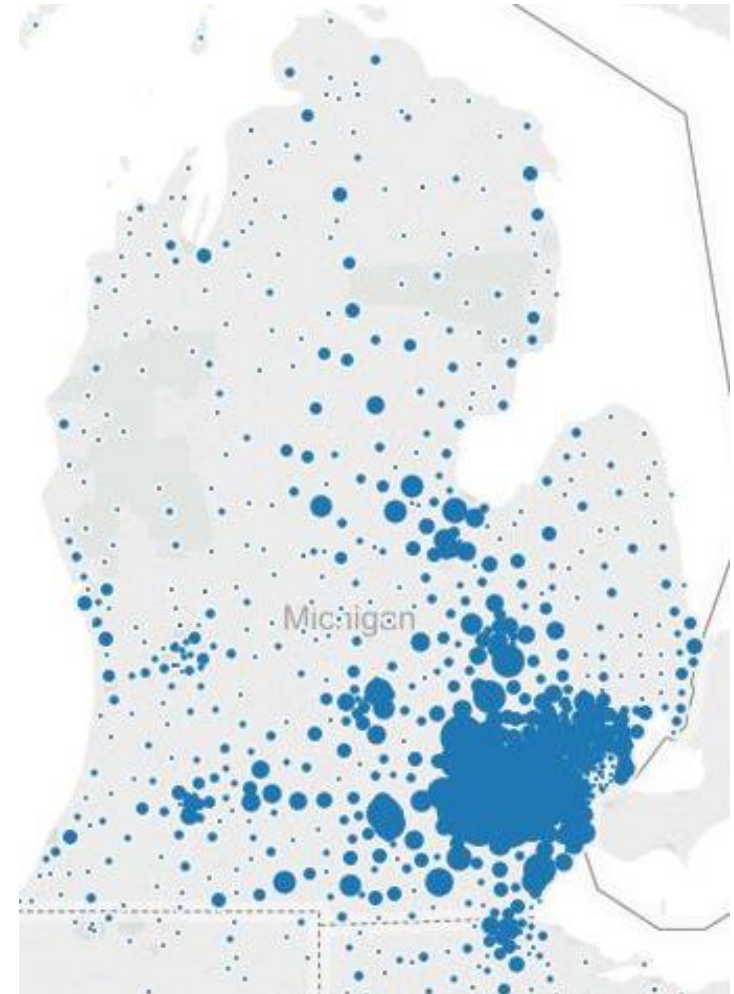
Where do UMCCC patients live?

Phlebotomy

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	
Patient waits to be checked-in	13 min
Check-In	2.55 min
Patient waits to be called to the back	16 min
Blood Draw	3.52 min
Batch	20 min
Prepare and send capsule	1.43 min
7.5 min (Value Added)	
49 min (Non-Value Added)	

- 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

Phlebotomy Layout and ProModel Simulation
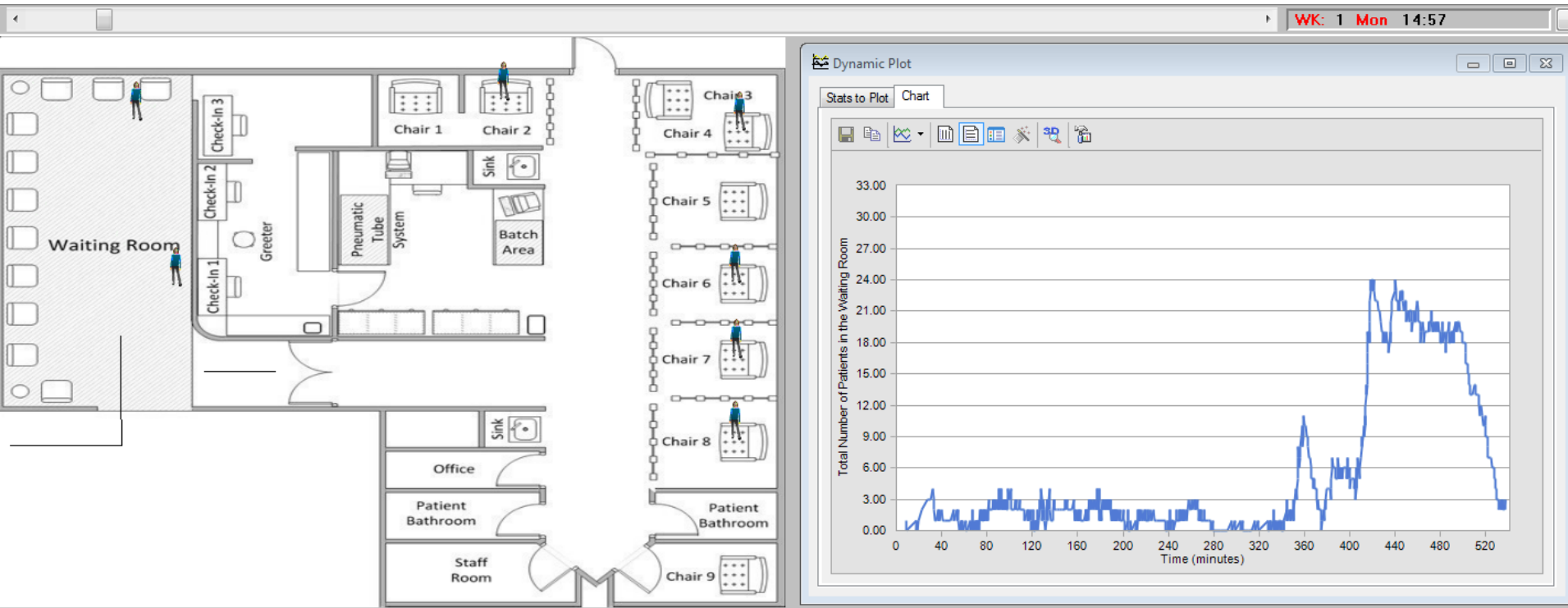
Discrete Event Simulation

2) Table-Top Simulation:

- Hands-on activity

- Engage the whole team

- Educational component

- Brainstorm ideas

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:

Amy Cohn – amycohn@umich.edu
Pamela Martinez – mvpamela@umich.edu
Matt Rouhana – mrouhana@umich.edu

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

Last Updated: 9/5/2014

Data Sources:

‡: Time study performed by Corrie Pennington-Block

†: Time study performed by Sarah Bach

⚹: Hematology TAT data (Aug 2014)
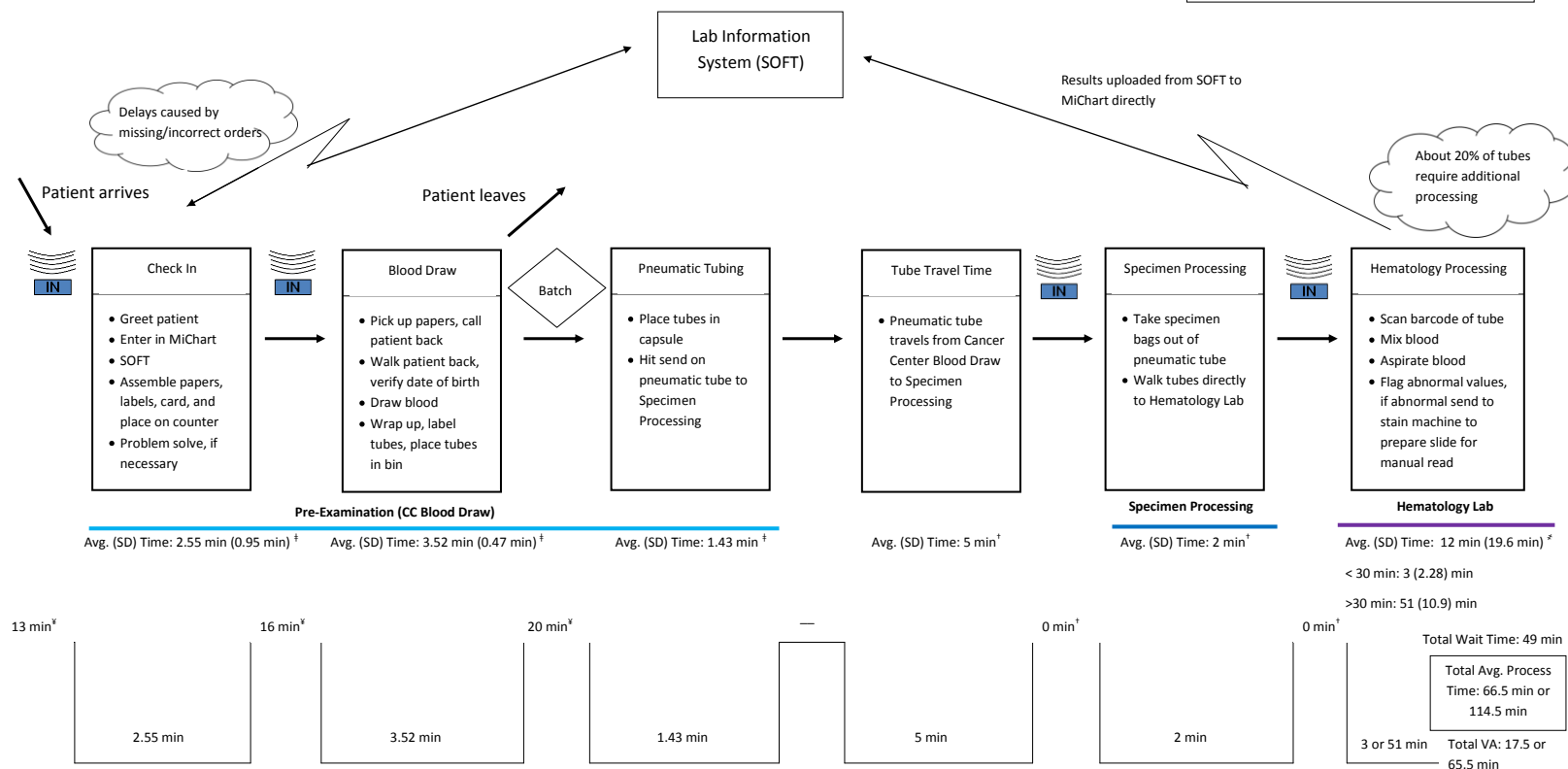
¥: Cancer Center Blood Draw TAT Data (July 2014)

Lab Information System (SOFT)

Results uploaded from SOFT to MiChart directly

Delays caused by missing/incorrect orders

About 20% of tubes require additional processing

Patient arrives

Patient leaves

| Check In | | Blood Draw | | Batch | Pneumatic Tubing | | Tube Travel Time | | Specimen Processing | | Hematology Processing |

Check In
- Greet patient
- Enter in MiChart
- SOFT
- Assemble papers, labels, card, and place on counter
- Problem solve, if necessary

Blood Draw
- Pick up papers, call patient back
- Walk patient back, verify date of birth
- Draw blood
- Wrap up, label tubes, place tubes in bin

Pneumatic Tubing
- Place tubes in capsule
- Hit send on pneumatic tube to Specimen Processing

Tube Travel Time
- Pneumatic tube travels from Cancer Center Blood Draw to Specimen Processing

Specimen Processing
- Take specimen bags out of pneumatic tube
- Walk tubes directly to Hematology Lab

Hematology Processing
- Scan barcode of tube
- Mix blood
- Aspirate blood
- Flag abnormal values, if abnormal send to stain machine to prepare slide for manual read

Pre-Examination (CC Blood Draw)

Specimen Processing

Hematology Lab

Avg. (SD) Time: 2.55 min (0.95 min) ‡

Avg. (SD) Time: 3.52 min (0.47 min) ‡

Avg. (SD) Time: 1.43 min ‡

Avg. (SD) Time: 5 min †

Avg. (SD) Time: 2 min †

Avg. (SD) Time: 12 min (19.6 min) ⚹

< 30 min: 3 (2.28) min

>30 min: 51 (10.9) min

13 min ¥

16 min ¥

20 min ¥

—

0 min †

0 min †

Total Wait Time: 49 min

Total Avg. Process Time: 66.5 min or 114.5 min

2.55 min

3.52 min

1.43 min

5 min

2 min

3 or 51 min

Total VA: 17.5 or 65.5 min

Appendix

Pre-Examination Blood Draw	
Description	*Mean (Standard Deviation)*
Patient waits to be checked-in	--
Check-In	3.12 min (2.10 min)
Patient waits to be called to the back	--
Blood Draw	**Vein:** 4.99 min (2.38 min) **Port:** 13.60 min (4.44 min)
Batch	17.63 min (3.92 min)
Prepare and send capsule	--
(Value Added)	
(Non-Value Added)	

- 2015 PHLEBOTOMY TIME STUDIES

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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

		630	700	730	800	830	900	930	1000	1030	1100
		2	10	12	13	13	13	17	17	17	16
	Front Desk	-2	-3	-3	-3	-3	-2	-2	-2	-2	-2
Totals do not include the Associate Supervisor	Greeter		-1	-1	-1	-1	-1	-1	-1	-1	
	Clinic Sweep				-1				-1		
	Breaks/Lunches					-1	-2	-2	-2	-2	-3
	Part Time/Day Off		-1	-1	-1	-1	-1	-1	-1	-1	-1
	Available to Draw	0	5	7	7	7	7	11	10	11	10

1130	1200	1230	1300	1330	1400	1430	1500	1530	1600	1630	1700	1730
16	15	15	15	15	15	15	14	7	5	4	4	4
-2	-2	-2	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1
	-1				-1				-1			
-3	-3	-2	-3	-4	-2	-2	-2	-2				
-1	-1	-1	-1	-1	-1	-1						
10	8	10	9	8	9	10	10	3	3	3	3	3