



University of Michigan
Comprehensive Cancer Center

Scheduling and Patient Flow in an Outpatient Chemotherapy Infusion Center

INFORMS

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CHEPS Center for
Healthcare Engineering
& Patient Safety



Collaborators

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Current Team

- Jeremy Castaing
- Vera Lo
- Donald Richardson
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Cancer and Cancer Treatment

- Cancer Statistics
 - In 2014 there will be an estimated 1,665,540 new cancer cases
 - Second leading cause of death in the United States
- Chemotherapy Infusion Center
 - Facility where cancer treatment is given on an outpatient basis
 - Over 50% of all cancer patients receive chemotherapy treatment

Source: American Cancer Society. (2014). <http://www.cancer.org>





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- 93,319 outpatient visits annually
- 51,884 infusion treatments annually
- 5% increase in patient volume annually



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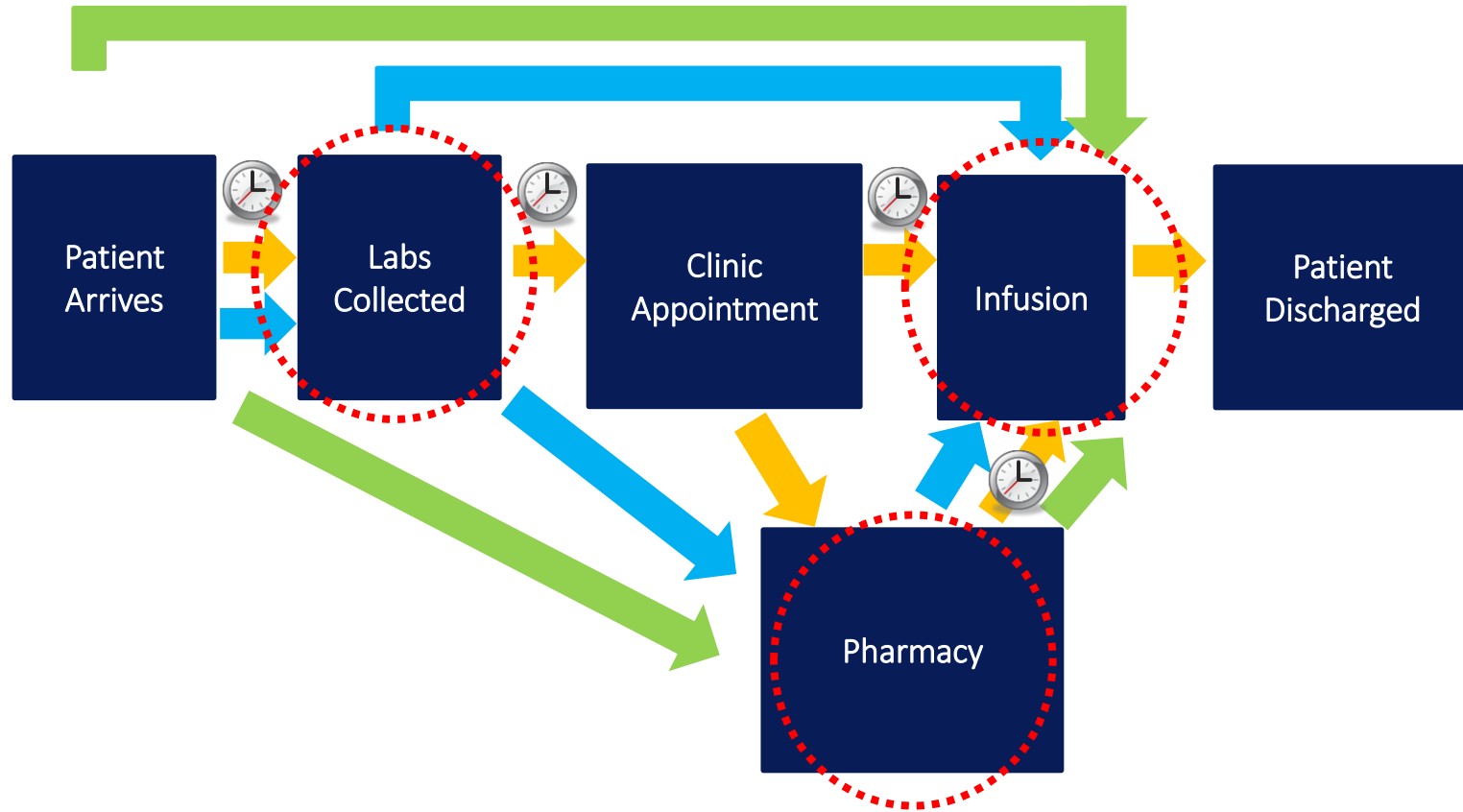
Project Goals

- Improve quality of cancer care delivery in the infusion center
 - Reduce patient waiting times
 - Reduce total length of day of operations
 - Others:
 - Promote equity in nurse workload
 - Improve patient and nurse safety
 - Reduce cost associated with pharmaceutical waste



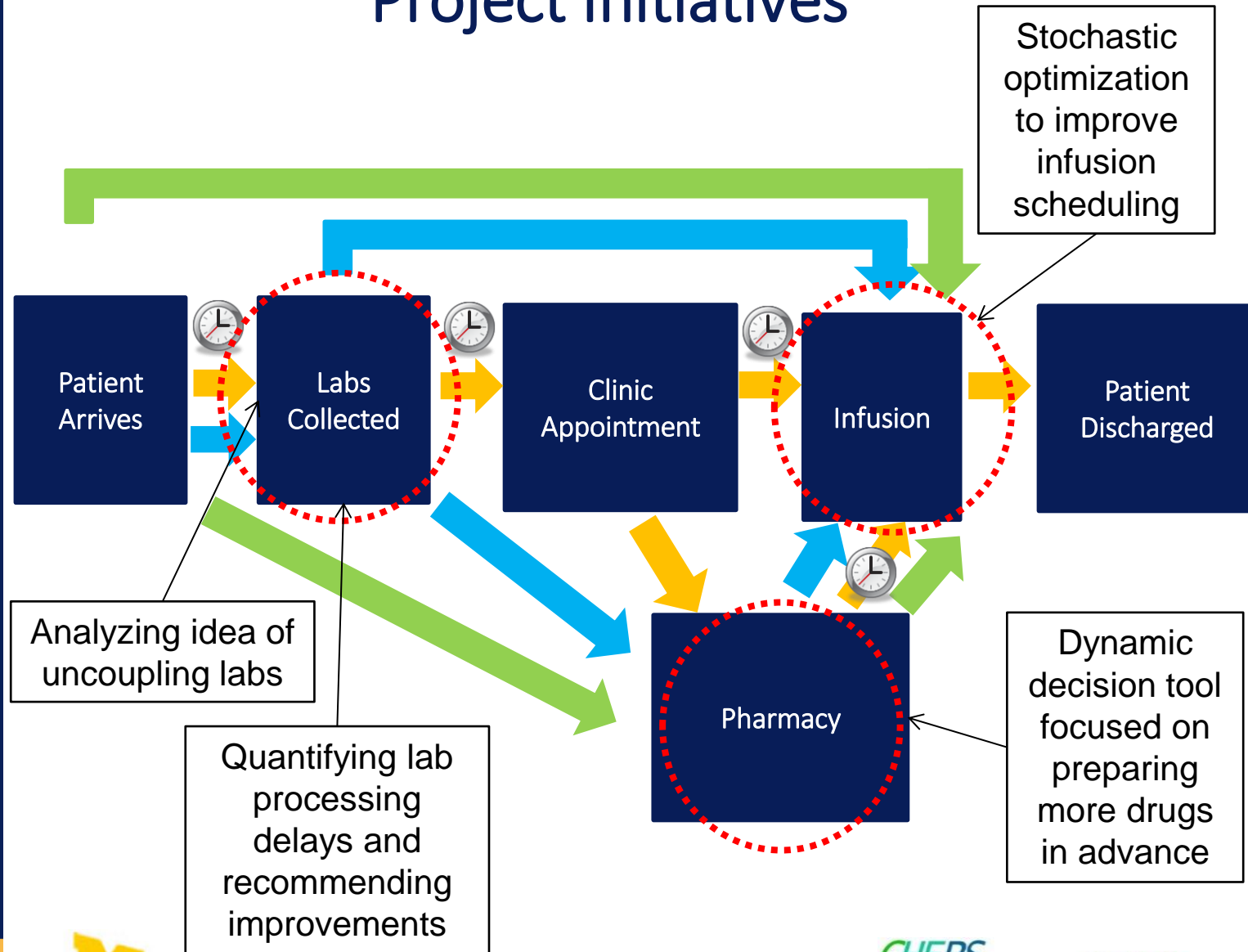


Patient Flow





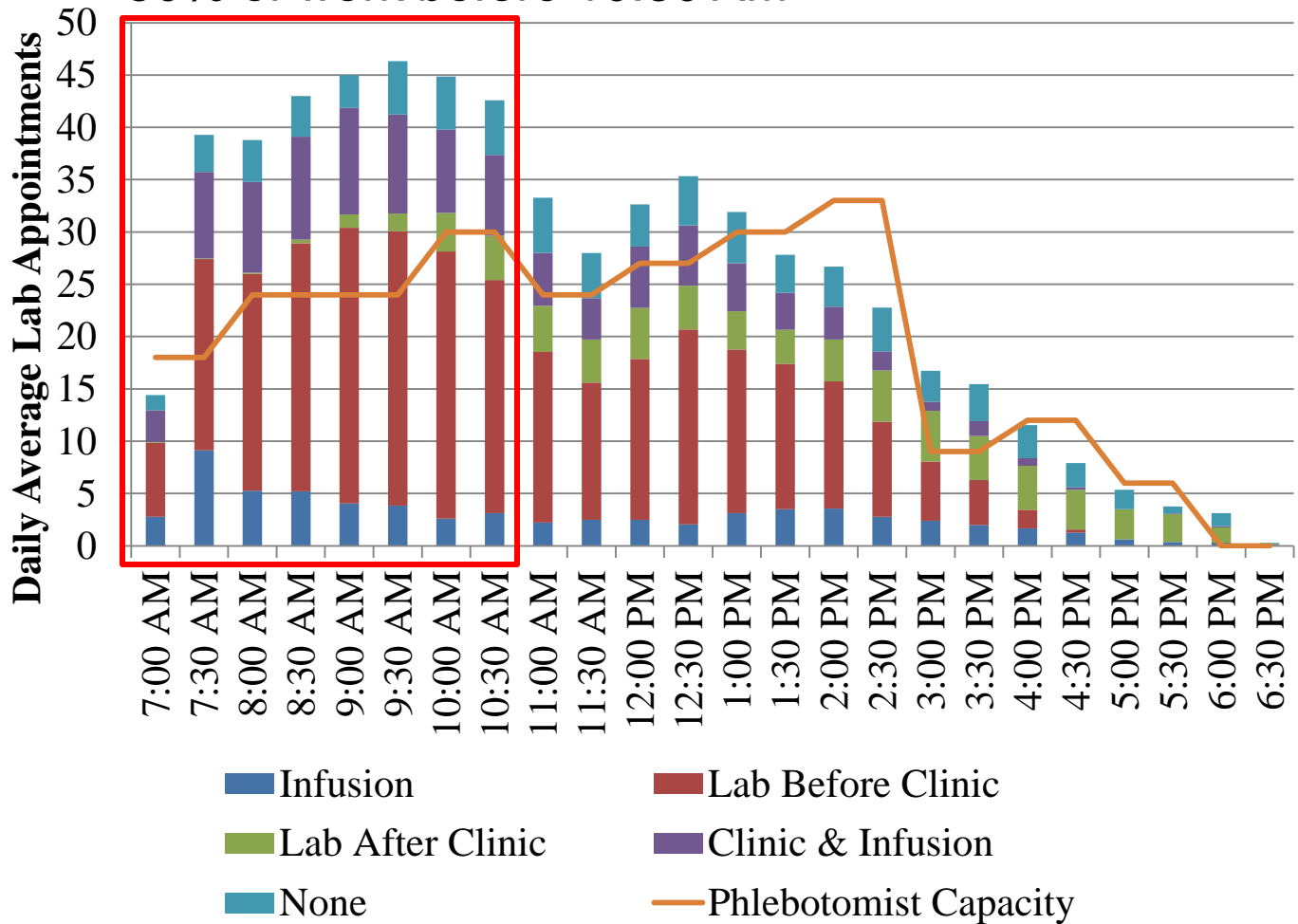
Project Initiatives





Additional Motivation

50% of work before 10:30 AM





Decoupling of Visits

Day 1:

Day 2:





Assessing Decision of Decoupling

Advantages

- Reduce patient wait times on day of infusion or clinic visit
- Reduce UMHS Cancer Center lab workload in morning

Disadvantages

- Patients must complete two visits

Decoupling becomes beneficial when roundtrip travel time and lab draw time < 1 hour

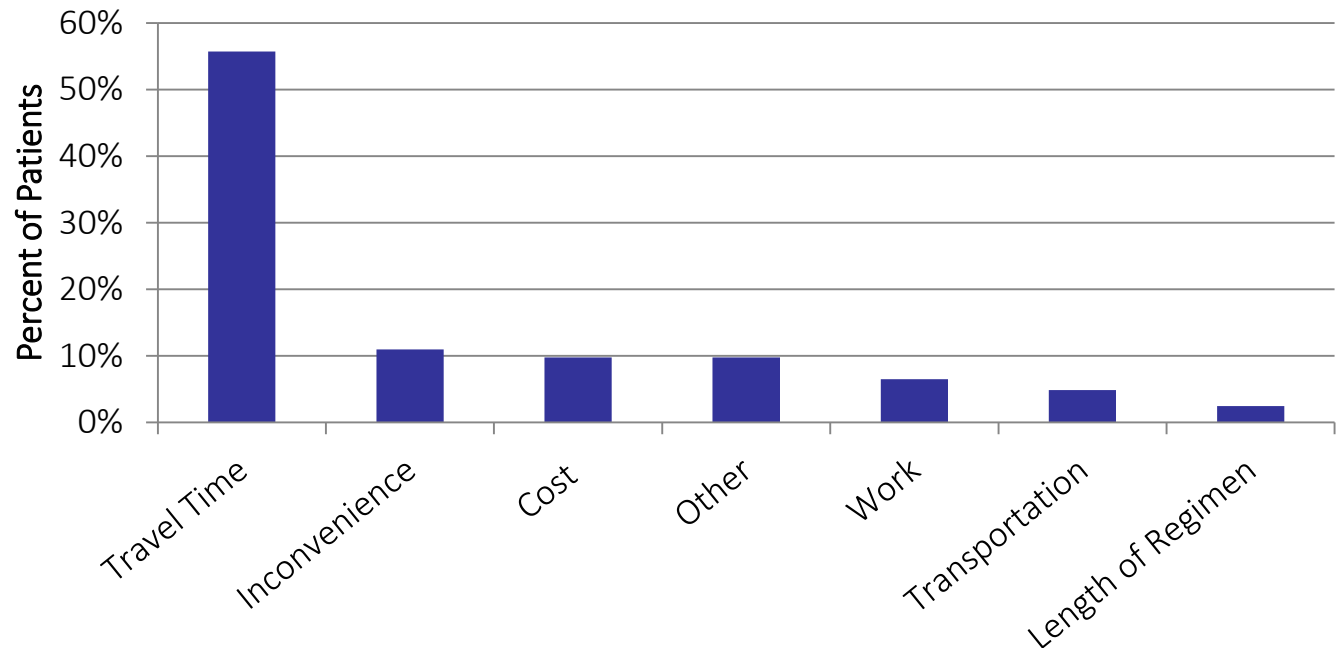




Feasibility of Decoupling Visits

- Survey results indicate 9% of patients interested in a 2 day schedule

Patient Reasons for Opposing a 2 Day Schedule



Data Source: Infusion Survey of Patients on Monday, June 10, 2013. 251 Responses.





Methods

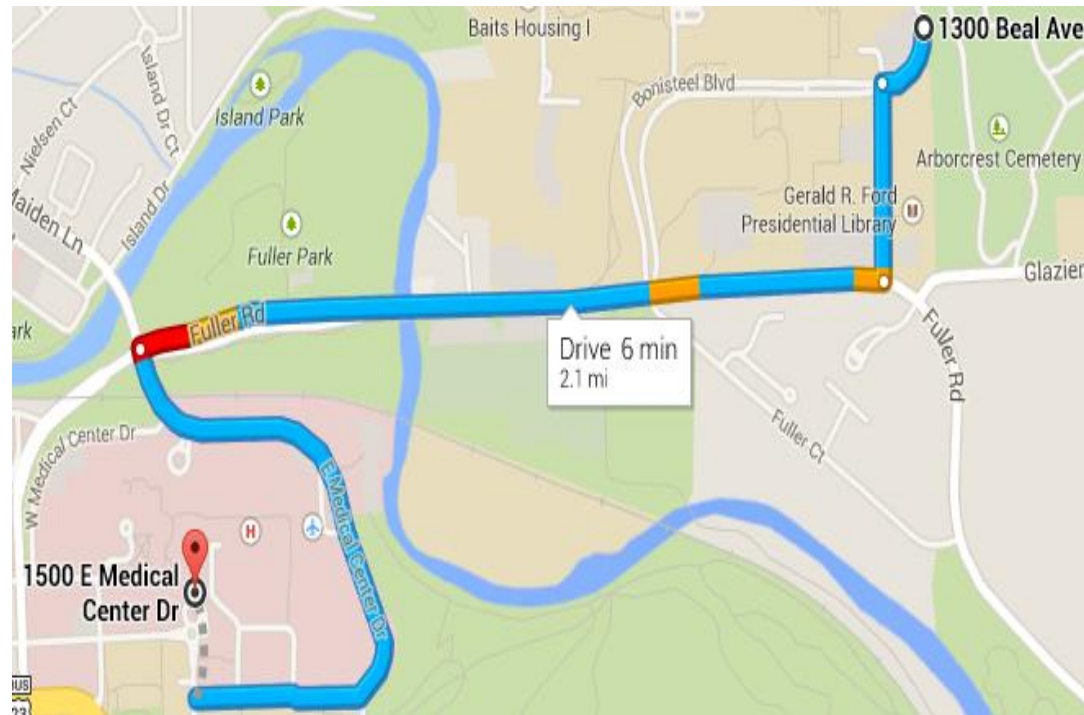
- Pulled data from electronic health record for Aug 2012 – Feb 2013 (9429 patients)
 - Patient addresses contained in this data set
- Calculate distance and driving duration for each patient address to the UMHS Cancer Center





Methods

- Google Maps API used to determine distance and driving duration from patient addresses to UMHS Cancer Center



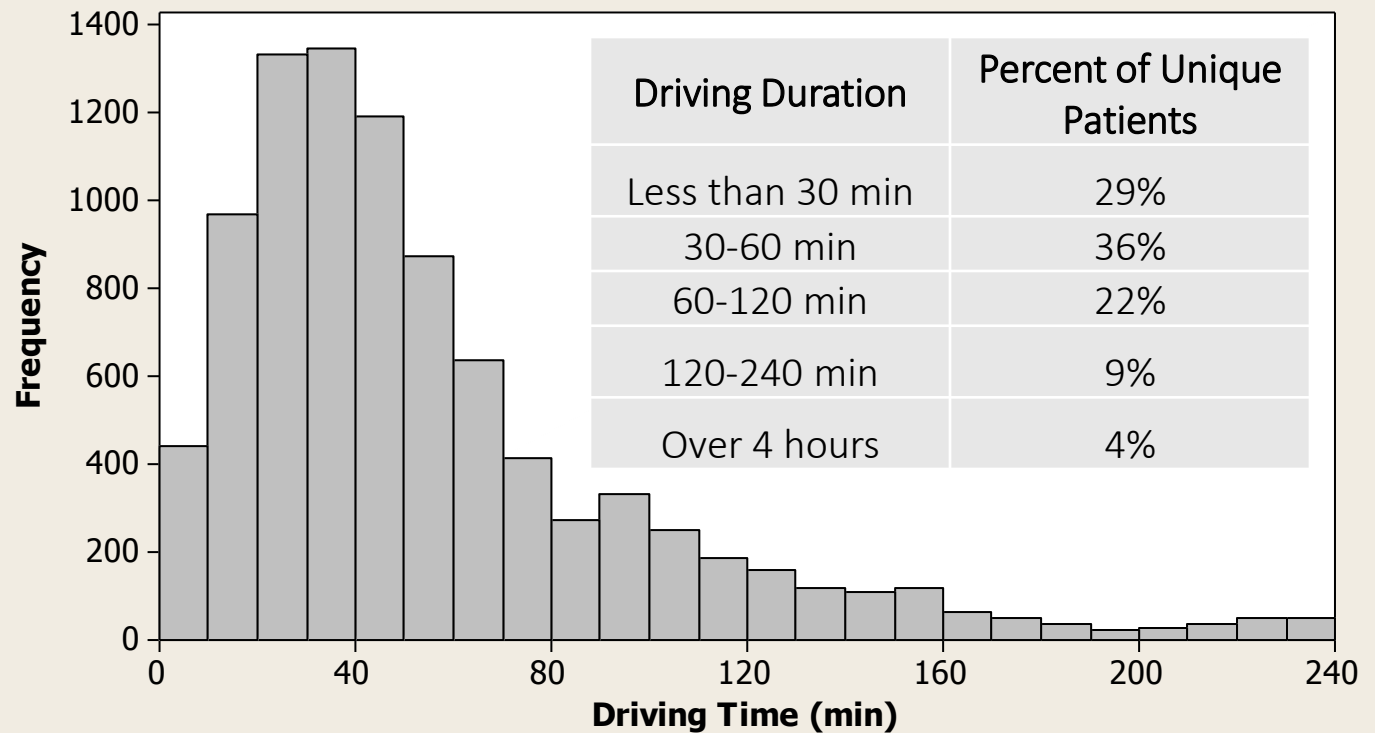


Quantifying Driving Time to UMHS

Histogram of Patient Driving Time to Cancer Center

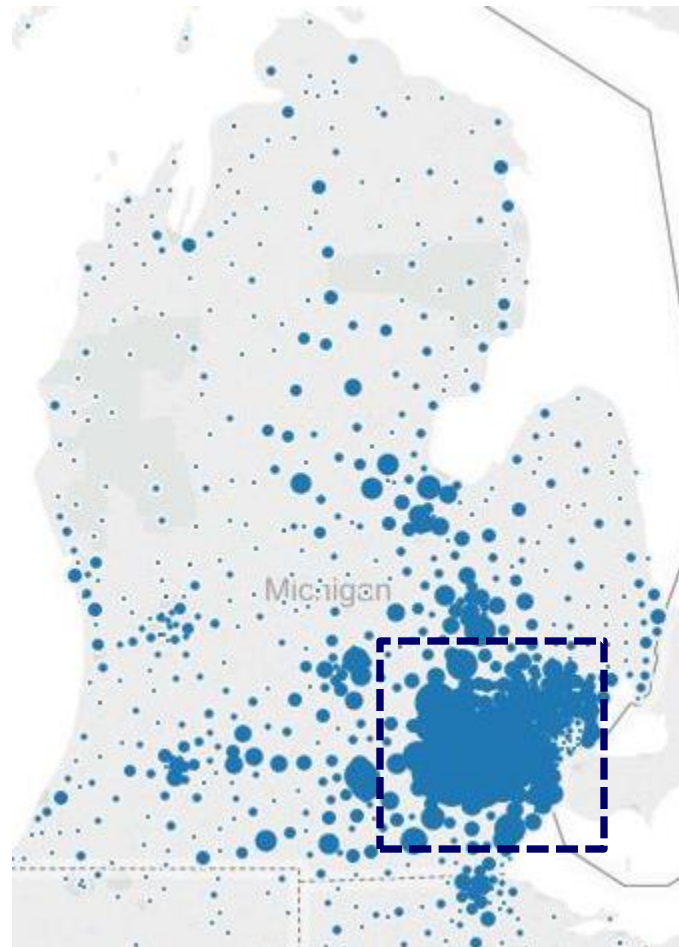
Clarity Data Aug 2012 – Feb 2013 (9429 patients)

Excludes patients with driving time > 4 hours





Patient Location in Michigan



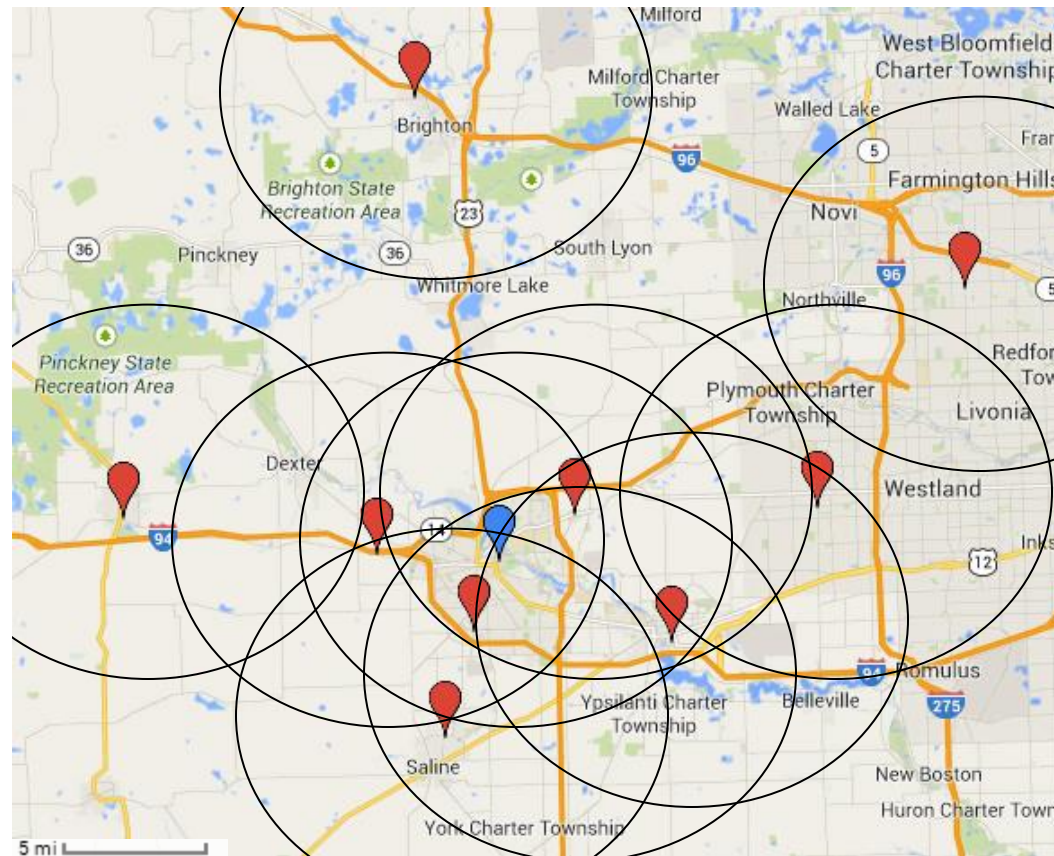
- 9 satellite lab facilities in Southeast Michigan





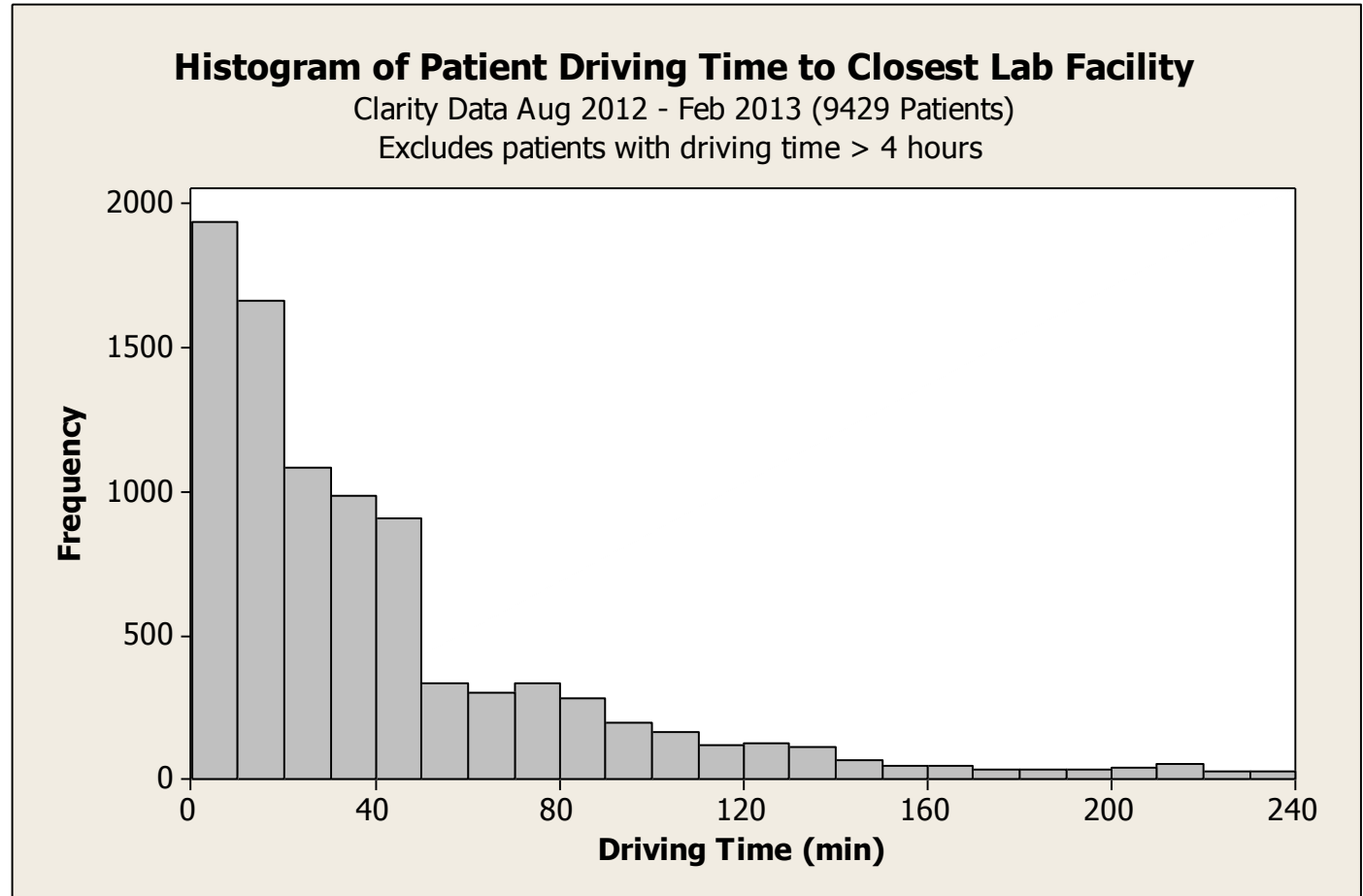
Methods

- Labs can be drawn at any of 9 satellite facilities associated with UMHS





Driving Time to Closest Lab Facility





Results of Satellite Facilities Analysis

Driving Duration	Percent of Patients to Satellite Facilities	Percent of Patients to Cancer Center
Less than 30 min	52%	29%
30-60 min	23%	36%
60-120 min	15%	22%
120-240 min	7%	9%
Over 4 hours	3%	4%





Results of Satellite Facilities Analysis

- Conservatively, encourage decoupling visits for patients within 15 minutes of satellite facility
 - 32% of patients





Conclusion

- Patients live closer to UMHS and satellite facilities than perceived by Cancer Center providers and staff
- Encourage decoupling of visits for patients within close proximity
- Educate patients on utilizing satellite facilities





Future Work

- Pilot decoupling of visits
 - Barriers: Physician workflow differs with lab location
- Investigate alternative improvements to lab process
 - “Fast track” phlebotomist
 - Prioritizing lab processing





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CHEPS & the HEPS Master's Program

- **CHEPS:** The Center for Healthcare Engineering & Patient Safety
- **HEPS:** Industrial and Operations Engineering (IOE) Master's Concentration in Healthcare Engineering and Patient Safety offered by CHEPS
- CHEPS and HEPS offer unique multidisciplinary teams from engineering, medicine, public health, nursing, and more collaborating with healthcare professionals to better provide and care for patients
- For more information, contact Amy Cohn at amycohn@umich.edu or visit the CHEPS website at: <https://www.cheps.engin.umich.edu>



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Thank You!
Questions?

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