

# Scheduling and Patient Flow in an Outpatient Chemotherapy Infusion Center

INFORMS

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# Current Team

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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>





# University of Michigan Comprehensive Cancer Center

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



University of Michigan Cancer Center

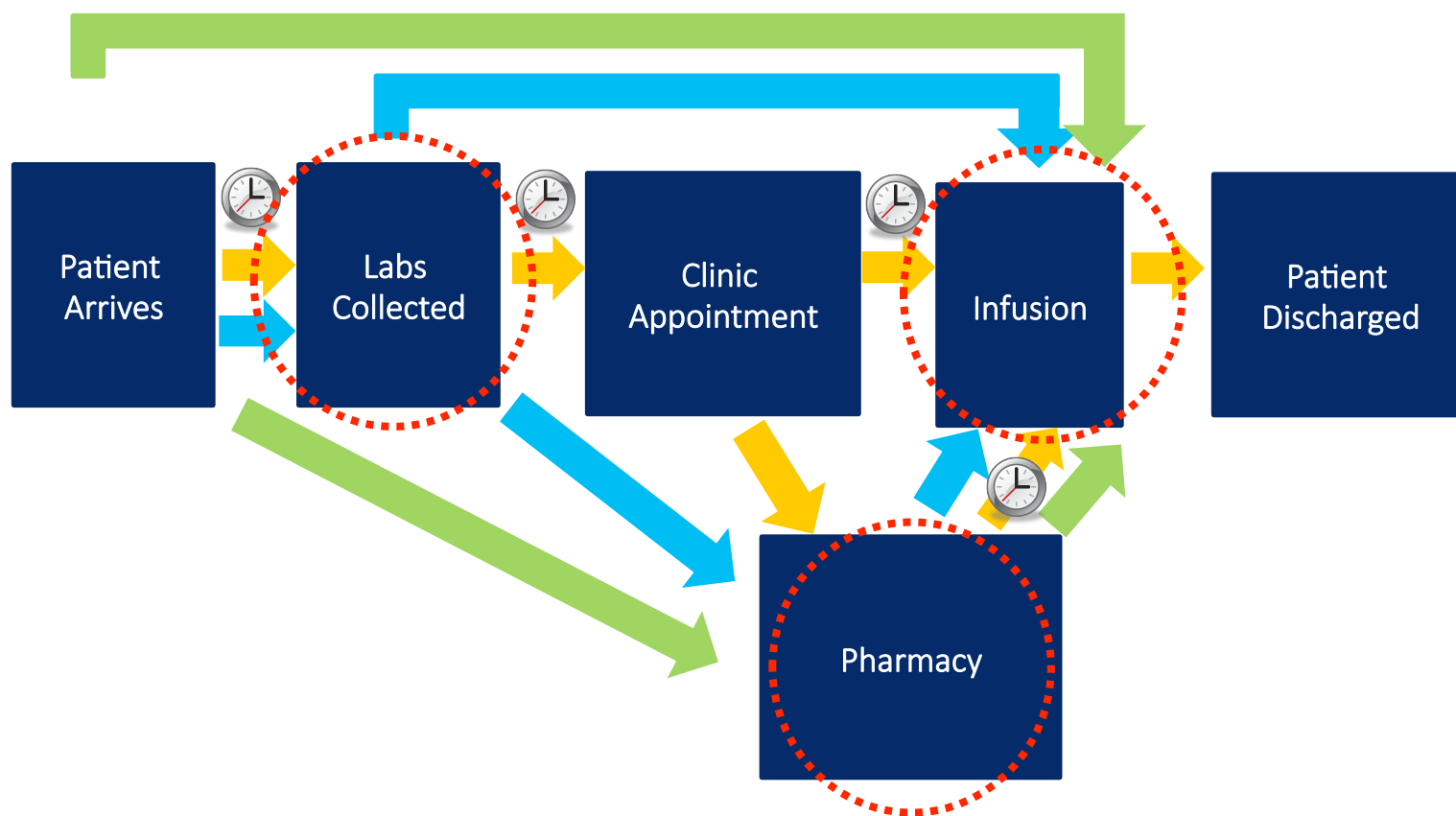


# Project Goals

- 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



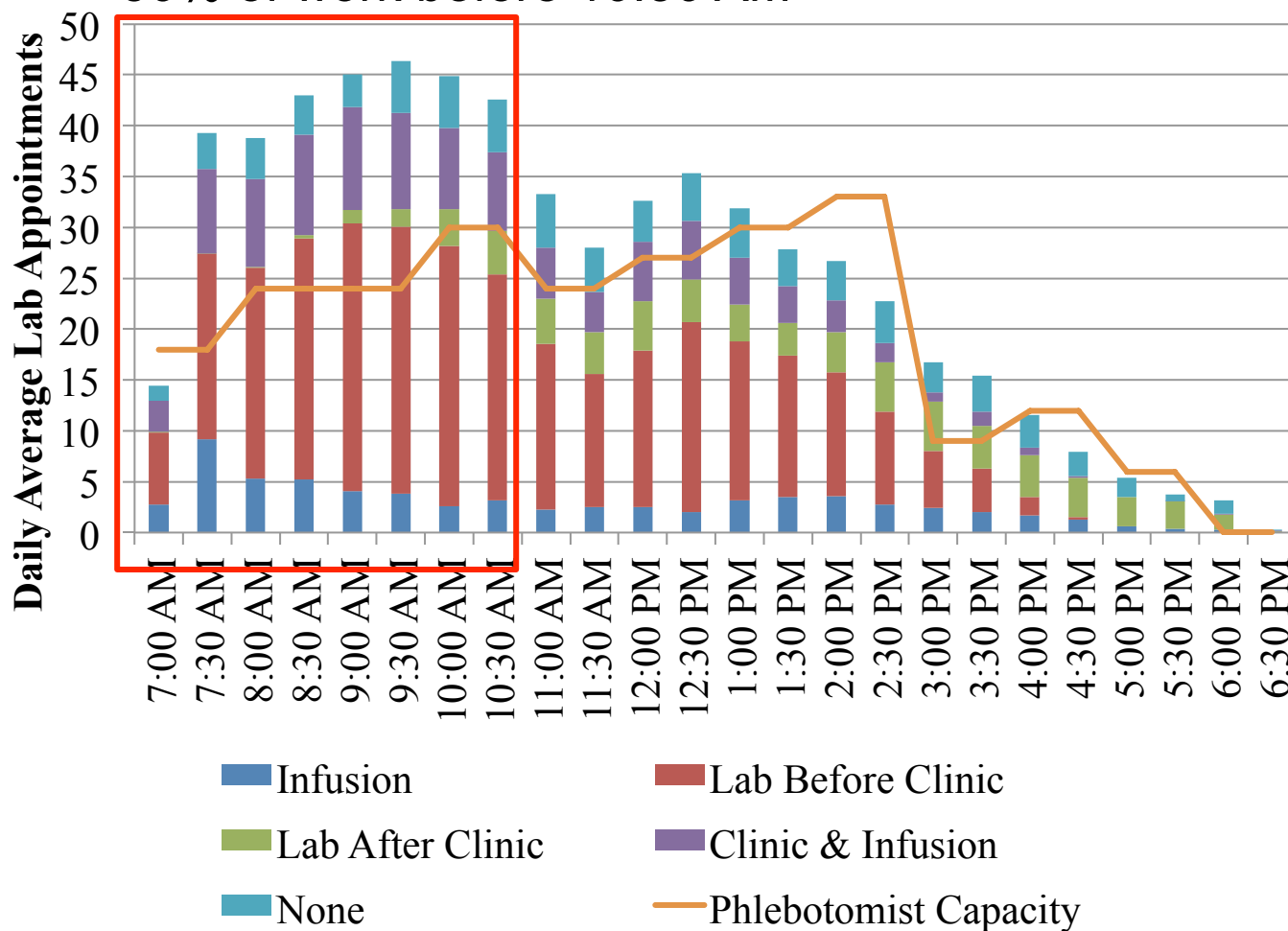
# Patient Flow





# Additional Motivation

50% of work before 10:30 AM



# Decoupling of Visits

Day 1:      Day 2:

Lab

Clinic

Infusion



# 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

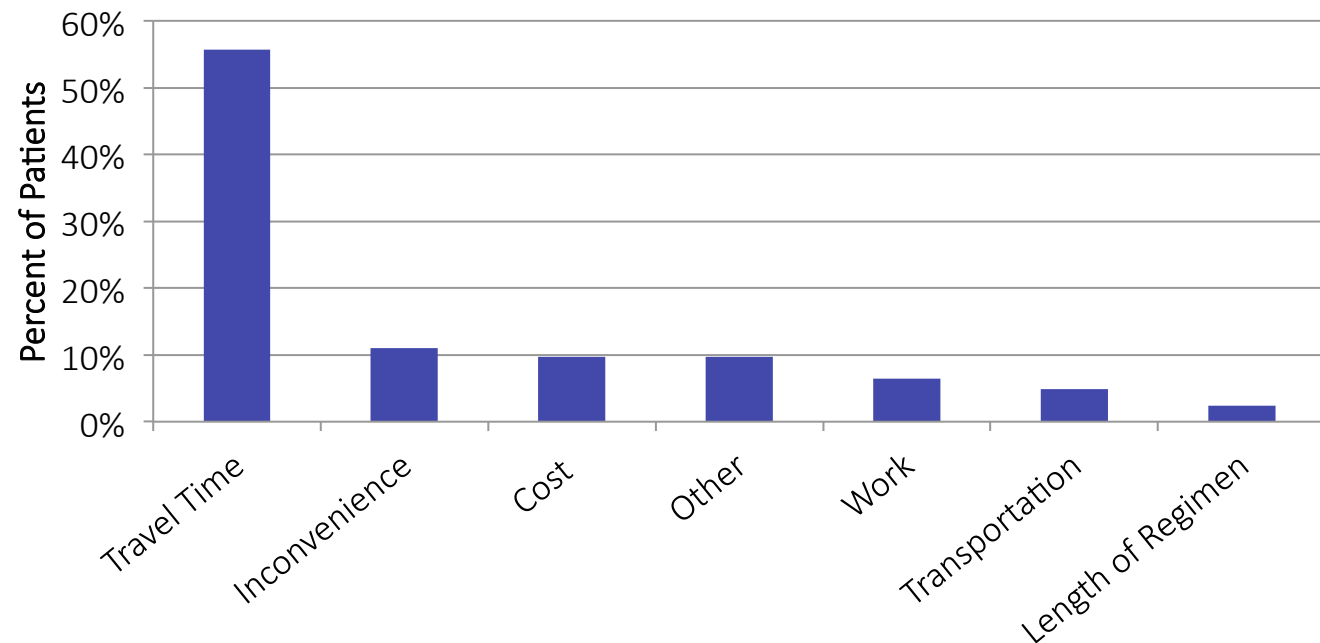
Decoupling becomes beneficial when roundtrip travel time and lab draw time < 1 hour



# 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.





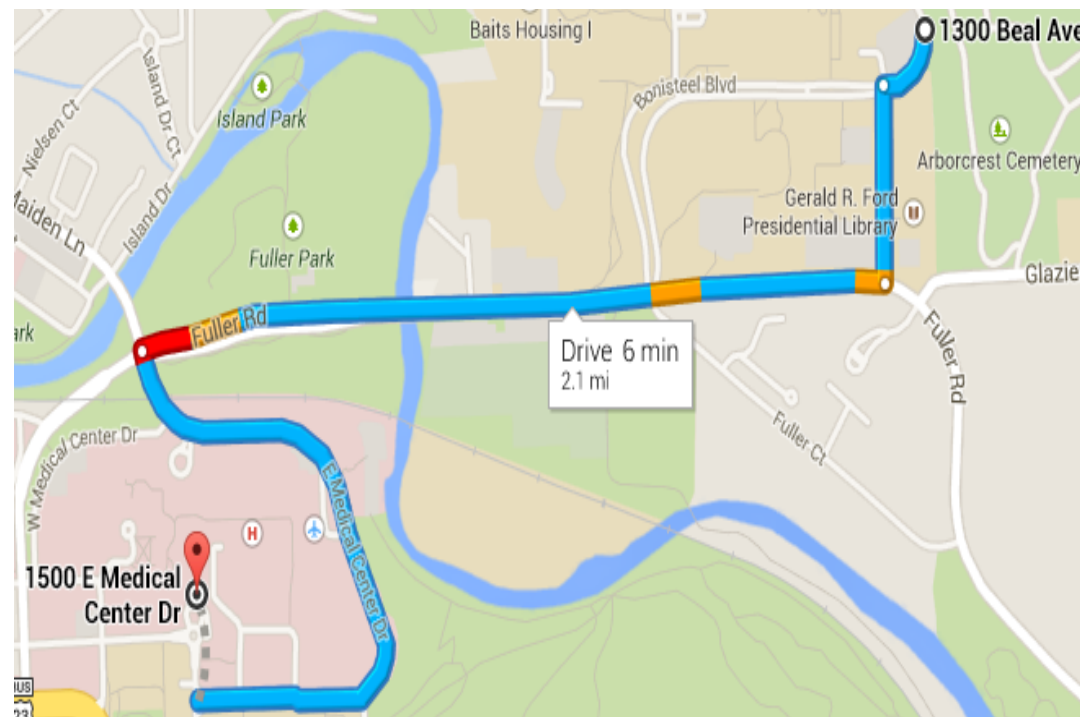
# Methods

- 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

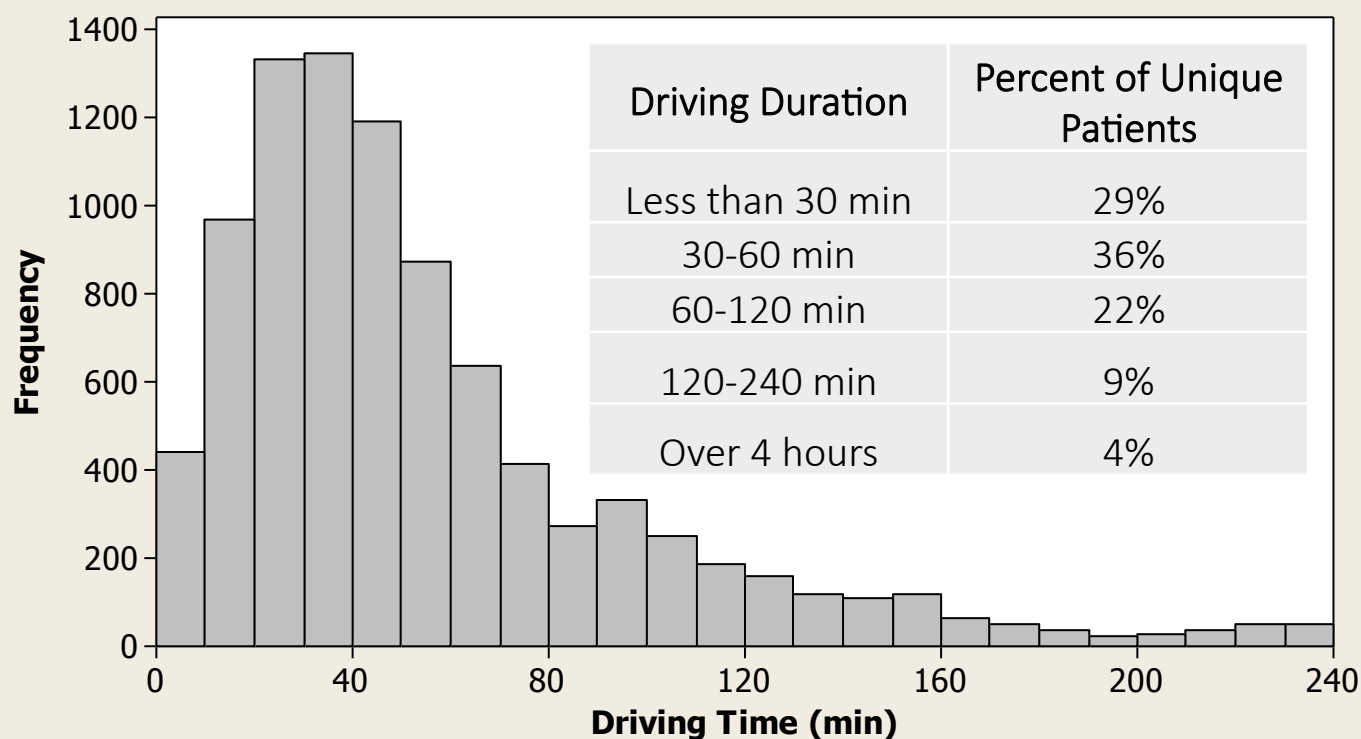


# Quantifying Driving Time to UMHS

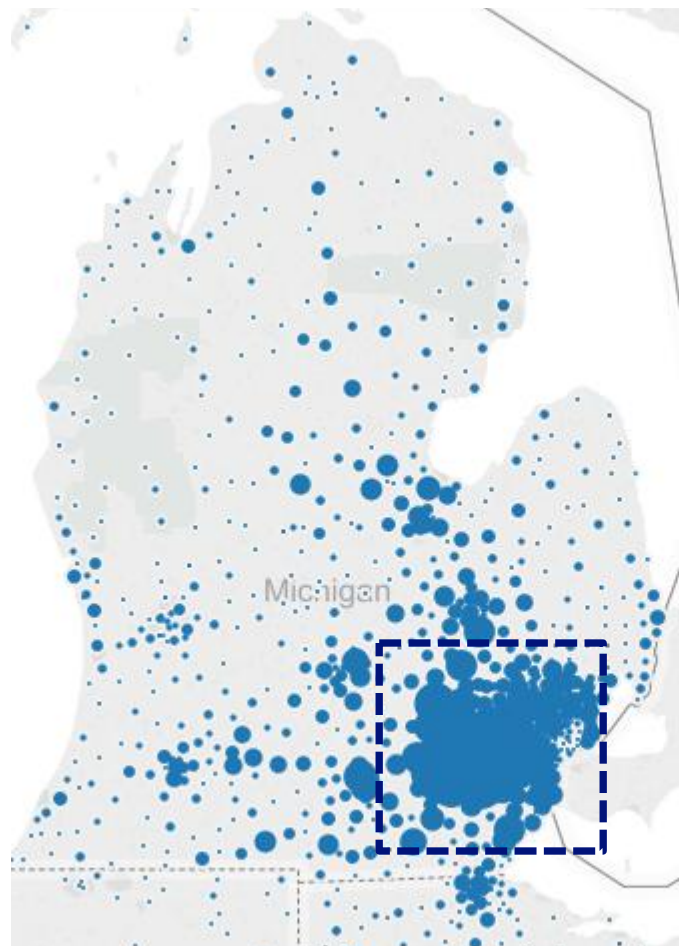
## Histogram of Patient Driving Time to Cancer Center

Clarity Data Aug 2012 – Feb 2013 (9429 patients)

Excludes patients with driving time > 4 hours



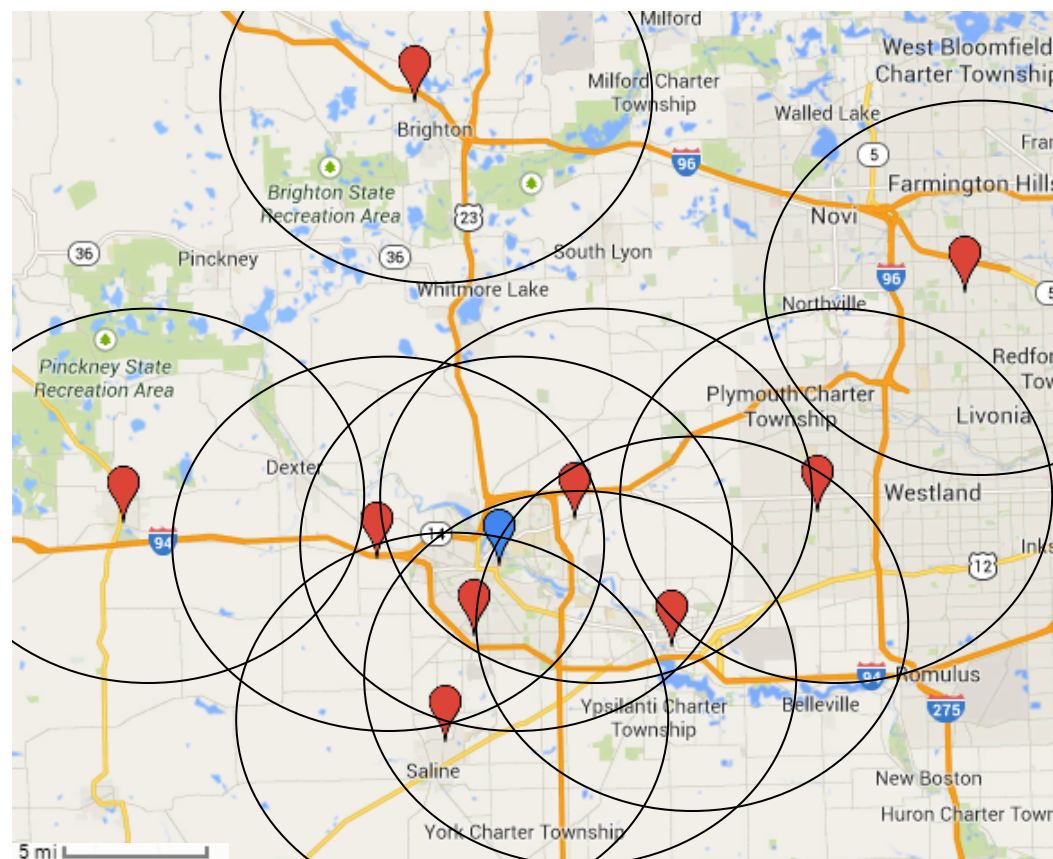
# Patient Location in Michigan



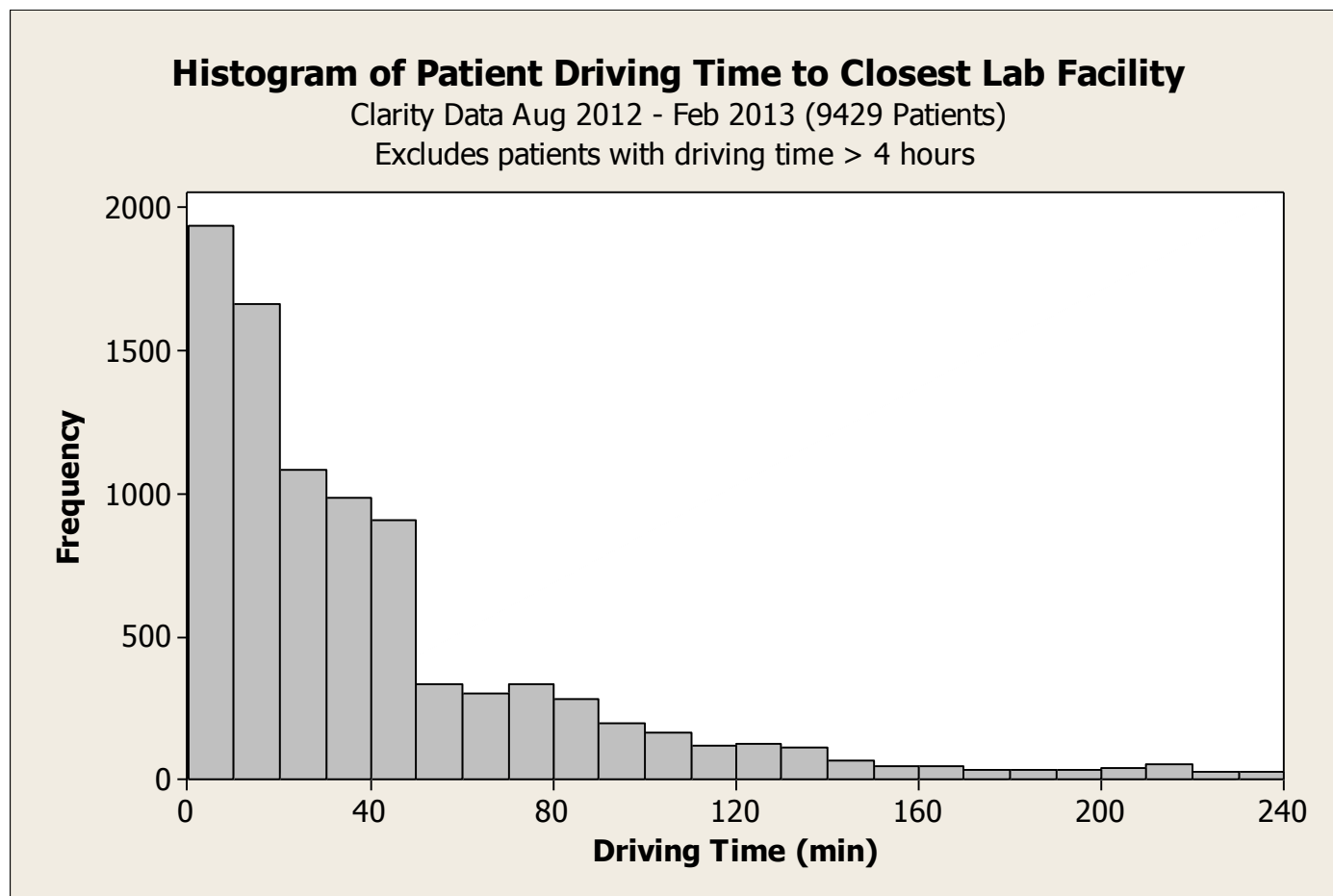
- 9 satellite lab facilities in Southeast Michigan

# 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



# Acknowledgements

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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](mailto: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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