



University of Michigan  
Comprehensive Cancer Center

# Scheduling and Patient Flow in an Outpatient Chemotherapy Infusion Center

ISERC

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Sarah Bach



**CHEPS** Center for  
Healthcare Engineering  
& Patient Safety



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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





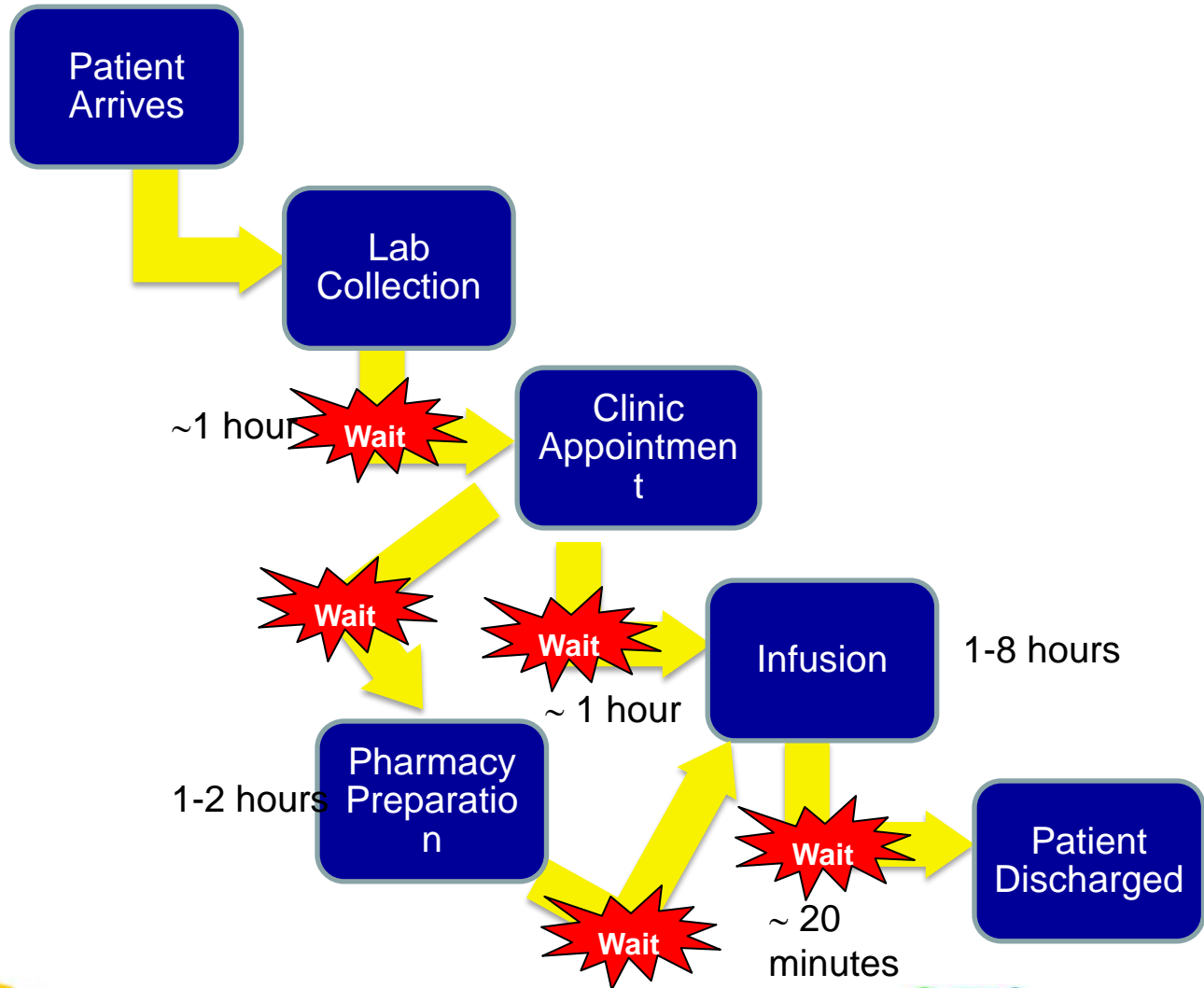
# Project Goals

- 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



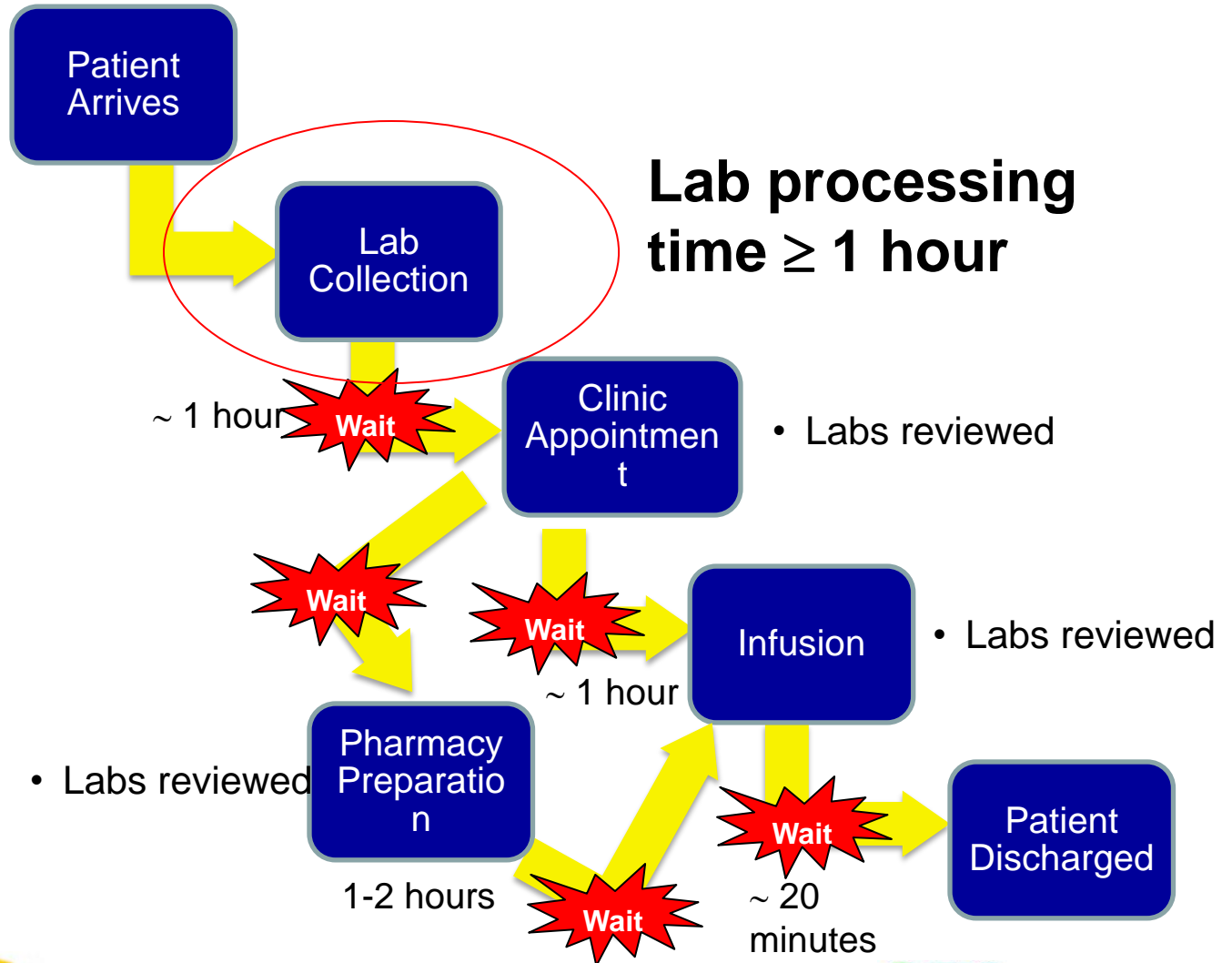


# Patient Flow





# Patient Flow

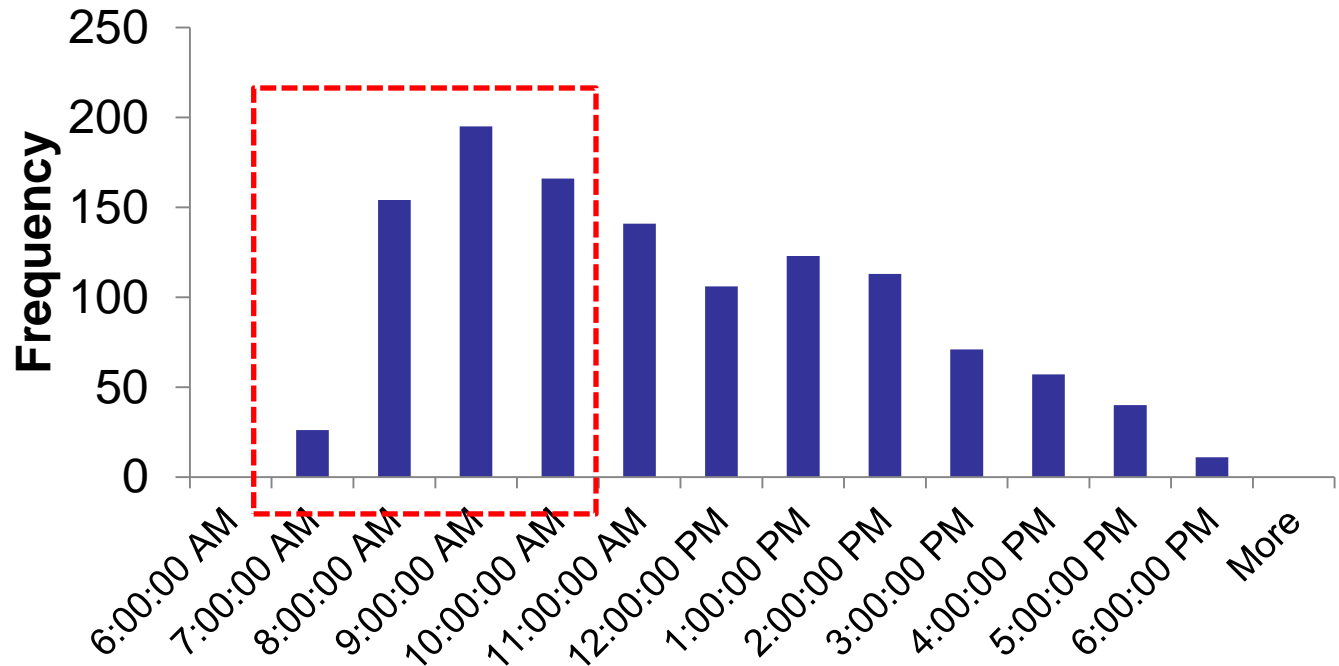






# Additional Motivation

## Volume of Lab Patients per Hour



- Labs can be collected within 48 hours of infusion appointment

Source: Electronic health record data, April 7-11, 2014





# Decoupling of Visits

Day 1:

Day 2:

Lab

Clinic

Infusion





# Assessing Decision of Decoupling

## Advantages

- Reduce patient wait times on day of infusion
- 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

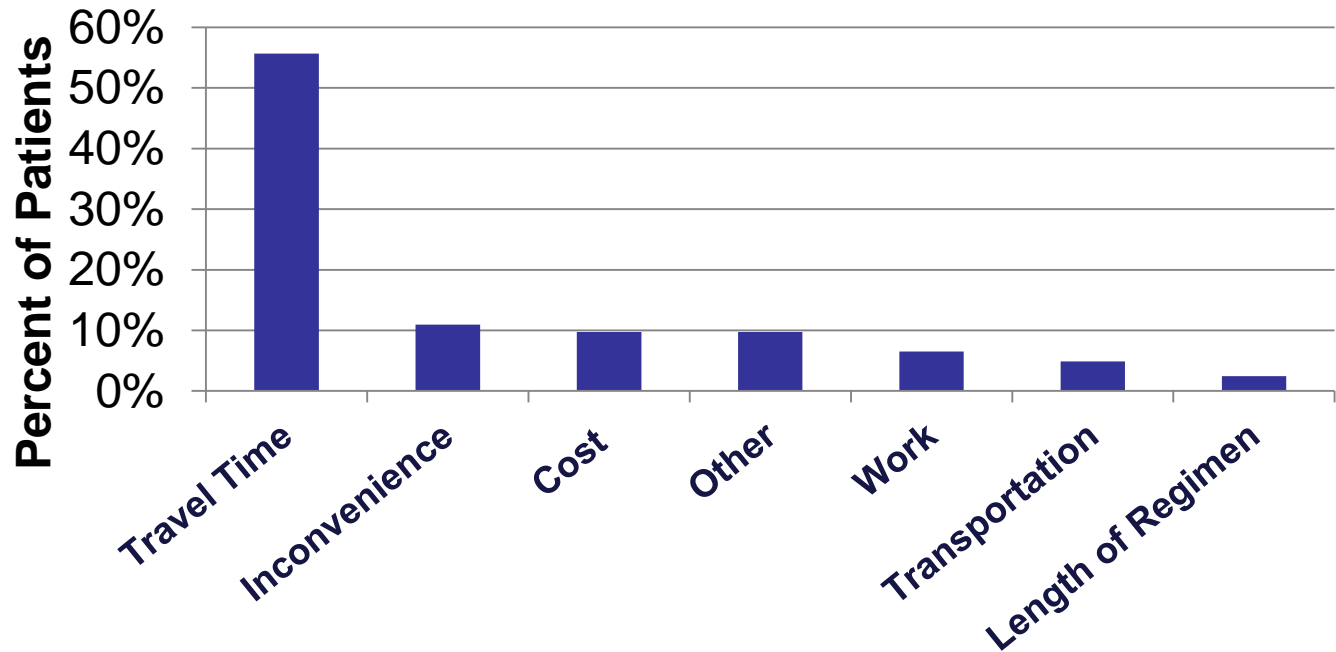




# Feasibility of Decoupling Visits

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

## Patient Reasons for Opposing a 2 Day Schedule



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





# Methods

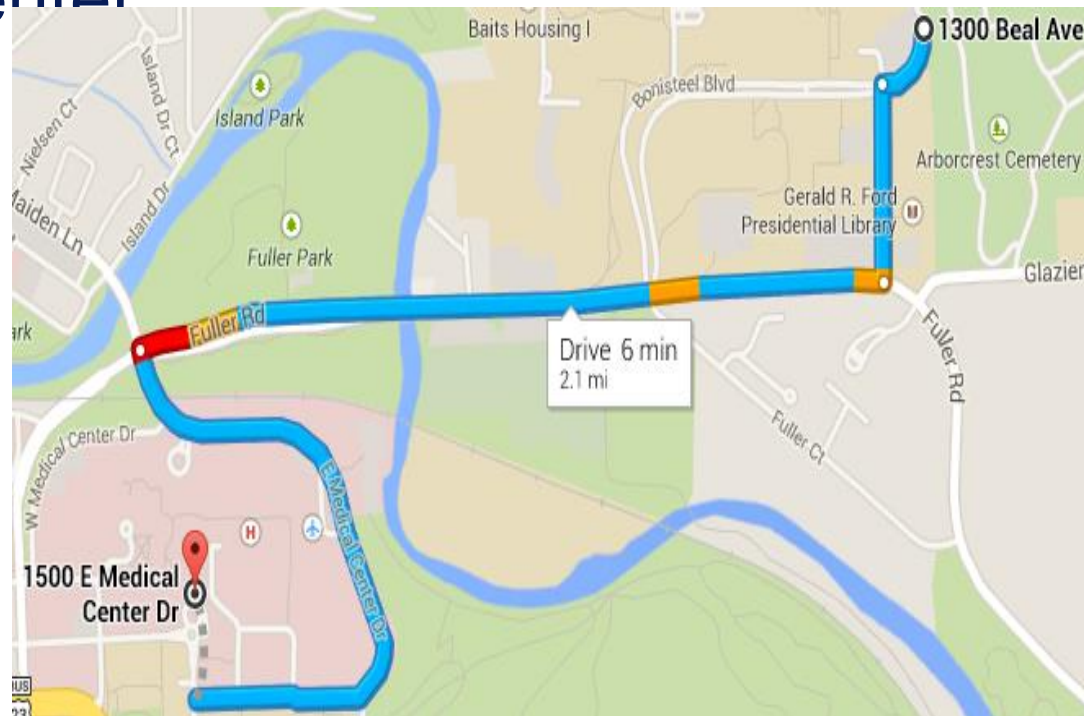
- Pulled data from electronic health record for Aug 2012 – Feb 2013 (9429 patients)
  - Patient addresses contained in this data set
- Calculate distance and driving duration for each patient address to the UMHS Cancer Center





# Methods

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



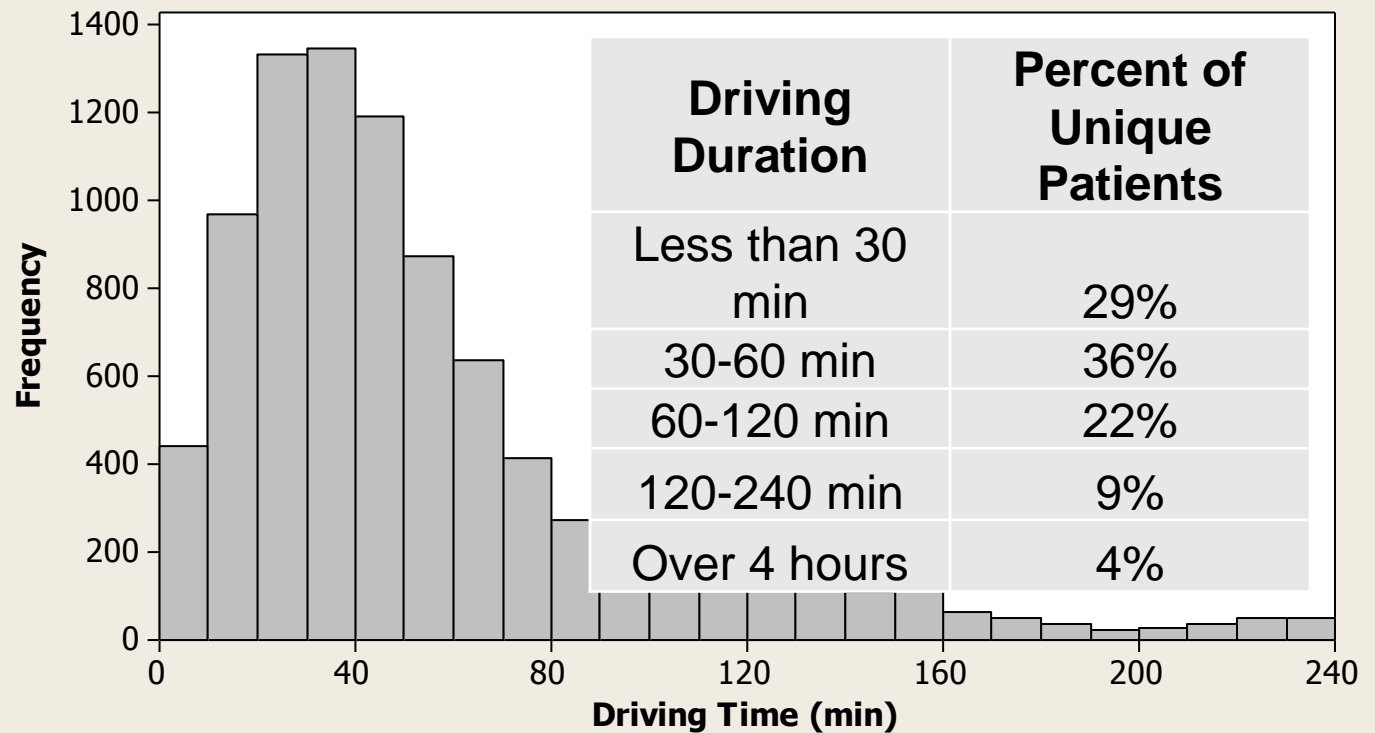


# Quantifying Driving Time to UMHS

### Histogram of Patient Driving Time to Cancer Center

Clarity Data Aug 2012 – Feb 2013 (9429 patients)

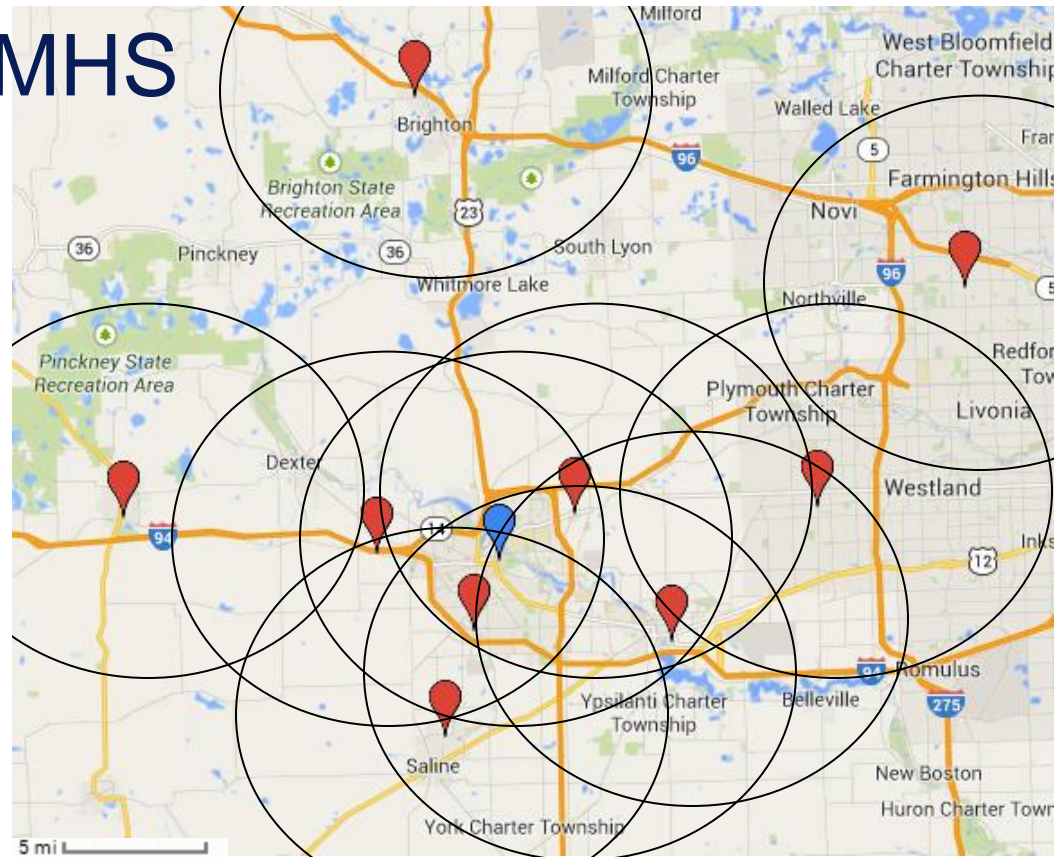
Excludes patients with driving time > 4 hours





# Methods

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





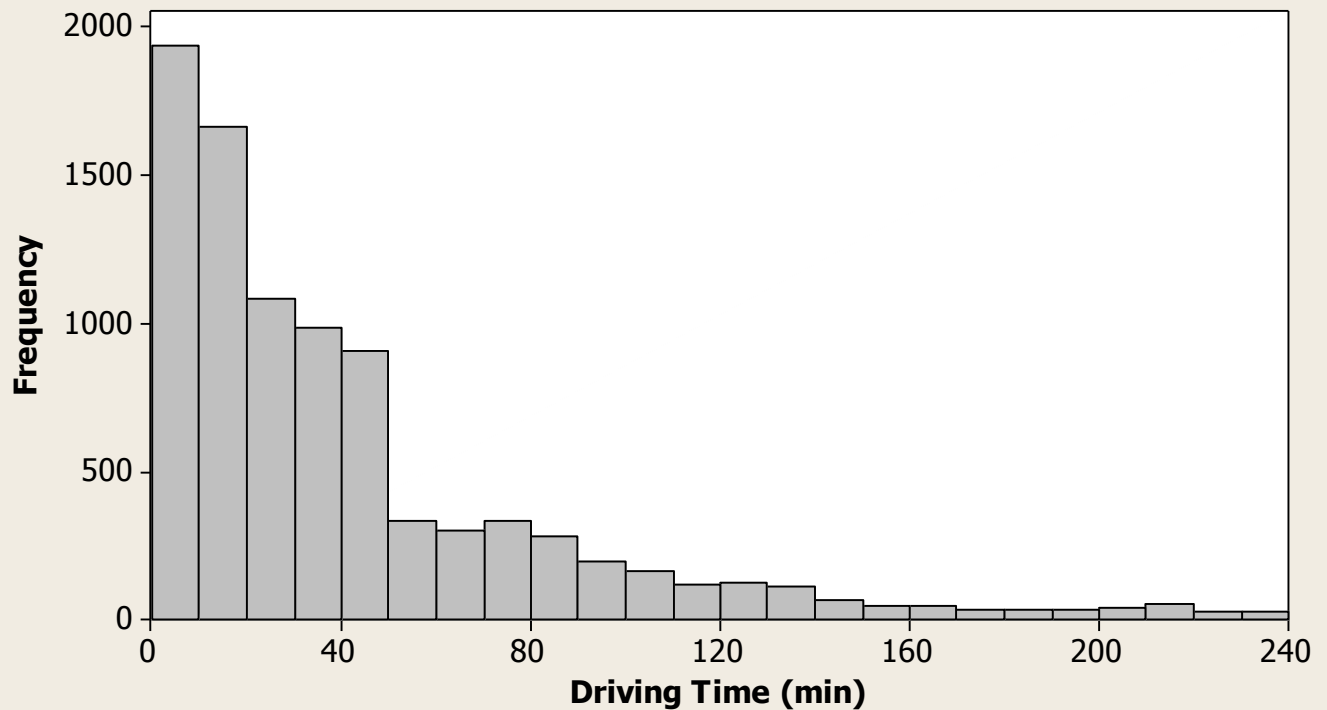


# Driving Time to Closest Lab Facility

### Histogram of Patient Driving Time to Closest Lab Facility

Clarity Data Aug 2012 - Feb 2013 (9429 Patients)

Excludes patients with driving time > 4 hours





# 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

- Simulate decoupling of visits
- Investigate alternative improvements to lab process
  - “Fast track” phlebotomist
  - Prioritizing lab processing





# Acknowledgements

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# Thank You! Questions?

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