HEALTHCARE SYSTEMS PROCESS IMPROVEMENT CONFERENCE 2019

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LEADING HEALTHCARE IMPROVEMENT

Reducing Patient Wait Time using Radio-frequency Identification (RFID) Technology

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CHEPS

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Rx

A prescription to address system complexity in healthcare

INNOVATING HEALTHCARE DELIVERY

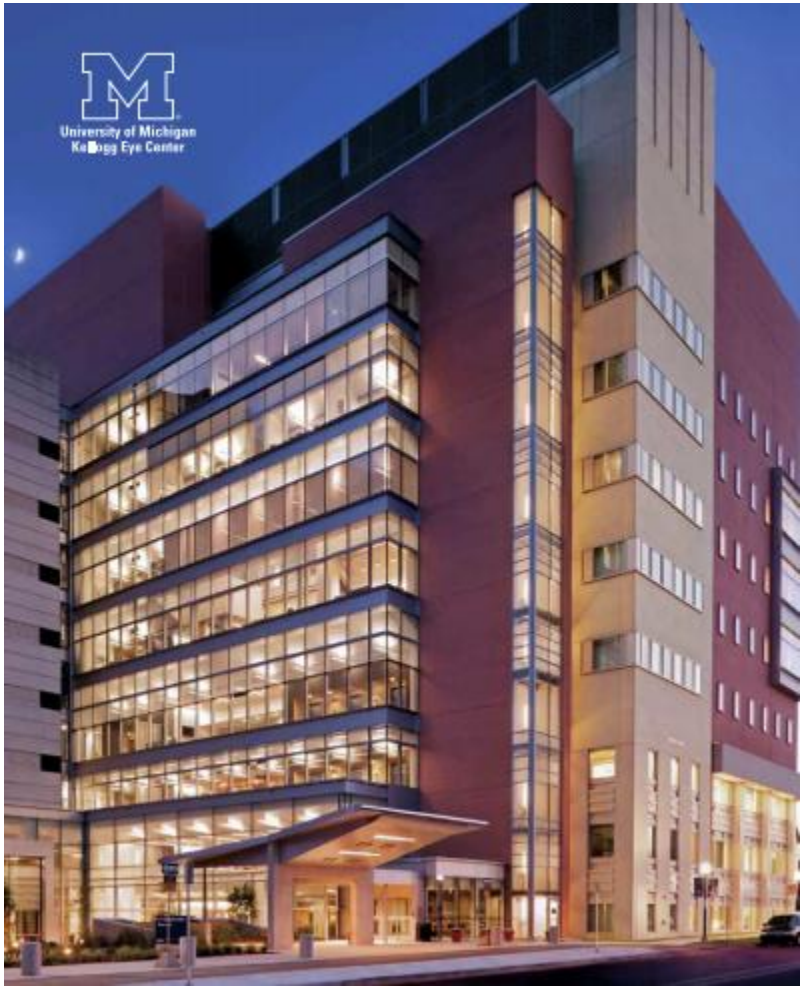
FOSTERING LEARNING

BUILDING COMMUNITY

POSITIVE IMPACT THROUGH...

Research
Education
Implementation
Outreach
Dissemination

Kellogg Eye Center

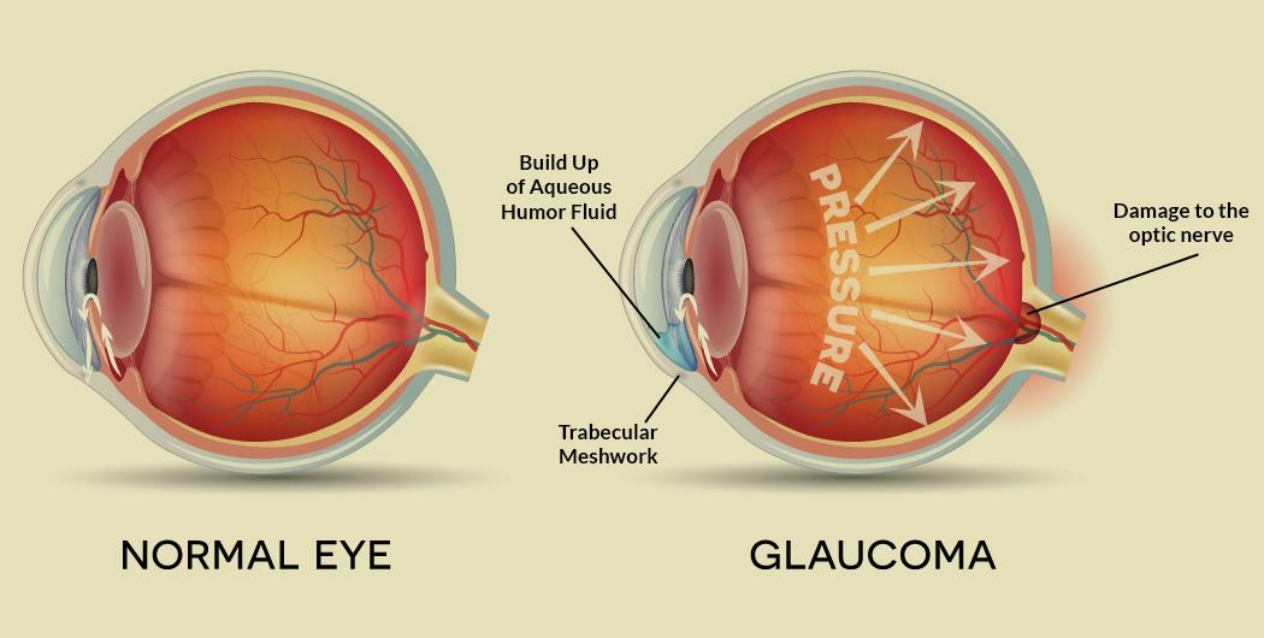


Background

- Glaucoma is one of the leading causes of blindness
- Treatment often requires lengthy clinic visits with multiple steps
- Patient wait time is a significant complaint in many clinical environments
- Our research goal is to reduce wait times incurred by patients in the Glaucoma clinic at the Kellogg Eye Center

What is Glaucoma?

- Eye fluid pressure slowly rises
- Over 3 million people in the United States affected



http://www.insightvisioncenter.com/treating-and-controlling-glaucoma/

Key Goals

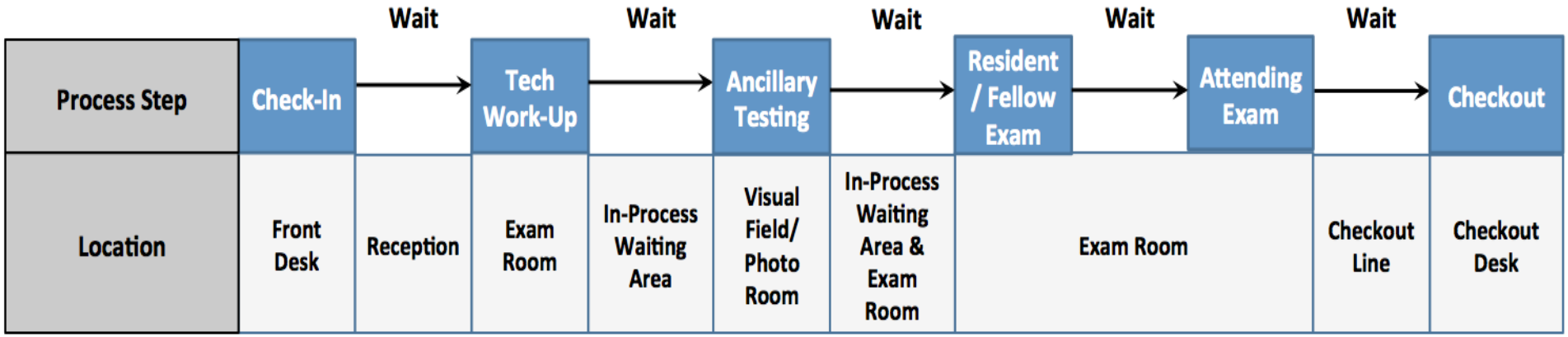
- Goals:
  - Reduce patient wait time
  - Incorporate patient education opportunities

- How:
  - Collect data on patients
  - Analyze data
  - Run simulations

Implementation Plan

- Conduct time studies
- Map process flows
- Test and install RFID readers
- Collect data
- Simulate Clinic flow

Process Flow



Return Visit – 102.5 ± 45 minutes

- 49% of time spent waiting

New Visit – 187.4 ± 44.2 minutes

- 32% of time spent waiting

RFID Data Collection

- Need to know when and where patients are during their time with and without providers (e.g. physicians, technicians, residents, etc.)
- RFID can be used as a low-cost, portable, and passive way of tracking people
- Can give RFID tags to both patients and providers to measure wait time

RFID Data Collection - continued

- Patients and providers wear RFID tags while in clinic
- Tags ping RFID readers twice per second
- Wait time measured as time patients are not with providers

Data Analysis

- Patient visit durations
- Periods of patient/provider co-location
- Periods of time patients wait
- Input for simulation

Simulation

- Compare results from data analysis
  - 6 months of daily provider data and over two-thousand patients
- Evaluate impact of system changes
- Identify opportunities for patient education

Simulation Inputs

Type of Patient	Count
New Patient	8
Return Patient	30
Post-Op	11
Visual Field	27
Laser	3
Urgent	1
Total	**80**

Type of Provider	Count
Check-in Clerks*	2
Technicians	5
Visual Field MAs	3
Photographers	4
Residents	1
Fellows	0
Physicians	3
Check-out Clerks*	4

**Resource shared with Retina Clinic*

Other Configurations	
Clinic Open Time	7:30 AM
Number of Simulations	20,000
Python Version	3.6.5
SimPy Version	3.0.10

Average Visit Duration

Patient Type	Mean (min)	Std Dev (min)
New Patient	166.38	47.54
Return Patient	105.43	36.24
Visual Field	145.06	41.87
Post-Op	82.35	33.44

Average Wait Time (min)

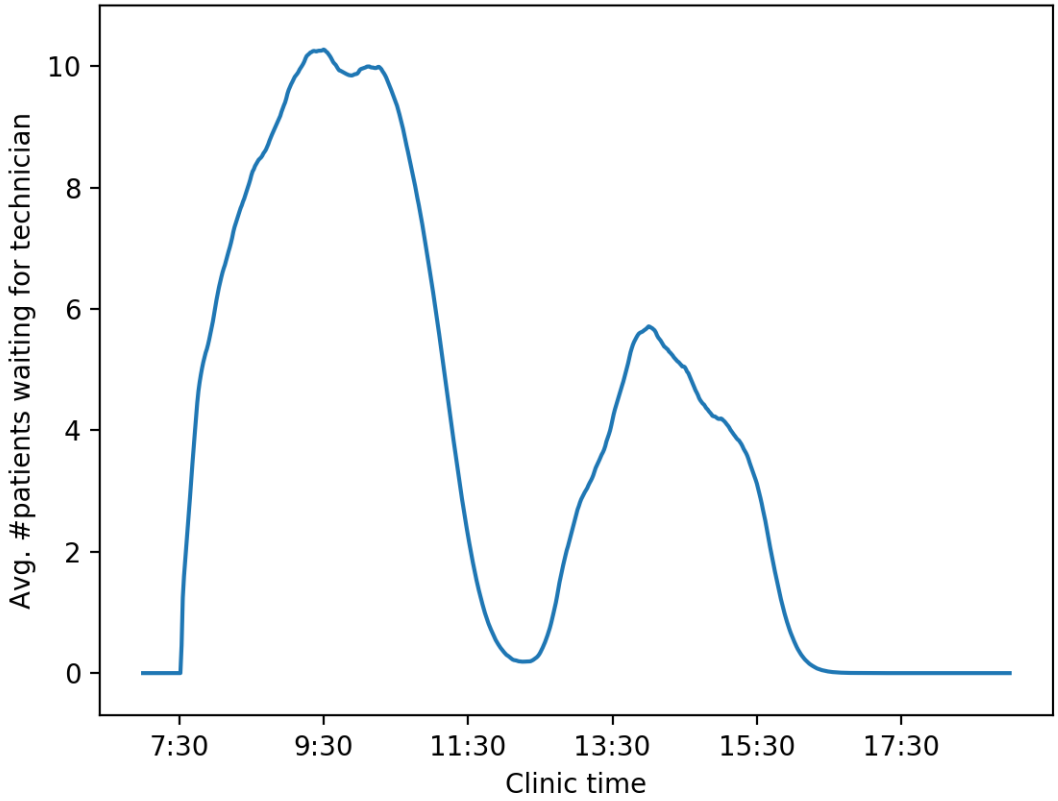
	New Patient	Return Patient	Post-Op	Visual Field	Overall
Technician Work-up	30.45	41.70	26.58	40.54	34.82
Visual Field Test	4.92	6.53	-	5.62	5.69
Dilation	25.00	25.00	25.00	25.00	25.00
Photography	1.03	1.04	1.04	1.04	1.04
Resident/Fellow Exam	1.01	1.01	1.01	1.01	1.01
Attending Exam	12.30	11.37	10.52	11.75	11.49
Check-Out	1.01	1.01	1.01	1.01	1.01

Average Wait Time (min)

Patient Type	Mean (min)	Std Dev (min)
New Patient	63.61	31.59
Return Patient	60.61	30.13
Visual Field	70.48	32.84
Post-Op	40.23	28.85

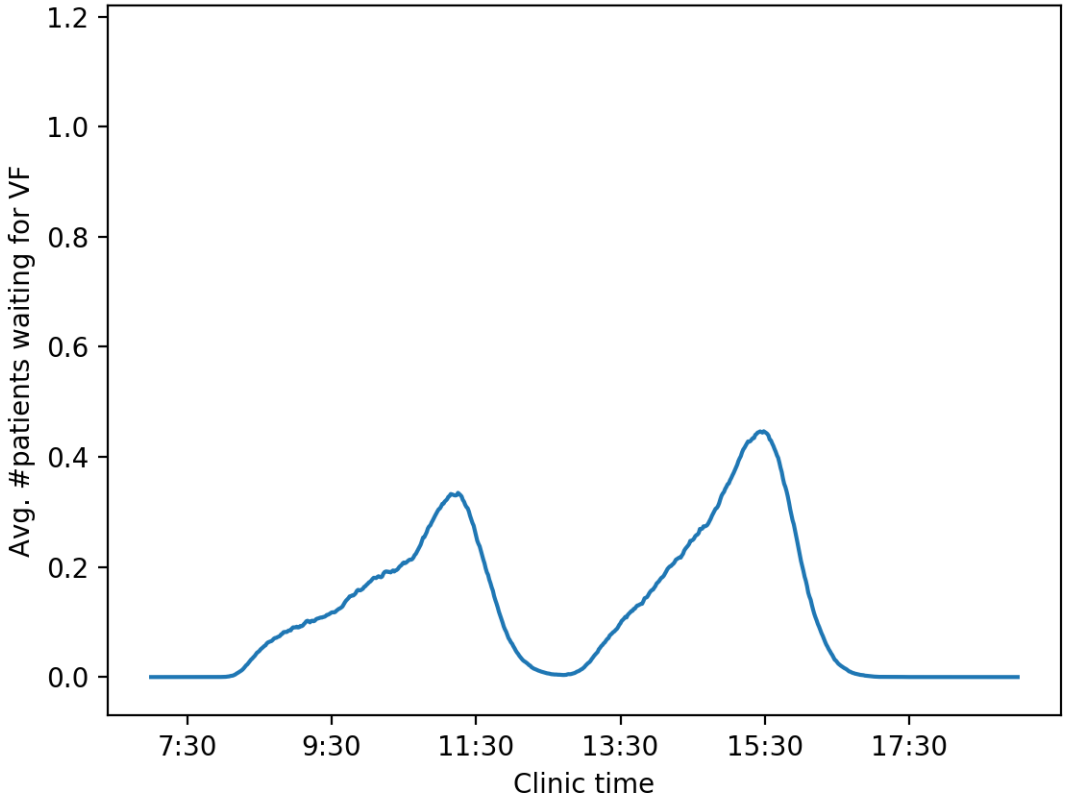
Average Patients Waiting…

- …for a technician



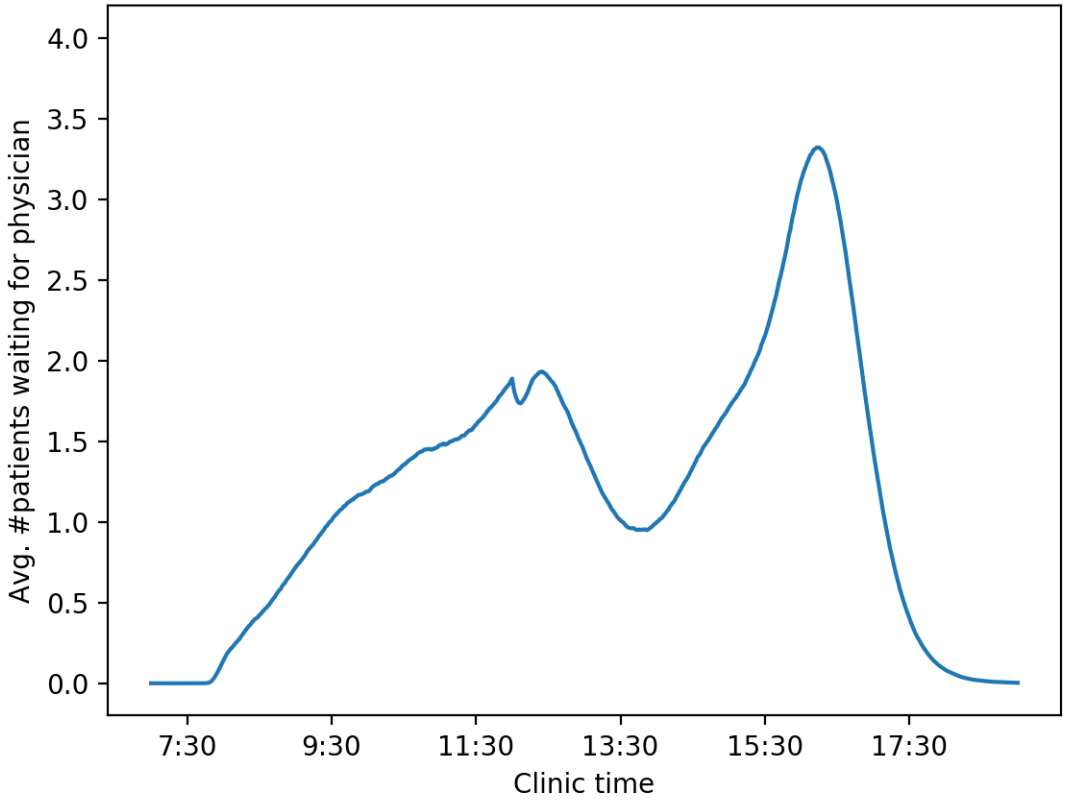
Average Patients Waiting…

- …for a visual field test



Average Patients Waiting…

- …for a physician



Results

- Main bottleneck occurs during Technician Work-up

- Possibility to add more technicians

Results: Average Wait Time (min)

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- 6 Technicians:

	New Patient	Return Patient	Post-Op	Visual Field	Overall
Technician Work-up	19.13	21.93	14.43	22.09	20.97
Visual Field Test	6.42	8.83	-	7.52	7.44
Dilation	25.00	25.00	25.00	25.00	25.00
Photography	1.04	1.06	1.01	1.05	1.05
Resident/Fellow Exam	1.01	1.01	1.01	1.01	1.01
Attending Exam	14.12	12.37	11.76	13.56	13.20
Check-Out	1.01	1.01	1.01	1.01	1.01

Average Wait Time (min)

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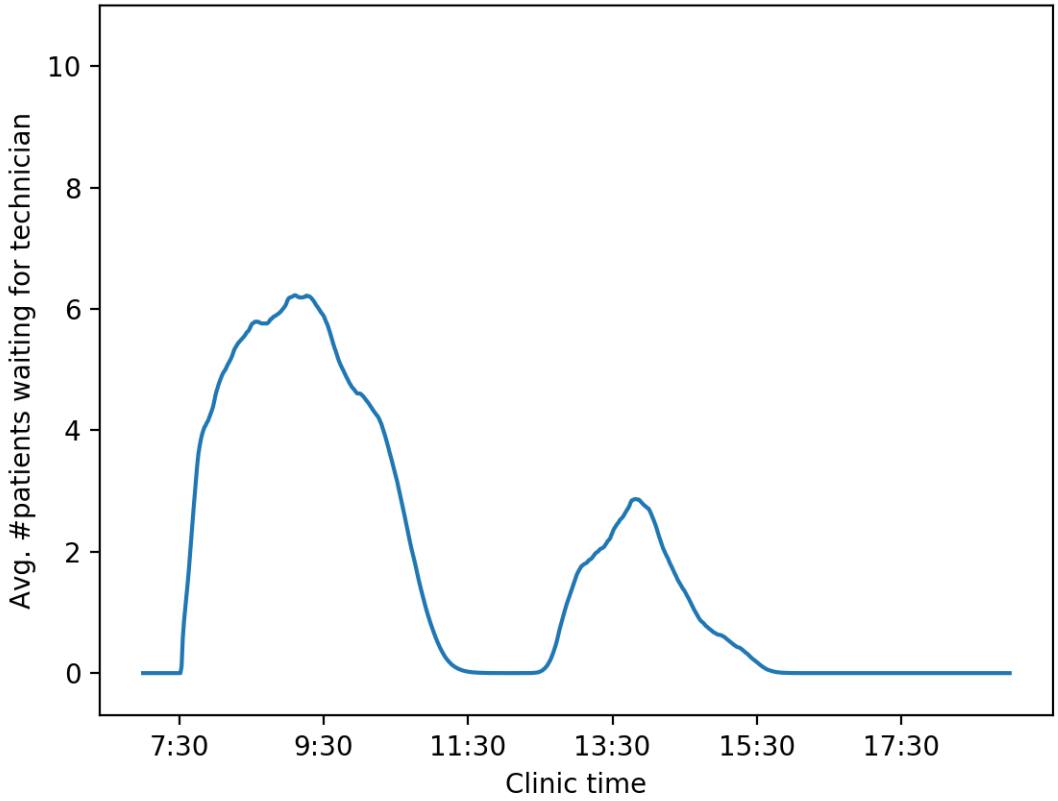
- 6 Technicians:

Patient Type	Mean (min)	Δ	Std Dev (min)	Δ
New Patient	55.20	-8.41	27.96	-3.63
Return Patient	42.05	-18.56	25.26	-4.87
Visual Field	55.70	-14.78	28.79	-4.05
Post-Op	29.33	-10.90	21.98	-6.87

Average Patients Waiting…

- …for a technician



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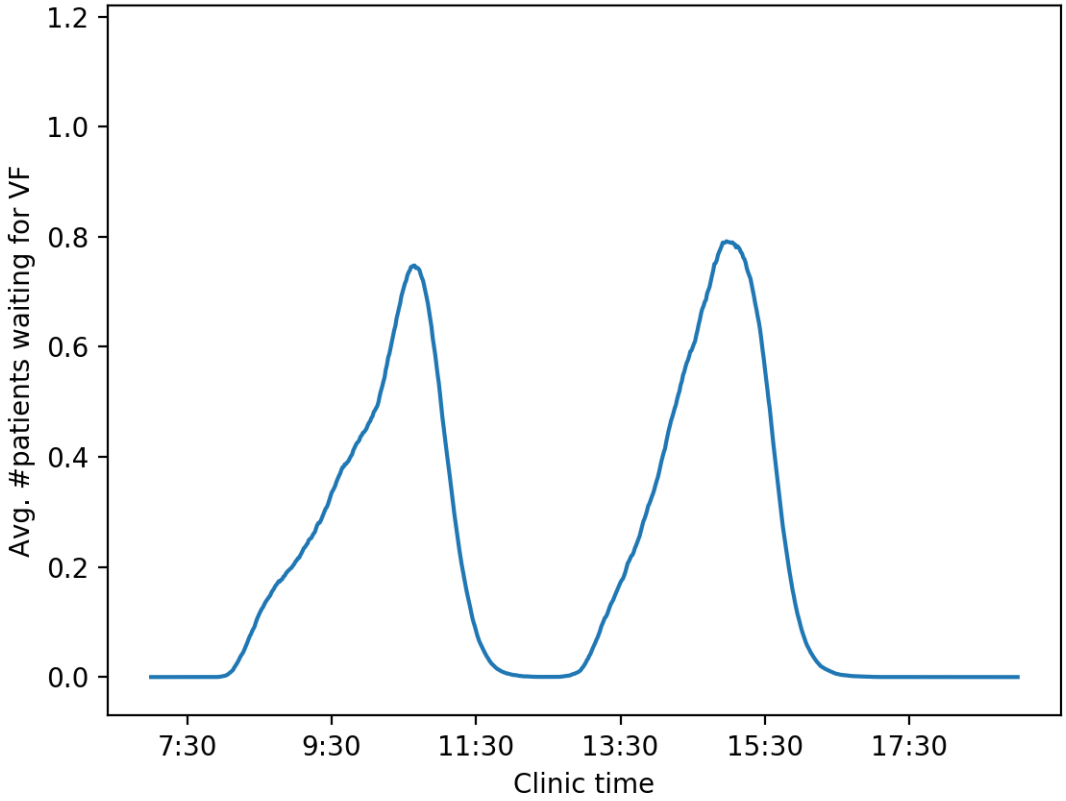

Average Patients Waiting…

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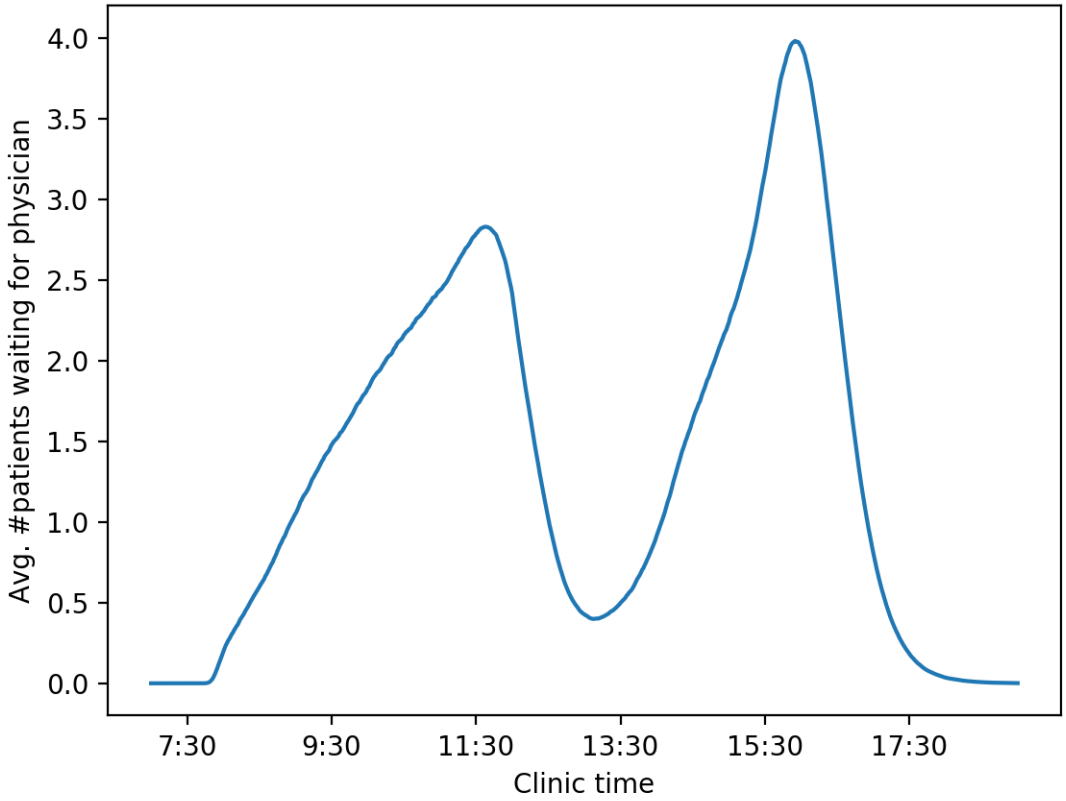

Results: Average Wait Time (min)

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- 7 Technicians:

	New Patient	Return Patient	Post-Op	Visual Field	Overall
Technician Work-up	12.49	12.42	9.71	12.44	12.01
Visual Field Test	8.02	10.24	-	9.01	8.94
Dilation	25.00	25.00	25.00	25.00	25.00
Photography	1.06	1.07	1.04	1.07	1.06
Resident/Fellow Exam	1.01	1.01	1.01	1.01	1.01
Attending Exam	15.32	12.86	12.23	14.49	13.91
Check-Out	1.01	1.01	1.01	1.01	1.01

Average Wait Time (min)

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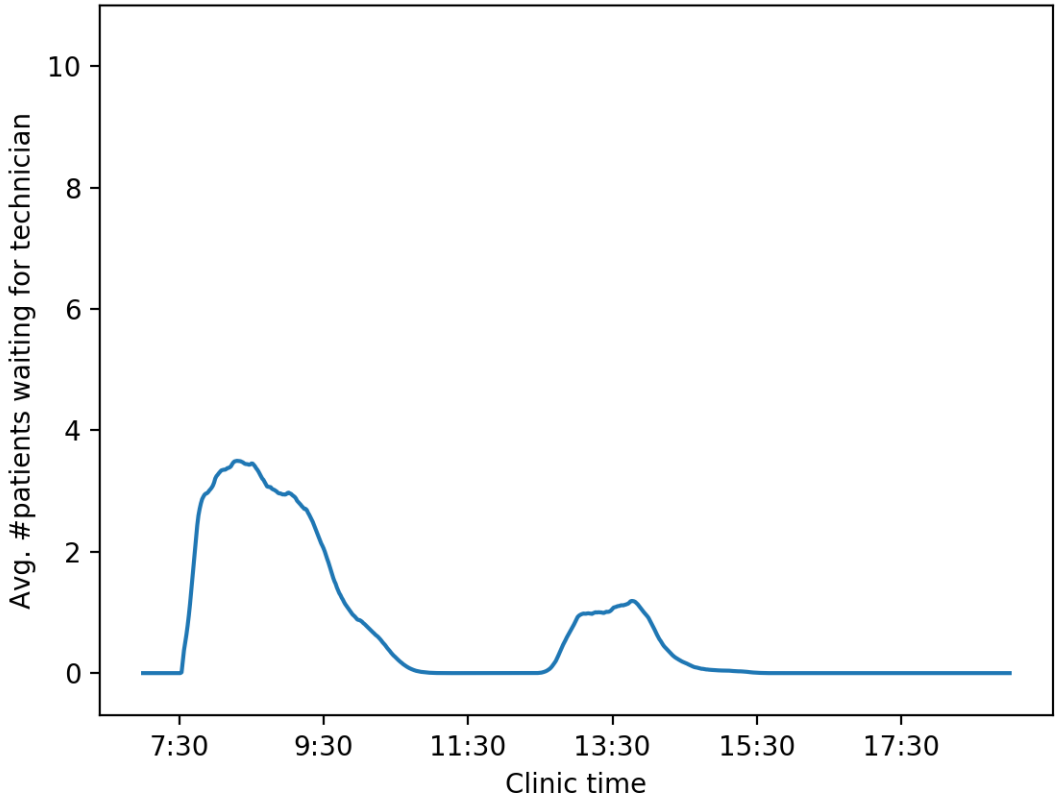
- 7 Technicians:

Patient Type	Mean (min)	Δ	Std Dev (min)	Δ
New Patient	50.86	-12.75	26.44	-5.15
Return Patient	33.15	-27.46	22.67	-7.46
Visual Field	48.47	-22.01	26.74	-6.10
Post-Op	25.04	-15.19	19.65	-9.20

Average Patients Waiting…

- …for a technician



Average Patients Waiting…

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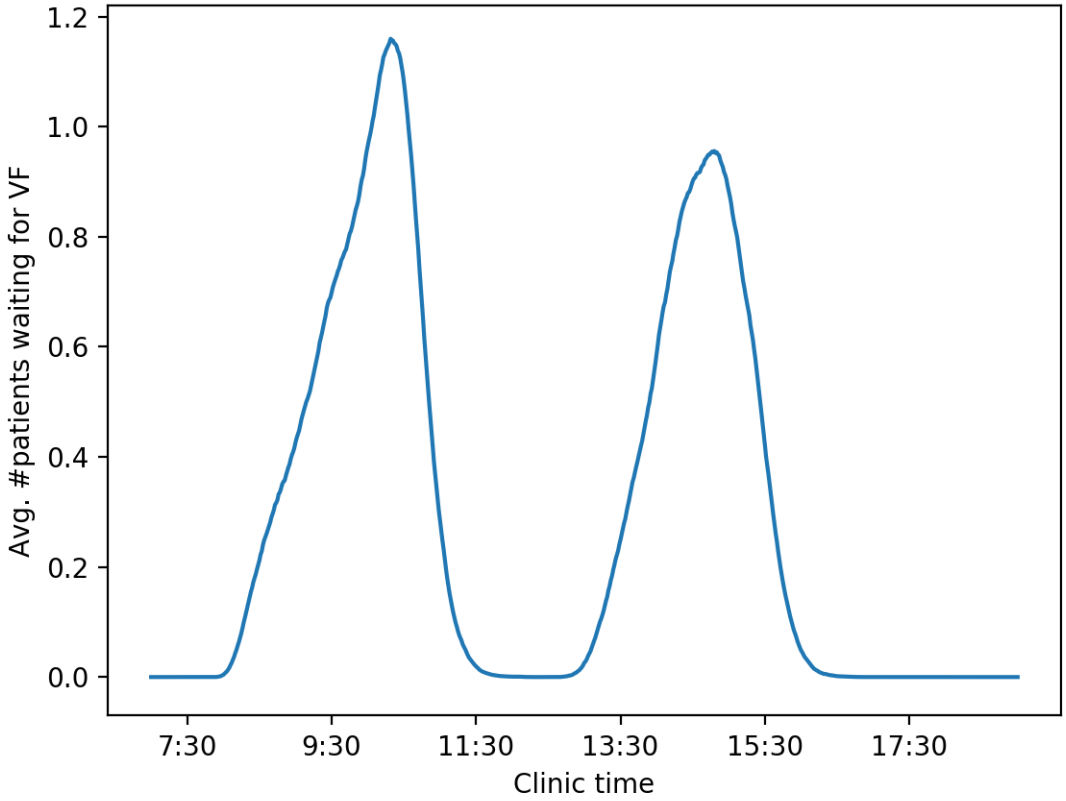

Average Patients Waiting

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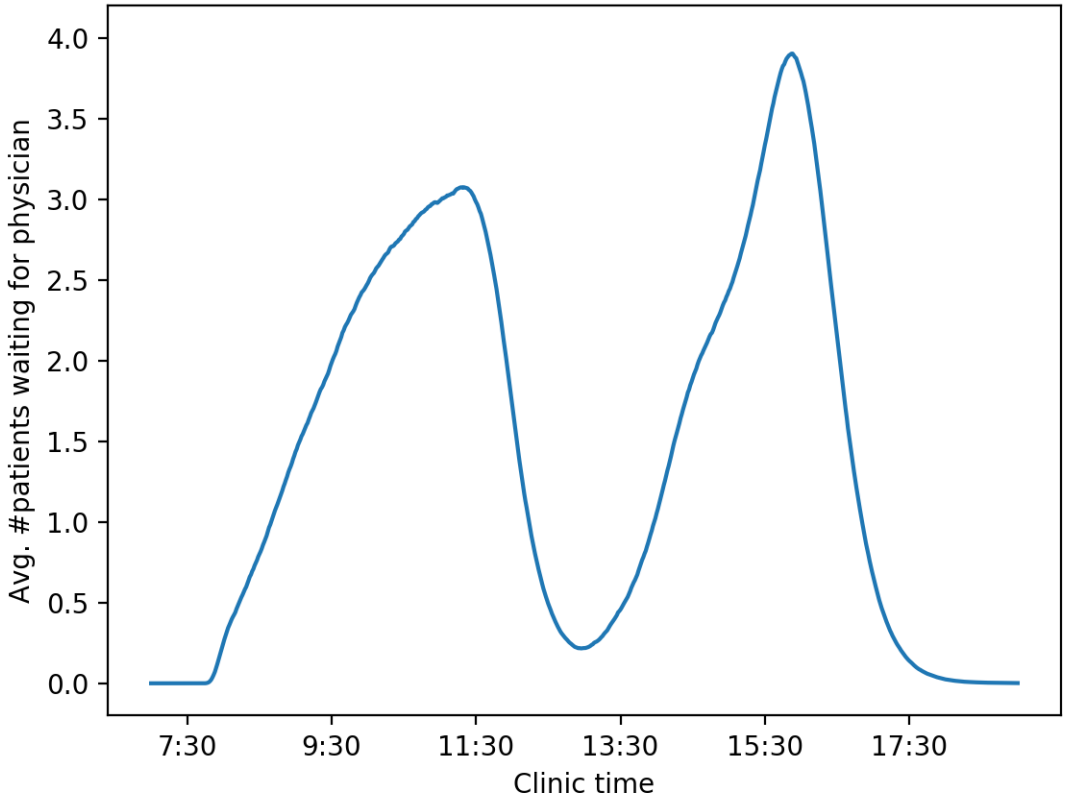
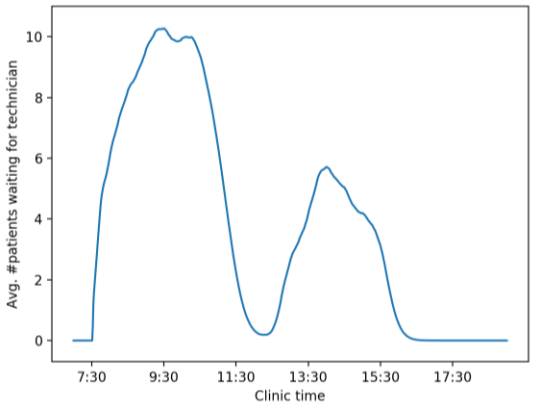
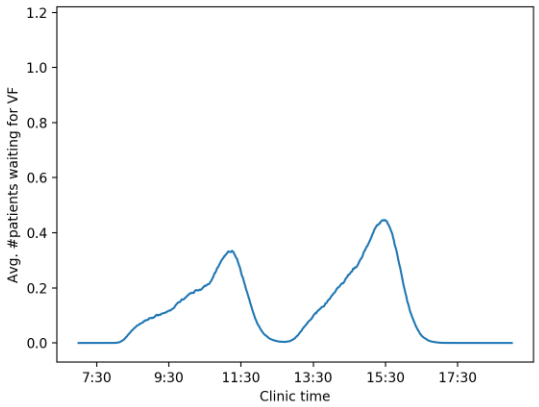
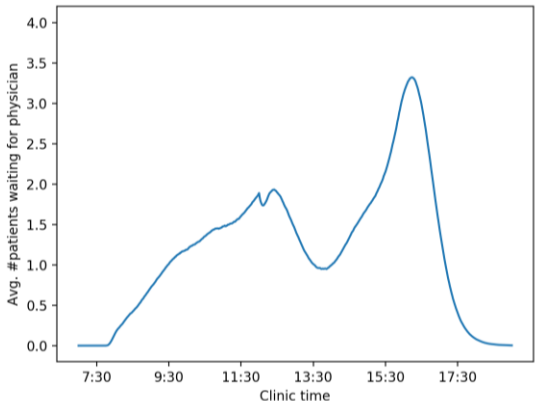


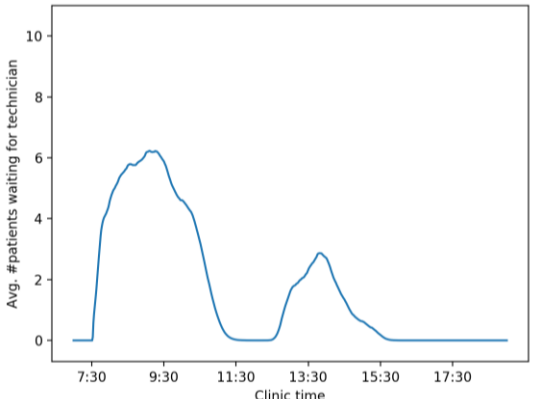
5 technicians

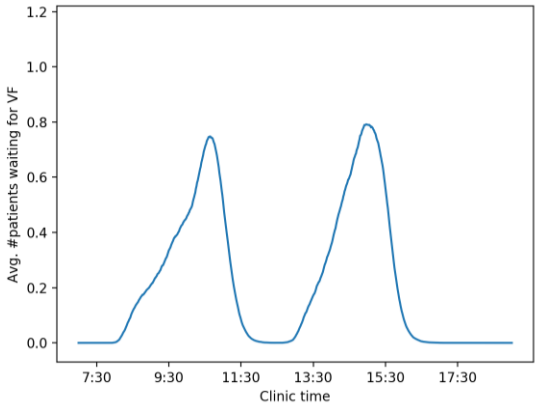


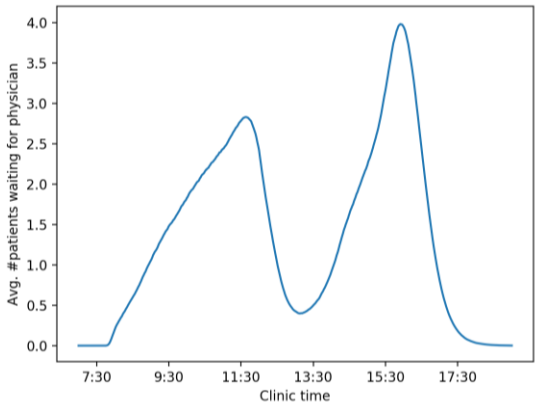




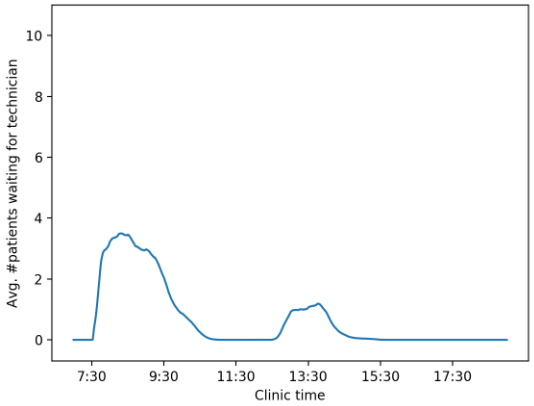
6 technicians

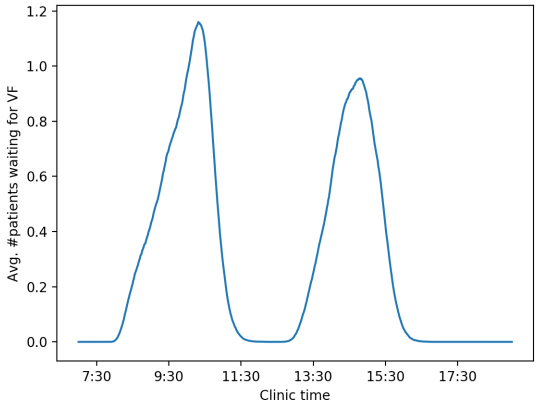


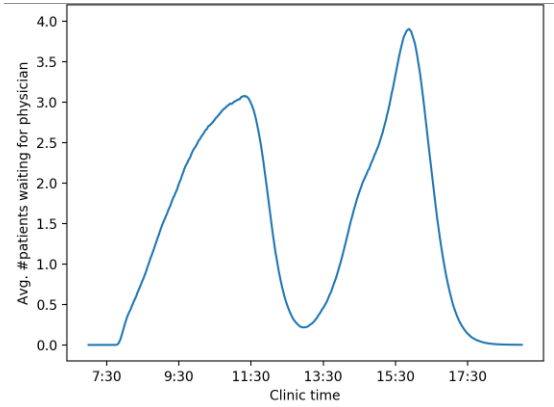




7 technicians







Technician

Visual Field Test

Physician

Conclusion

- Low cost and passivity of RFID system allows collection of vast amounts of data
- Informs clinicians regarding patient experience
- Opportunities to transform wait time into value-added time
- Similar systems possible within clinics at other institutions

Acknowledgements

Center for Healthcare Engineering & Patient Safety

Amy Cohn
Rachel Moeckel
Abhilash Rao
Michelle Chen
Emily Krebs
Junhong Guo
Neil Gollapudi

Michigan Medicine Kellogg Eye Center

Paula Anne Newman-Casey
Leslie Niziol
John Musser

Support

Supported By

Research to Prevent Blindness

National Eye Institute

NATIONAL INSTITUTES OF HEALTH

Grant Number: 1K23EY025320

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Questions?

Rawson Challenge Checklist

- [x] Engage Physicians in Improvement Projects
- [x] Include Patients and Families in Improvement Projects
- [ ] Free up $1M of waste and reinvest it in your healthcare system
- [ ] Tweet your lessons learned
- [x] Report the impact of your reinvestment in US healthcare at HSPI Conference 2019