# Automating Continuous Practice Improvement: An Assessment of Clinical Policy Change on Patient Wait Time

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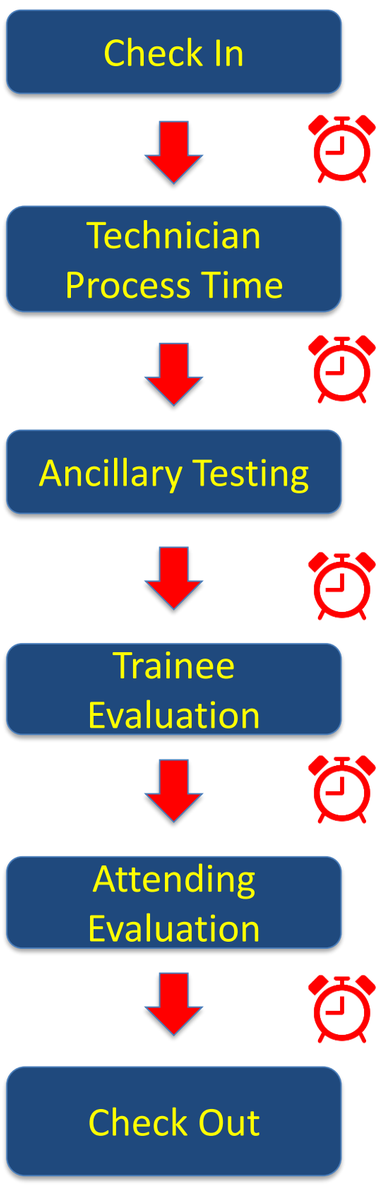
## BACKGROUND

- Patient satisfaction is used as an important measure of healthcare quality. The Center for Medicare and Medicaid Services (CMS) incentivizes focusing on patient satisfaction by tying it to physician compensation with Merit-Based Incentives Payment (MIPS).
- In ambulatory care settings, and in Ophthalmology in particular, patient wait time is a key factor in determining patient satisfaction. (1,2) Lean analysis has been credited with improving surgical wait times, hospital cost savings, and patient satisfaction in large healthcare systems. (3,4,5)
- Lean process management was developed by Toyota to maximize value at each step in the manufacturing process by eliminating any waste identified by workers.(6,7) In 2013, 35% of healthcare efficiency literature was focused on Lean process integration. (4)
- In 2015, we undertook a Lean analysis of glaucoma clinic flow at the University of Michigan Kellogg Eye Center and identified technician work-up time as one key bottle-neck to patient flow.

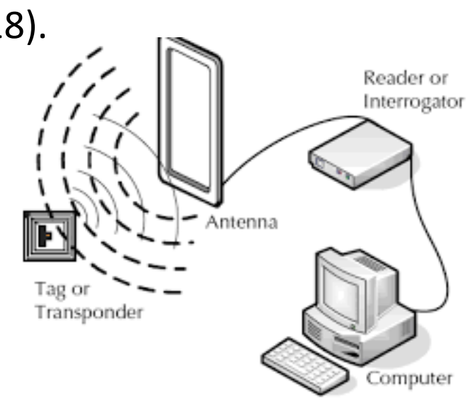



## OBJECTIVE

To evaluate the impact of a streamlined glaucoma clinic refraction policy on technician process times, patient wait times and patient volume in an academic glaucoma clinic. We used automated, passive time studies via Radio Frequency Identification (RFID) technology to complete this assessment.

## METHODS

- A RFID system was implemented into the glaucoma clinic at the University of Michigan Kellogg Eye Center to conduct passive continuous time studies (1/5/18-7/3/18).
- RFID readers were placed in each clinical space and set to sample for area tags once every 0.5 seconds. Providers and patients were all given RFID tags.




- A hidden Markov model was used to optimize RFID location data and model locations were validated with direct clinic observations.
- A clinical policy change was implemented on March 30, 2018 where patients with ≥20/30 visual acuity were not refracted unless requested.
- We compared technician process time to evaluate the effect of this policy change and volume of patients seen in clinic before and after March 30 to evaluate this policy change.
- Process and wait times were tested for differences before and after implementing the policy change with 2-sample t-tests. Linear regression was used to estimate the effect of policy change on process and wait time, adjusting for day of week, patient type, and daily patient volume. SAS 9.4 was used for statistical analysis.


## RESULTS

- 6813 patients were seen in clinic 1/5-7/3, of which 1972 (29%) participated (1031 before and 941 after the policy change).

Refraction Policy Change

Time (minutes)

| | Before (mean ± SD) | After (mean ± SD) | Change (mean ± SD) | P value |
|---|---|---|---|---|
| Technician Process Time | 23.8 ± 13.6 | 20.8 ± 12.9 | -3.0 ± 13.3 | p < 0.0001 |
| In-Process Waiting | 15.4 ± 19.4 | 16.2 ± 18.9 | 0.8 ± 19.2 | p = 0.3063 |
| Exam Room Waiting | 19.5 ± 21.8 | 20.3 ± 21.6 | 0.8 ± 21.7 | p = 0.4021 |
| Patient Clinic Volume | 51.9 ± 16.8 | 58.4 ± 17.4 | 6.5 ± 17.4 | p = 0.0381 |

**Table 1:** Descriptive statistics for wait and process time before and after policy change

| Outcome (minutes) | Estimate (95% CI) | P-value |
|---|---|---|
| Technician Process Time | -3.5 (-4.8, -2.3) | <0.0001 |
| In-Process Wait Time | -0.2 (-1.9, 1.5) | 0.8231 |
| Exam Room Wait Time | 0.7 (-1.3, 2.7) | 0.4771 |
| Total Wait Time | 1.5 (-1.5, 4.5) | 0.3348 |

**Table 2:** Linear regression results estimating effects of policy change on wait and process times adjusted for day of week, patient visit type, and daily patient volume

- After linear regression analysis adjusting for day of the week, patient visit type, and daily patient volume, the refraction policy change resulted in an an average decrease of 3.5 minutes ($p<0.0001$) in technician process time.

## CONCLUSION

- Decreasing the number of refractions decreased technician work-up time and facilitated a higher through-put of patients without increasing patient wait time.
- RFID technology is a valuable tool in deconstructing complex clinical workflows into their composite parts. This allows for identification of bottlenecks and evaluation of targeted clinical changes on the entire system.
- Lean process management with employee directed change initiatives can be used to improve overall patient work flow in academic clinics.

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