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## Background

- Glaucoma is a leading cause of irreversible blindness, affecting over 70 million people worldwide, with 10% of these people suffering from blindness in both eyes.<sup>1</sup>
- The current leading treatment is eye drops that lower the intraocular pressure (IOP), inhibiting the progression of glaucoma.<sup>2,3</sup>
- Adherence to glaucoma medication regimens is estimated to be as low as 30-80%<sup>4,5</sup>; this poor adherence has been correlated with more severe vision damage from glaucoma.<sup>6</sup>
- Counseling and educational information tailored to each patient's needs have been the most successful in combating poor adherence.<sup>6</sup> However, these interventions are time-intensive.<sup>7</sup>
- Although providers believe there is not enough time for additional counseling during a clinic visit, many glaucoma patients complain about long clinic wait times.

## Objectives and Hypothesis

- We hypothesize that there is considerable time during a glaucoma clinic visit when patients are not engaged in value added activities.
- We aimed to quantify these wait times to identify times that could be used for educational interventions.

## Methods

### Time Studies

- A purposive sample of new visit (NV) and return visit (RV) patients, across different providers and days of the week, seen at the Kellogg Eye Center glaucoma clinic were included over 4 months.
- Patients were followed through their clinic visit and length of time spent within each component of their visit was recorded using a stopwatch.

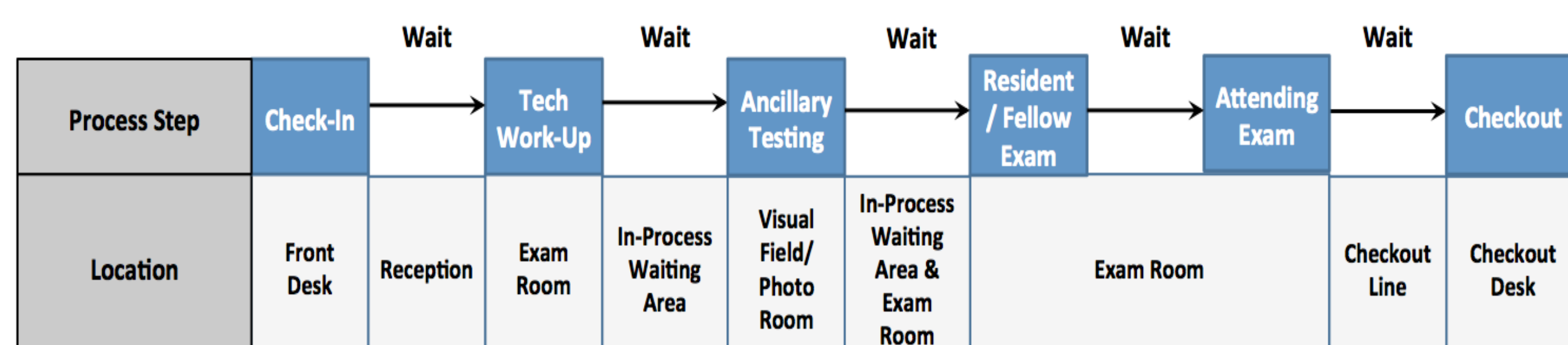
### Lean<sup>8</sup> Observations

- Clinic flow (Figure 1) was observed, paying attention to bottlenecks, long wait times, queuing of patients, and miscommunications. Clinic staff and patients were asked for their opinions regarding these issues.

### Lean Analysis

- Value-stream mapping<sup>8</sup> was used to analyze the clinic process and assess for improvement.
- Observations were recorded in an A3 format.<sup>9</sup>

Figure 1. Clinic visit process



## Results

### Current A3

I. Background	III. Goals/Targets																																																																																																																																																																										
<ul style="list-style-type: none"> <li>• Patients are frustrated with how much they have to wait in clinic especially for visits that are perceived to be short: return visits. Approximately 85% of clinic visits in the past year were return visits.</li> </ul>	<ul style="list-style-type: none"> <li>• Return visit patients spend almost as much time waiting as they do being served.</li> <li>• Goal: Reduce return visit wait times by 50%.</li> </ul>																																																																																																																																																																										
II. Current State	IV. Analysis																																																																																																																																																																										
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Visit times, stratified by new patients and return visit patients</b></p> <table border="1"> <thead> <tr> <th>Variable</th> <th>N</th> <th>Mean</th> <th>SD</th> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td colspan="6"><b>New Patients</b></td> </tr> <tr> <td>Total time (min)</td> <td>29</td> <td>187.4</td> <td>44.2</td> <td>120.0</td> <td>331.0</td> </tr> <tr> <td>Process time (min)</td> <td>29</td> <td>126.1</td> <td>27.7</td> <td>78.9</td> <td>173.2</td> </tr> <tr> <td>Wait time (min)</td> <td>29</td> <td>61.4</td> <td>31.5</td> <td>25.5</td> <td>185.0</td> </tr> <tr> <td>Percent Wait time</td> <td>29</td> <td>31.9%*</td> <td>9.4%</td> <td>13.1%</td> <td>55.9%</td> </tr> <tr> <td colspan="6"><b>Return Visit Patients</b></td> </tr> <tr> <td>Total time (min)</td> <td>47</td> <td>102.5</td> <td>45.0</td> <td>31.5</td> <td>203.9</td> </tr> <tr> <td>Process time (min)</td> <td>48</td> <td>49.4</td> <td>24.8</td> <td>15.5</td> <td>131.8</td> </tr> <tr> <td>Wait time (min)</td> <td>48</td> <td>52.6</td> <td>31.6</td> <td>8.9</td> <td>129.1</td> </tr> <tr> <td>Percent Wait time</td> <td>47</td> <td>49.4%*</td> <td>14.7%</td> <td>20.4%</td> <td>78.7%</td> </tr> </tbody> </table> <p>*The percent of wait time to total visit time was significantly larger on average for RV patients (49.4%) compared to NV patients (31.9%), p&lt;0.0001, 2-sample t-test</p> <p><b>Table 2. Wait times for each process step for return visit patients</b></p> <table border="1"> <thead> <tr> <th>Wait Variables (min)</th> <th>N</th> <th>Mean</th> <th>SD</th> <th>Min</th> <th>Max</th> <th>Median</th> </tr> </thead> <tbody> <tr> <td>General reception</td> <td>48</td> <td>14.7</td> <td>9.7</td> <td>0.2</td> <td>47.9</td> <td>11.9</td> </tr> <tr> <td>In-process waiting 1</td> <td>14</td> <td>12.3</td> <td>11.3</td> <td>3.1</td> <td>43.5</td> <td>7.4</td> </tr> <tr> <td>Photo</td> <td>9</td> <td>11.9</td> <td>12.8</td> <td>3.5</td> <td>40.5</td> <td>4.4</td> </tr> <tr> <td>In-process waiting 2</td> <td>18</td> <td>12.7</td> <td>12.1</td> <td>1.0</td> <td>47.6</td> <td>8.9</td> </tr> <tr> <td>Resident</td> <td>35</td> <td>11.0</td> <td>9.6</td> <td>1.0</td> <td>35.2</td> <td>7.1</td> </tr> <tr> <td>Attending</td> <td>38</td> <td>22.1</td> <td>19.8</td> <td>2.3</td> <td>70.1</td> <td>13.7</td> </tr> <tr> <td>Checkout</td> <td>21</td> <td>2.0</td> <td>2.3</td> <td>0.0</td> <td>7.7</td> <td>1.6</td> </tr> </tbody> </table> <p><b>Table 3. Frequency of wait time blocks, overall and stratified by new versus return visit patients</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Useable Wait Times</th> <th colspan="2">Overall (n=77)</th> <th colspan="2">New Patient (n=29)</th> <th colspan="2">Return Patient (n=48)</th> </tr> <tr> <th>#</th> <th>%</th> <th>#</th> <th>%</th> <th>#</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>5+ minutes</td> <td>77</td> <td>100.0%</td> <td>29</td> <td>100.0%</td> <td>48</td> <td>100.0%</td> </tr> <tr> <td>10+ minutes</td> <td>71</td> <td>92.2%</td> <td>29</td> <td>100.0%</td> <td>42</td> <td>87.5%</td> </tr> <tr> <td>15+ minutes</td> <td>57</td> <td>74.0%</td> <td>24</td> <td>82.8%</td> <td>33</td> <td>68.8%</td> </tr> <tr> <td>20+ minutes</td> <td>42</td> <td>54.5%</td> <td>13</td> <td>44.8%</td> <td>29</td> <td>60.4%</td> </tr> <tr> <td>30+ minutes</td> <td>22</td> <td>28.6%</td> <td>5</td> <td>17.2%</td> <td>17</td> <td>35.4%</td> </tr> </tbody> </table>	Variable	N	Mean	SD	Min	Max	<b>New Patients</b>						Total time (min)	29	187.4	44.2	120.0	331.0	Process time (min)	29	126.1	27.7	78.9	173.2	Wait time (min)	29	61.4	31.5	25.5	185.0	Percent Wait time	29	31.9%*	9.4%	13.1%	55.9%	<b>Return Visit Patients</b>						Total time (min)	47	102.5	45.0	31.5	203.9	Process time (min)	48	49.4	24.8	15.5	131.8	Wait time (min)	48	52.6	31.6	8.9	129.1	Percent Wait time	47	49.4%*	14.7%	20.4%	78.7%	Wait Variables (min)	N	Mean	SD	Min	Max	Median	General reception	48	14.7	9.7	0.2	47.9	11.9	In-process waiting 1	14	12.3	11.3	3.1	43.5	7.4	Photo	9	11.9	12.8	3.5	40.5	4.4	In-process waiting 2	18	12.7	12.1	1.0	47.6	8.9	Resident	35	11.0	9.6	1.0	35.2	7.1	Attending	38	22.1	19.8	2.3	70.1	13.7	Checkout	21	2.0	2.3	0.0	7.7	1.6	Useable Wait Times	Overall (n=77)		New Patient (n=29)		Return Patient (n=48)		#	%	#	%	#	%	5+ minutes	77	100.0%	29	100.0%	48	100.0%	10+ minutes	71	92.2%	29	100.0%	42	87.5%	15+ minutes	57	74.0%	24	82.8%	33	68.8%	20+ minutes	42	54.5%	13	44.8%	29	60.4%	30+ minutes	22	28.6%	5	17.2%	17	35.4%	<p><b>Root Cause Analysis</b></p> <pre> graph TD     A[Variability] -- Why? --&gt; B[Based on individual physician's experience]     A -- Why? --&gt; C[Templates/Scheduling Causes Waiting]     A -- Why? --&gt; D[Batching]     C -- Why? --&gt; E[No understanding of what's best in a collective sense for a multi-physician practice]     C -- Why? --&gt; F[Unscheduled Ancillary Testing]     C -- Why? --&gt; G[Amount of patients scheduled at a given time exceeds clinic capacity.]     E -- Why? --&gt; H[Coordination of scheduling templates has not been done before in this clinic]     F -- Why? --&gt; I[Checkout notes from previous visit incomplete]     G -- Why? --&gt; J[Clinic tries to frontload patients.]     I -- Why? --&gt; K[Physician rushed due to batch of patients and is interrupted by other staff.]     J -- Why? --&gt; L[To finish clinic on time, increase capacity, and decrease access times]     K -- Why? --&gt; M[Batching]     M -- Why? --&gt; N[SCHEDULING TEMPLATES]     </pre>
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## Conclusions

- Return visits have a higher percentage of wait time, on average.
- The root causes identified for wait times through lean evaluation were scheduling issues which lead to patient batching and increased wait times.
- Educational interventions that can be delivered in 10-15 minute blocks may be best integrated into clinic flow.
- Clinic efficiency should be improved to decrease five-minute wait times as they are unlikely to be useful for education.
- Patient and provider movement will be monitored in the future using passive RFID technology<sup>10</sup> to assess process and wait times on a larger scale and to assess the effectiveness of any countermeasures.

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## Grant Support