Continuous Process Improvement
Using Systems Engineering to Improve Laboratory Operations

Presenter: Mohammed Mustapha
Tackling Phlebotomy’s Toughest Challenges:

How Mayo Clinic Balanced Phlebotomy Workload and Reduced Patient Wait time
Case Study:

Reducing patient wait time

phlebotomy lab
Laboratory Background

- **Size:**
  - Largest of 3 phlebotomy lab service areas

- **Services:**
  - Blood and urine collection

- **Workload:**
  - Busiest days of the week (Monday – Wednesday)
  - 1000 - 1200 patients on busy days
  - 75% of workload between 6 and 10 am
Business Case

Problems:
- Patients presenting to the phlebotomy lab on Monday mornings between 6:00 and 10:00 am spend significant amount of time waiting.
- 53% of patients wait more than 15 minutes
- More patients arriving early in the morning

Goal:
- Less than 20% of patients wait more than 15 min.
Understand the Process

Follow and observe the patient experience

- Time the processes (value and non value added activities)
- Identify bottlenecks and wastes in the processes
Data Collection

- Queue time (time spent waiting to check in)
- Check-in time (time to complete checking in a patient)
- Wait time (time spent waiting for blood draw)
- Process time (time to complete a blood draw)
- Number of patients per hour
- Patient arrival times
Workload Distribution (M-F)

Average daily workload

<table>
<thead>
<tr>
<th>Day</th>
<th># of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>1200</td>
</tr>
<tr>
<td>Tuesday</td>
<td>1100</td>
</tr>
<tr>
<td>Wednesday</td>
<td>1000</td>
</tr>
<tr>
<td>Thursday</td>
<td>800</td>
</tr>
<tr>
<td>Friday</td>
<td>600</td>
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</table>
Patient Arrival by Half Hour

Average hourly workload

<table>
<thead>
<tr>
<th>Time</th>
<th>AM</th>
<th>PM</th>
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<tbody>
<tr>
<td>6:30</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>7:00</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>7:30</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>8:00</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>8:30</td>
<td>70</td>
<td></td>
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<tr>
<td>9:00</td>
<td>60</td>
<td></td>
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<tr>
<td>9:30</td>
<td>50</td>
<td></td>
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<tr>
<td>10:00</td>
<td>40</td>
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<tr>
<td>10:30</td>
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<tr>
<td>11:00</td>
<td>20</td>
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<tr>
<td>11:30</td>
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<td>12:00</td>
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<td>17:30</td>
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<tr>
<td>18:00</td>
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</tbody>
</table>

6σ measure
Wait time (baseline)

Average wait times

<table>
<thead>
<tr>
<th>Time</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00-7:00</td>
<td>10.00</td>
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<tr>
<td>7:00-8:00</td>
<td>12.00</td>
</tr>
<tr>
<td>8:00-9:00</td>
<td>25.00</td>
</tr>
<tr>
<td>9:00-10:00</td>
<td>20.00</td>
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<tr>
<td>10:00-11:00</td>
<td>15.00</td>
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<tr>
<td>11:00-12:00</td>
<td>10.00</td>
</tr>
<tr>
<td>12:00-1:00</td>
<td>5.00</td>
</tr>
<tr>
<td>1:00-2:00</td>
<td>3.00</td>
</tr>
<tr>
<td>2:00-3:00</td>
<td>3.00</td>
</tr>
<tr>
<td>3:00-4:00</td>
<td>3.00</td>
</tr>
<tr>
<td>4:00-5:00</td>
<td>3.00</td>
</tr>
</tbody>
</table>
Factors contributing to long wait times

- Patient arrival pattern
- Service types
- Staffing
- Capacity
- Separate check-in desks
- Patients joining the wrong line
Determine Root Causes of Problem

Improper staffing to workload was a major contributor to long wait times.
Implemented solutions

- Workflow redesign
- Staffing to workload
Improvement #1

Workflow redesign
Redesign Goals

- Efficient use of space
- Reduce waste
  - transportation
    - minimize walking distances
    - minimize unnecessary movement by staff
  - waiting
    - reduce work in progress
    - reduce inventory
- Improve workflow throughout the lab
- Improve visual management
- Maximize overall operational efficiency
Simulation

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Simulation Goals

› Improve workflow
  • Patient flow
  • Specimen flow

› Reduce patient wait time
  • Check-in line
  • Waiting area
Results: current state

Combined desk C & C1 - current capacity (6 checkin stations, 19 draw rooms)
Results: future state

Combined Desk C&C1-future capacity (6 check-in stations, 27 blood draw rooms)
Improvement #2

Staffing to workload
Why Staffing to Workload?

- Respond to changes in demand
  - Patients arriving early in the mornings
- Patient satisfaction
  - Reduce patient wait time
- Respond to staff complaints (fatigue)
  - Reduce staff burn out
- Staff resource planning
  - Capacity planning tool
- Needs of the patient come first
  - Achieving Mayo’s mission
How to get started

- Collect and Analyze data
  - Patient volume (daily, hourly)
  - Processing times
  - Wait times
  - # of scheduled staff
- Share findings
- Develop solution options
- Ask for feedback to optimize solution
Findings

- Insufficient staff to meet early morning peak demand (6:00 – 10:00 am)
- Patients are waiting longer
- Overcrowding in the lobby
Improvements

Proactive
- Adjust staff to match expected workload based on capacity analysis

Reactive
- Manage staff based on need
- Float staff by sending or asking for help from other work units
- Offer same day vacations
Maintaining the Gains

- Tracking mechanisms
  - Continue to monitor patient volumes per hour/day
  - Continue to monitor patient waiting times

- Compare patient volumes to staffing
  - “Tweak” schedule
  - Adjust float assignments, breaks, lunches

- Monitor the workload - more than once daily
Challenges / Lessons Learned

- Floating staff to other outpatient areas
  - Provide cross functional training
  - Ensure room availability

- Balancing daily staff to workload
  - Over staffing
    - Too much down time
  - Under staffing
    - Insufficient staff to deal with sudden increase in patient load
Implemented solutions

- Rearranged staff schedule to match workload at peak hours
- Float staff to areas that need help
- Introduced dedicated staff to deal with check-in issues
Future Plans

- Monitor patient wait times
- Respond quickly to issues
- Continue to improve processes
Questions ?