Lean Journey at Seattle Children’s Hospital

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Measurable Learning Objectives

At the end of this activity the participant will be able to:

• 1. Describe SCH microbiology’s development of lean culture.

• 2. Identify institutional gains.

• 3. Understand the importance and challenges of sustaining change.
Background

- **Seattle Children’s Hospital**
  - 323 bed tertiary hospital serving 4 states.
  - Pediatric academic referral hospital.
  - All specialty services offered including neonates, solid organ transplant, oncology, and bone marrow transplant.

- **Microbiology**
  - Divided into 4 subsections: molecular, cystic fibrosis, AFB/mycology, routine
  - Volume: ~200 routine cultures/day
  - Staff: 1 technical director, 2 supervisors, 1 LIS analyst, 14 technologists, 2 MLT, 2 NRT, 1 lab assistant
  - Hours: 24/7
  - Previous Lean experience

- **Lean and ISE (Industrial Engineering)**
GOAL: Improve patient care by delivering quality results sooner.

• Provide doctors with timely, meaningful, and predictable results.

• Improve the hospital’s antibiotic stewardship.

• Decrease length of stay in the hospital.
Modest Beginnings: How to develop a lean culture.

• Understand your lean philosophy.

• Started with small wins.

• Build on your experiences and understanding.
Seattle Children’s Microbiology Timeline:

- 5s 2007
- Blood RPIW 2008
- Urine RPIW 2008
- Stool culture A3 2009
- Cerner millennium conversion 2010
- Lab system conversion 2011-2012
- Lab system PDCA 2013
What’s our foundation for success?

- An institution that has invested and implemented lean philosophy in a deep and meaningful way.

- A senior management guidance team that actively participates in removing obstacles.

- Engaged frontline staff willing to transform microbiology to improve patient care.

- Partnership with ISE engineers.

- Project management tools.
Do we understand Change Management?

- Understand perception
  - Vision statement

- Understand organization
  - Use project management organizational tools such as charters, work breakdown structures, and meeting minutes
  - Timeline and milestones
  - Communication

- Understand motivation
  - Staff involvement
Organization of MALDI-TOF CONVERSION

Gallup Impact Plan: MALDI-TOF

- FTE ALIGNMENT
  - ISE support
  - FTE Gallup Team

- VALIDATION
  - Validation Gallup Team

- WORKFLOW
  - Workflow Gallup Team
  - ISE support
Assessment our existing workflow system
Assess Microbiology System

• Identify scope of project and create a process map
• Identify bottlenecks, unnecessary steps, wait times etc.
• Identify solutions
• Identify metrics to measure your success
Pre-MALDI work flow map based on Jan 1, 2011-Dec 31, 2011

Avg Time: 70 hours
Max Time: 216 hours
Pre-MALDI system measurements
Solutions
Optimal Read Times

- Reduce variation in culture incubation and reporting cycle times
  - Read cultures when they are ready (16 hours incubation) not when tech is ready
  - Move from one large batch done on day shift to 6 mini batches done 24/7
  - Consistently generate reports 18-24 hours after cultures are received in lab

<table>
<thead>
<tr>
<th>Micro Start Time (Plate Inoculation)</th>
<th>Read Time</th>
<th>Color Dot</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100-0459</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td>0500-0859</td>
<td>0300</td>
<td></td>
</tr>
<tr>
<td>0900-1259</td>
<td>0700</td>
<td></td>
</tr>
<tr>
<td>1300-1659</td>
<td>1100</td>
<td></td>
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<tr>
<td>1700-2059</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>2100-0059</td>
<td>1900</td>
<td></td>
</tr>
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</table>
When samples arrive in SCH Microbiology, they will be plated and placed in the appropriate read time rack to ensure the culture status will be reported 18-24 hours later.

Racks will be placed in the appropriate time slot in one of three incubators.

After 16-22 hours of incubation (at the beginning of each 4 hour cycle) the appropriate read time rack will be selected for testing.

Cultures are read and spotted to 96 well plate, and placed into MALDI-TOF for testing.
Metric Results:

- **TAT Metrics (lab efficiencies/capacities-decrease WIP):**
  - % improvement in cultures receiving a preliminary report within 24hrs
    - **Wound 11.2%, Trach 11.0%**
  - % improvement in negative cultures receiving a final report within 48hrs
    - **Stool 17.0%, Wound 37.0%, Trach 33.0%**
  - % improvement in positive cultures receiving a final report within 48hrs
    - **Stool 11.9%, Wound 3.9%, Trach 22.7%**

- **TAT Metrics (predictability):**
  - % improvement in cultures receiving a preliminary report with 18-24 hrs
    - **Wound 26.7%, Trach 49.3%**
  - % improvement in negative cultures receiving a final report within 42-48 hrs
    - **Stool 37%, Wound 42.9%, Trach 35.9%**
  - % improvement in positive cultures receiving a final report within 42-48 hrs
    - **Stool 16.5%, Wound 21.5%, Trach 12.7%**

- **TAT Metrics (improve quality patient care):**
  - % blood culture definitive ID.

### Blood Culture ID TAT

<table>
<thead>
<tr>
<th></th>
<th>&lt;4 Hrs</th>
<th>&lt;12 Hrs</th>
<th>&lt;24 Hrs</th>
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<tbody>
<tr>
<td>GN pre-MALDI</td>
<td>0.0%</td>
<td>30.7%</td>
<td>30.7%</td>
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<tr>
<td>GN post-MALDI</td>
<td>80.0%</td>
<td>100.0%</td>
<td>NA</td>
</tr>
<tr>
<td>GP pre-MALDI</td>
<td>0.0%</td>
<td>2.9%</td>
<td>68.1%</td>
</tr>
<tr>
<td>GP post-MALDI</td>
<td>23.5%</td>
<td>27.5%</td>
<td>91.4%</td>
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</table>
Cost Savings

Microbiology Lab Future State Cost Savings Results

<table>
<thead>
<tr>
<th>Variability</th>
<th>Worst Case</th>
<th>Base Case</th>
<th>Best Case</th>
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<tbody>
<tr>
<td>Culture Plates per year</td>
<td>5% $1,772.11</td>
<td>$1,816.69</td>
<td>$1,860.61</td>
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<tr>
<td>Biochemicals per year</td>
<td>10% $41,901.27</td>
<td>$46,556.96</td>
<td>$51,212.66</td>
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<tr>
<td>Technician Time per year</td>
<td></td>
<td>$ (6,800.00)</td>
<td></td>
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<tr>
<td>Cost of Running MALDI-TOF</td>
<td>5% $ (2,496.60)</td>
<td>$ (2,628.00)</td>
<td>$ (2,759.40)</td>
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<tr>
<td>Total Savings</td>
<td></td>
<td>$38,945.65</td>
<td>$43,513.87</td>
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<tr>
<td>Percentage Savings</td>
<td></td>
<td>22%</td>
<td>25%</td>
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Assumptions:
- $50/hr (per tech time including overhead) and an additional $30/hr for each additional tech
- $30/run of MALDI-TOF
- 24 hours x 365 operation days throughout year

*Base Case savings equivalent to 1,557 $25 vaccines
Value of Monitoring your System

- Sustaining the Change: Help promote and maintain a lean culture.
- Allow for quick and easy identification of problems and trends.
- Allow you to identify your next steps in the continuous process improvement.
It takes a lean village…

• Thanks to our senior management team for guidance:
  • Dr. Joe Rutledge MD; Dr. Michael Astion MD, PhD; Joanne Simpson; Dr. Hiem PhD

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