Achieving Lean and Sustaining Lean Improvements in Phlebotomy and Pre-analytical

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Minneapolis, MN

Purpose
To present the benefits of Lean implementation by illustrating an improvement project in the phlebotomy department of a large urban hospital. Overview of Lean concepts to achieve Five S, create a Lean layout and staff to workload.

• Key Learning Objectives
  - Understand how Lean process improvement can improve workflow, remove waste and optimize performance in phlebotomy
  - Learn application of basic Lean concepts of Five S, Lean layout and staff to workload
  - Understand how to achieve cost benefits by reducing waste of inventory, waste of motion, waste of non-utilized talents
Allina Health System

• 11 Hospitals (Metro/Regional)
• 82 Clinic Locations

Allina Health Laboratory

• Employ 700 laboratory professionals system-wide
• Perform routine and esoteric testing:
  - Andrology
  - Cytogenetics
  - Flow Cytometry
  - Cytopathology
• 9.2 million lab tests performed in 2011
Allina Health Laboratory
Construction of New Central Lab Facility

- Adjacent to Abbott-Northwestern Hospital campus in Minneapolis
- $29 million facility opened March 2012
- Consolidated 12 lab sites
- Occupies 75,000 sq ft
- 400 employees

Strategic Plan: to gain efficiencies by implementing Lean workflows at design phase
Hired a Lean Consultant in 2010
Project timeline
- August 2010: Lean design phase begins
- March 2011: construction begins
- December 2011: Initial occupancy
- March 2012: Core lab move; full occupancy
Key projects identified for improvement ➔ Phlebotomy
Lean in Healthcare

Lean is derived from the Toyota Production System. The key focus is to increase the \textit{value-added} work by eliminating waste and reducing extra work to improve profitability, customer satisfaction, quality and employee morale.

\textit{Allina Health Laboratory’s commitment to increase value to the patient by improving quality and reducing cost}

Lean World Class Mission

\textit{To Seek Out and Eliminate Waste}

8 WASTES OF LEAN

- Defects
- Overproduction
- Waiting
- Transportation
- Inventory
- Motion
- Extra Processing
- Non-Utilized Talents

\textit{WASTE Raises cost, produces no benefit and threatens our jobs!}
Phlebotomy Project Team

Phlebotomy Team
Izzy Soeun, Evening Shift
Melissa Globensky, Day Shift

Leadership
Julie Singewald, Supervisor
Marcia Bell, Manager

Quality Improvement Specialists
Karen Chatt
Julie Simons

Champion
Jan Skoog, Laboratory Director

Phlebotomy Staff
Lean Consultant
Mike Hogan, ValuMetrix

A dedicated team is crucial to the success of Lean projects!

Project Scope

• Five S: The cornerstone of Lean
• Workflows and Layouts: Improving efficiency of the workspace
• Staffing to Workload: Driven by Demand
• Sustain Improvements: Standard Work and Pre-analytic Metrics
Five S
The cornerstone of Lean

- **Sort** → keep only what is needed
- **Set in order** → arrange & identify for ease of use
- **Shine** → clean daily; everything has a place
- **Standardize** → make standards obvious
- **Sustain** → discipline; set an expectation

Create and maintain an organized, efficient, clean and safe high performance workplace
Five S = Sort
Expired Tubes

Total 3049 expired tubes found throughout hospital
Oldest tube found from 1997!

Five S = Sort
Speckled Red Top Tubes

- Replaced by gold top tubes in 2005
- 6700 tubes in inventory
- Total savings @ $0.15 per tube = $1005
- Lean project suggested discontinuing product
  - Inventory maintained by Materials Management: as tubes expired, the par level was being replaced!
  - Added benefit: reducing inventory space in Materials Management

Inventory maintained by Materials Management: as tubes expired, the par level was being replaced!
Five S = Sort Overstock

- OP reception area
- Inventory = 3536 tubes
- Max. tubes used per day = 107
- 33 days worth of stock!
- Implemented 2-bin kanban system: one pack in use, one pack back-up
- Reduced inventory by 65%

Five S

Create and maintain an organized, efficient, clean and safe high performance workplace

- Sort → keep only what is needed
- Set in order → arrange & identify for ease of use
- Shine → clean daily; everything has a place
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- Sustain → discipline; set an expectation
Five S = Set in Order

**ED Layout**

Before

After

Create and maintain an organized, efficient, clean and safe high performance workplace

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Five S = Shine

ED Layout

Before

After

Unlabeled shelves gather junk!

Label, label, label!

Five S

Create and maintain an organized, efficient, clean and safe high performance workplace

- Sort → keep only what is needed
- Set in order → arrange & identify for ease of use
- Shine → clean daily; everything has a place
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- Sustain → discipline; set an expectation
Five S = Standardize
Phlebotomy Carts

**Before**  
**After**

Five S = Standardize
Standard supplies drive standard practice

Q1: Did you run out of supplies?

Survey results during pilot for standardized phlebotomy cart
Five S = Standardize

Further training for standard practice

- **Quick Care Hand Foam**
  - Protocol to foam in patient room
- **Minimum volume tubes**
  - Supports Blood Management initiatives
  - Carts stocked with lav and blue min. volume tubes
- **Butterfly needle**
  - Significant cost difference: $1.25 vs $0.21
  - Current usage at 47%; encourage staff to reduce
- **Band aids**
  - Discourage usage due to skin deterioration
  - Tape and Coban available on carts

Overall savings from inventory reduction = $5209
Five S
Create and maintain an organized, efficient, clean and safe high performance workplace

- Sort → keep only what is needed
- Set in order → arrange & identify for ease of use
- Shine → clean daily; everything has a place
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---

Five S = Sustain

- Daily audit of carts
- Visual aids
  - Color code racks
  - Label, label, label
- Monthly audit for expired tubes
- Weekly cleaning schedule

---
Five S = Sustain
Audit

Process Improvement Audit - ANW Phlebotomy

Person(s) Audited: Date: from 5/15/2012
Shift:

Process Inputs: Yes No Action Taken (if "No")

- Is one-piece flow being followed? (one label at a time at bedside?)
  - Yes

- Are phlebotomists following Standard Work for performing venipuncture? (observation)
  - Yes

- Are visual controls in place for prioritized draws?
  - Yes

- Is 5-S being followed? (carts, ED, POCC exception, MOB and coordinator desk?)
  - Yes

- Are regular audits conducted for expired tubes?
  - Yes

- Are phlebotomy carts re-stocked and parked at the end of each shift?
  - Yes

- Does scheduling reflect new Lean staffing goals of staggered start times and cross-training?
  - Yes

Based on Direct Observation Checklist:
standard work followed except time held for bandage. Leadership will discuss with staff.

Are workflows and layouts improving efficiency of the workspace?
Phlebotomy Original Layout

192 feet travel distance from door to material storage area

Original Layout
Carts in walkway
Phlebotomy Lean Layout

**Phase 1**

Workflow will transfer to new design of ANW lab space

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Phlebotomy Lean Layout

**Phase 2 Redesign**
Phlebotomy Lean Layout

Phase 2 Redesign

Printers on multiple levels. Ergonomically difficult to reach.
Walking around printers to get labels.
Walking around PHI and through specimen management to use PTS.
OPA of Evening Coordinator

Total distance traveled in 7 minutes = 194 feet

Analysis of Operations
Summary of Current Work

- Required Waste: 71%
- Pure Waste: 29%
- Value Added: 0%

Analysis of Operations
Summary of Current Required Waste

- Computer: 10.1%
- Parts: 6.9%
- Tools: 7.4%
- Material Handling: 10.4%
- Inspection: 41.1%
- Walk: 11.6%
- Other: 4.2%
- Paper: 8.5%

5:36 of 7:51 is Required Waste
Coordinator Desk

Phase 1

- Work space is tighter
- Add second computer monitor
- Printers and labels are ergonomic
- Improved accessibility to PTS

Coordinator Desk

Phase 2 – New Construction

- Extra computer for help with look-ups
- Routine label printer
- Stat label printer
- One computer with two monitors to toggle between systems
- Two stacked order printers
- Draws to be done set out by priority
Coordinator Desk

*Phase 2*

- Phase 1 design concepts incorporated into new space
- Ergonomic
- 2 computer screens
- Access to PTS
- Communication changes due to Central Lab location off-site

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Staffing to Workload

*Driven by demand*
### Phleb draws vs. staffing levels

The graph illustrates the relationship between the number of phlebotomy draws and staffing levels over time. The x-axis represents time, and the y-axis shows the number of phlebotomy draws and staffing levels. The graph highlights the following:

- **Average IP phlebotomy draws**
- **Actual scheduled phlebotomy shifts**
- **Total shifts for IP phlebotomy**

#### Staffing to Workload Model

The chart below provides a detailed breakdown of staffing levels across different time slots. Each row corresponds to a specific hour, and the columns indicate:

- **Time of day**
- **IP Sched**
- **# pt draws (ave)**
- **Takt Time (sec)**
- **Staffing per TLT**
- **Staffing variance %**

<table>
<thead>
<tr>
<th>Time of day</th>
<th>IP Sched</th>
<th># pt draws (ave)</th>
<th>Takt Time (sec)</th>
<th>Staffing per TLT</th>
<th>Staffing variance %</th>
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<tbody>
<tr>
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<td>3</td>
<td>1200</td>
<td>480</td>
<td>0.40</td>
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<tr>
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<td>3</td>
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<td>0.40</td>
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<tr>
<td>2:00</td>
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<td>3</td>
<td>1200</td>
<td>480</td>
<td>0.40</td>
</tr>
<tr>
<td>3:00</td>
<td>2</td>
<td>3</td>
<td>1200</td>
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<tr>
<td>4:00</td>
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<td>82</td>
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<td>10</td>
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<td>55</td>
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<td>10</td>
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<tr>
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<td>3</td>
<td>1200</td>
<td>480</td>
<td>0.40</td>
</tr>
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</table>

**Staffing to Workload Model**

Opportunity to level load staffing to meet hourly workload.
### Staffing to Workload Model

**Recomendation:** stagger phlebotomy staff start times  
**Absorbed 3 FTE from patient service areas without increase of budgeted FTE**  
**Reduced technical staff scheduled for phlebotomy**

<table>
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<th>Daily Cov.</th>
<th>0:00</th>
<th>1:00</th>
<th>2:00</th>
<th>3:00</th>
<th>4:00</th>
<th>5:00</th>
<th>6:00</th>
<th>7:00</th>
<th>8:00</th>
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<th>16:00</th>
<th>17:00</th>
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<th>19:00</th>
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<td>Ave # of pt draws</td>
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<tr>
<td>Staffing per TLT</td>
<td>0.21</td>
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<tr>
<td>Staffing variance +/-</td>
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</tr>
</tbody>
</table>

**Notes:**  
- **PATIENT SERVICE AREA:** 2800 Medical Building  
- Phlebotomists trained to flex  
- Originally staffed 7:00-5:00 (1.25 FTE)  
- Hours adjusted for staffing to workload: 8:00 – 4:30 (1 FTE)  
- **Saves 0.25 FTE and productivity**
**Staffing to Workload Model**

- PATIENT SERVICE AREA: Outpatient Reception
- Phlebotomists trained to flex
- Originally staffed 3 FTE daily
- LEAN RECOMMEND: Staff 2 FTE daily; flex if needed
- **Reduction of 1.0 FTE**

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**Sustain Improvements**

Standard Work and Pre-analytic Metrics
Standard Work

Standard Work is
- knowing WHAT to do
- knowing WHEN to perform the activity
- knowing WHY it needs to be done
- knowing WHO should do it
- knowing WHERE the activity should take place
- knowing HOW to perform the activity
... with the same effort and quality every time.

Simple step-by-step instructions for bench work (job aid)

Procedures are detailed instructions for process

(ValuMetrix, 2010)

Standard Work

Direct Observation

Phlebotomy – Direct Observation – Competency

Name: Audit         Date Started:  5/15/12  Date Completed:  5/16/12

<table>
<thead>
<tr>
<th>Date</th>
<th>Introduction Self Statement of Patient</th>
<th>Identify Patient (wristband and verbally)</th>
<th>Select Proper Equipment (straight or butterfly)</th>
<th>Venipuncture Success</th>
<th>Dispose of Sharps and Other Items Properly</th>
<th>Properly Label Specimens at Bedside</th>
<th>Check for Bleeding and Bandage</th>
<th>&quot;Anything Else I Can Do?&quot; Hand Hygiene</th>
<th>Return the Room to Initial Status (In-Pat)</th>
<th>Initials of Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/15/12</td>
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</tbody>
</table>

48
Standard Work Audit

Process Improvement Audit - ANW Phlebotomy

<table>
<thead>
<tr>
<th>Process Input</th>
<th>Yes</th>
<th>No</th>
<th>Action Taken (if &quot;No&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is one-piece flow being followed? (one label at a time at bedside?)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are phlebotomists following Standard Work for performing venipuncture? (observation)</td>
<td>x</td>
<td></td>
<td>Based on direct observation. Check standard work followed except time held for bandages. Leadership will discuss with staff.</td>
</tr>
<tr>
<td>Are visual controls in place for prioritized draws?</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is 5-S being followed? (carts, ED, POCC, exception, MOB and coordinator desk)?</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are regular audits conducted for expired tubes?</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are phlebotomy carts re-stocked and parked at the end of each shift?</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does scheduling reflect new Lean staffing goals of staggered start times and cross-training?</td>
<td>x</td>
<td></td>
<td>New guidelines for cross-training expectations of start times; will review at next audit for improvements.</td>
</tr>
</tbody>
</table>

Metrics

Visual Display Board

- Use metrics that show a meaningful improvement: quality, TAT, safety, cost
- Don’t make the data collection too complicated
- Display where staff can be active participants
- Celebrate achievements
**Metric**

**Pre-Analytic Error Rates**

- New PTS caused spike in hemolysis rate
- Change to full size, minimum volume tubes
- Education and training
  - Packaging samples for transport
  - Slower fill rate of tube

**Metric**

**Blood Culture Contamination**

Overall rate of contamination is within established guidelines
Lab initiated direct observations for phlebotomists identified as repeat offenders
- Found non-standard practice used for cleansing site
- Re-training resulted in 37% reduction of contaminated cultures collected by lab!
- Metric shows trends for non-lab staff; initiates re-training events

**New Metric**

**Stat Response Time**

**May 2011**

**August 2012**

- Goal: Improve quality by reducing stat response time

**Overall improvement**
New Metric
Missed Draw Rate

<table>
<thead>
<tr>
<th>Day</th>
<th>Misses</th>
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<tr>
<td>3 Jun</td>
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<tr>
<td>6 Jun</td>
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<td>8 Jun</td>
<td>7</td>
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Baseline average
2.2% misses/day

* Goal: increase patient satisfaction by reducing multiple sticks
  - Opportunity for training

Butterfly Use – Metro Hospitals 2012
Goals not achieved

Ave = 44%; Range 40-48%

Goal: 5% reduction = annual cost savings $11,000
Lessons Learned

- Make friends with LIS and learn their language
- Face time with staff is essential; personal communication is better than emails
- Importance of project scoping: this initial project was quite broad; future projects are more focused and shorter duration
- Central lab move and disconnect from phlebotomy location has large communication impact
- Sustaining: First annual audit showed 60% compliance overall; primary area to improve was implementing metrics (missed draws, stat draw response time) and visual displays of metrics
- Butterfly usage reduction: goals not reached, suggestions welcome!

References


