Optimizing Transfusion and Blood Banking Services by Using Lean and Smart Automation

Susan F. South, M.A.O.M., MT(ASCP)SBB
Six Sigma Black Belt
Senior Consultant
Ortho Clinical Diagnostics

Optimizing Transfusion and Blood Banking Services by Using Lean and Smart Automation: Agenda

• Commonly Voiced Business Needs
• Lean Basics
• Applications to Transfusion Services
• Questions and Discussion
Commonly Voiced Business Needs

- Optimize scarce resources, including labor, space and dollars
- Decrease error potential in current processes
- Simplify current processes and identify redundant process
- Enhance services to physicians and other stakeholders
- Absorb increased testing volume
- Consolidate testing platforms
- Decrease stress on the personnel
Lean is NOT…

- Quick fix
- New quality “flavor of the month”
- Housekeeping or cleanup activity
- Just tools
- Headcount reduction initiative
### Lean is…

- Structured, methodical, systematic approach to solve complex process problems
- Creation of continuous flow and elimination of waste
- A starting point for a process journey of continuous improvement

### Goal of Lean is to:

Deliver what the customer wants the right way, at the right time, the **first** time, with no wait times, interruptions or barriers
Lean Definitions

Value - always defined by the customer

Value-Added Activity
Activity that transforms the material or information to meet customer requirements

Non Value-Added Activity
Activity that takes time or resources and does not add to the customer requirements

8 Types of Waste

• Over Production....
• Waiting............
• Transportation......
• Inventory............
• Processing.........
• Motion............... 
• Defects..............
• Intellect...............
Types of Waste: Transfusion Service Examples

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects</td>
<td>Wrong label on tube or mismatched specimens or blood products</td>
</tr>
<tr>
<td>Overproduction</td>
<td>Specimens delivered in large batches and “just in case” tubes</td>
</tr>
<tr>
<td>Transportation</td>
<td>Moving specimens or blood products excess distances</td>
</tr>
<tr>
<td>Waiting</td>
<td>Specimens waiting to be moved or tested</td>
</tr>
<tr>
<td></td>
<td>Employees waiting on work to do</td>
</tr>
<tr>
<td>Inventory</td>
<td>Excess supplies / equipment or expired reagents</td>
</tr>
<tr>
<td>Motion</td>
<td>Personnel walking &gt;5 miles/day to get work done</td>
</tr>
<tr>
<td>Processing</td>
<td>Performing QC more often than needed or crossmatching units that are not likely to be transfused</td>
</tr>
<tr>
<td>Human Potential</td>
<td>Searching for tools / supplies to do work</td>
</tr>
<tr>
<td></td>
<td>Ideas not solicited or listened to</td>
</tr>
</tbody>
</table>

Burger Fast Food Shop

Who can relate to this?
Flow is the Goal

- Actions that create value without:
  - Interruptions
  - Waiting
  - Barriers or detours

- Keys to making product / process flow:
  - Co-locate operations throughout the value stream
  - Drive to smallest batch-size possible

- Ultimate goal is single-piece flow, level loading of work, and flexible operation

Good Flow: Quiznos and Subway Sandwich Shops

- Flow of customers and product in single direction
- Oven flows at Quiznos
- Can adjust production rate with more people at peak demand
Decreased Flow is the Enemy of Lean

- TAT increases as specimens build and increase in size between processes
  - Wait time between steps has the greatest impact on TAT
  - Increased re-sorting and re-inspection occurs
- Error potential increases as specimen numbers and paperwork increase between process steps
- No FIFO (First-in-first-out)

Impact of Decreased or Lack of Flow

Suppliers

- Patient Specimens from Inpatients & Outpatients
- Blood Donor Units

Order Entry and Specimen Review

Sort and Distribute

Receive Blood
Donor Units into
Stock Inventory

Crossmatch & Tagging Units
EXM IS AHG

Blood Component
Return and/or Final Disposition


General Process Flow for Pretransfusion Testing

Patient Specimen
Blood Donor Unit

Manual Tube

Tubes

Patient Specimen

Blood Donor Unit

4C Inventory of RBCs

Manual Tube

Tubes

General Process Flow for Pretransfusion Testing

Coagulation factors

Summary Table of Process Steps and Defect Opportunities for T&S Processes

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of High-Level Process Steps</th>
<th>Number of Defect Opportunities</th>
<th>% Reduction in Defect Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Tube 2-Cell Screen</td>
<td>18</td>
<td>112</td>
<td>15%</td>
</tr>
<tr>
<td>Manual Tube 3-Cell Screen</td>
<td>18</td>
<td>132</td>
<td>0%</td>
</tr>
<tr>
<td>Manual Column Agglutination</td>
<td>10</td>
<td>58</td>
<td>56%</td>
</tr>
<tr>
<td>ProVue Automation</td>
<td>4</td>
<td>7</td>
<td>95%</td>
</tr>
</tbody>
</table>

These are minimum defect opportunities.

Consider other factors like the drop size of the disposable pipettes and the angle at which reagents or patient red cells and plasma drops are dispensed.

There are ways to take these complex processes and look for ways to improve flow and decrease error potential.

Multiple wait points and high error potential

Value-Added Analysis in Pretransfusion Testing
Examples from Transfusion Services
Specimen Flow Value-Added Analysis

- Patient specimens (or whatever is the raw material) are followed, from arrival to final result, and the process steps are categorized.

<table>
<thead>
<tr>
<th>Process Step Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transportation:</strong></td>
</tr>
<tr>
<td>Moving from one area to another for any reason</td>
</tr>
<tr>
<td><strong>Inspection:</strong></td>
</tr>
<tr>
<td>Reviewing sample for correctness (i.e. label identification and placement, HIT, etc.)</td>
</tr>
<tr>
<td><strong>Processing:</strong></td>
</tr>
<tr>
<td>Value Added - changing fit, form or function (i.e. labeling, centrifuging, and testing)</td>
</tr>
<tr>
<td>Non-Value Added - not changing fit, form, function (i.e. marking on label, aliquotting, and repeat testing)</td>
</tr>
<tr>
<td><strong>Storage:</strong></td>
</tr>
<tr>
<td>Waiting between processes (i.e. waiting for delivery to centrifuge, waiting in stopped centrifuge, waiting to be loaded on analyzer)</td>
</tr>
</tbody>
</table>

Specimen Flow Analysis Example: Manual Routine Type and Screen Test

Current Product Process Flow
Routine Type and Screen

Total time = 05:40:24

<table>
<thead>
<tr>
<th></th>
<th>TOTAL VALUE ADDED</th>
<th>TOTAL NON-VALUE ADDED</th>
<th>TOTAL STORAGE TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Specimen Flow: STAT Manual T&S


Total Time from Receipt to Result: 1:13:44

Specimen Flow Analysis Example: Automated Routine T&S

Current Product Process Flow: Routine T&S

This is NOT the kind of instrument you would want to select.

Total Time from Receipt to Result: 3:02:04
Specimen Flow Analysis Example: STAT Type & Screen Test

Distance Traveled – 204 feet
Touch points – 8 by 3 people
Wait points – 7

Operator Process Flow Value-Added Analysis

- Representative operators are observed, and each process step is categorized.

<table>
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<tr>
<th>Process Step Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value-Added:</strong></td>
</tr>
<tr>
<td>Changing the fit, form, or function of the tube(s)</td>
</tr>
<tr>
<td><strong>Required Waste:</strong></td>
</tr>
<tr>
<td>Not changing fit, form, function of the tube(s), but is required in order to move the tube(s) through the current system</td>
</tr>
<tr>
<td><strong>Pure Waste:</strong></td>
</tr>
<tr>
<td>Idle time or activity unrelated to the tube or any other work function</td>
</tr>
</tbody>
</table>
Operator Process Flow: Specimen and Order Receipt Operator Example

8% Pure waste

31.5% of required waste is related to paper

Operator Process Flow Analysis Example: Automated Testing

Analysis of Operations: Summary of Estimated Required Waste
- Computer: 37%
- Manual Operation: 10%
- Parts: 1%
- Material Handling: 4%
- Inspect: 3%
- Walk: 2%
- Other: 43%
- Phone calls
Operator Process Flow: Instrument Operator

- **Analysis of Operations: Galileo Testing**
  - **Summary of Current Work**
    - Required Waste: 54%
    - Pure Waste: 46%
    - Value Added: 0%

- **46% Pure waste**

- **Analysis of Operations: Galileo Testing**
  - **Summary of Current Required Waste**
    - Manual Operation: 22.1%
    - Computer: 18.4%
    - Paper: 7.7%
    - Walk: 7.0%
    - Inspect: 19.0%
    - Position: 15.3%
    - Unload: 0.3%
    - Material Handling: 5.1%

22.1% Manual operations, 19% inspection and 15.3% positioning tubes or parts


- **Analysis of Operations**
  - **Summary Of Current Work**
    - Required Waste: 98%
    - Pure Waste: 1%
    - Value Added: 1%

- **Summary of Current Required Waste**
  - Manual Operation: 20%
  - Computer: 7%
  - Paper: 27%
  - Walk: 6%
  - Inspect: 35%

- **Inspection and paper represent 52% of required waste –**
- **This was a “paperless” transfusion service**

1 Operator

What do you think is the impact of this layout on the process, TATs, and the people?
Operator Process Observations: Example

Poor layouts can cause increased congestion, stress, TATs, and error potential as well as decreased capacity and efficiencies.

Non-Productive Inventory Items and Visual Noise

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What do you notice about this work area?

What about this work area?
When you use lean concepts and tools to identify improvement opportunities and redesign work processes, expect dramatic results.
Application of Lean to Transfusion Services

When you use lean concepts and tools to identify improvement opportunities and redesign work processes, expect dramatic results.

The goal of lean is to eliminate waste, create flow and deliver value to the end customers of the process.

Current State Layout: Pre-transfusion Testing Example

109 ft travel distance
7 touch points
7 wait points
7 hand-offs
Current State: Multiple Operator Process Flows

- 2 Testing personnel
- 1 Reference lab personnel
- 2 Distribution personnel

Future State Layout: Pre-transfusion Testing Example

- 47 ft travel distance vs. 109 ft.
- 4 touch points vs. 7
- 4 wait points vs. 7
- 3 hand-offs vs. 7

Relocation of centrifuge and specimen triage and creation of:
- New work assignments
- Automated testing area
- Manual testing area
Lean Project – Typical Results

• Turnaround time (TAT) - 20-60% reduction
• Floor space requirements - 10-40% reduction
• Capacity - 20-30% improvement
• Productivity - 20-50% improvement

1. Data on file: ValuMetrix® Services case studies

Lean Project – Typical Benefits

• Inventory - 10-30% reduction
• Increased quality through reduction in defects – 20-75% reduction
• Financial savings – usually in the hundreds of thousands of dollars

1. Data on file: ValuMetrix® Services case studies


Lean Project – Other Benefits

- Organized and visually managed workplace
- More manageable workload
- Decreased employee stress
- Application of intellectual capital to blood product management and utilization
  - Imagine if only 1 RBC or 1% of products was saved every day!
- New way of thinking about who, what, why, when, where, and how things are done
- Increased organizational capacity for creating and making change

This is not a small benefit. This is hugely important.
Summary
Application of Lean to Transfusion Services

Lean Applications to Transfusion Service Operations

Everything is a process.
With every process, there is a fit for lean.
We always seem to find time to deal with rework and firefighting, and we never seem to find time to do things right the first time.

Lean provides a platform for sustainable and continuous improvement.