LSS IMPROVES MORE THAN TAT

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Lean 6-Sigma Tools improved efficiencies and reduced waste in the ED to LAB blood draw process. However, some of the greatest insights gained by the Working Team went to the root causes of System wastes and some cultural and technical issues that are extensions of Lean waste definitions.

Here’s the SBAR.....
SITUATION

ED Physicians wanted a more “reliable” process on (4) common Lab tests—UA, Chem 7, CBCA, and Troponin. Therefore, TAT was not the overriding concern but only one component of the ED to LAB Blood Test Process.
BACKGROUND

This North Carolina Hospital is a tertiary care, 1000 bed teaching hospital that services approximately 75,000 patients annually through its Emergency Departments. The campus also has an Urgent Care Center for low acuity patients and has recently opened a new Pediatrics Emergency Room.
On incoming patients the ED RN’s would draw a “rainbow” or typically 7 to 9 vials using a vacutainer© or butterfly or syringe.

These Rainbows were a major portion of 12,600 accessioned samples monthly from the ED; each of which required a Control Copy (hard copy) of the Physician’s Order. Together, the vials and hard copy were pneumatically tubed to the Lab.
BACKGROUND

The Working Team of (4) ED RNs and (4) Lab personnel defined a “reliable process” for the ED to Lab vials in terms of a process having minimal delays (TAT), defects, and deviations.

1. TAT was previously defined as 90 minutes from Lab receipt to resulted, (revised to 75 mins)
2. Defects—the big (3) were clotted, hemolyzed, and Qty Not Sufficient (QNS) on 2.7% of vials.
3. Deviations were departures from standards as well as from internal customer’s needs.
ASSESSMENT

- Standard Lab reports for TAT using a 50th and 95th percentile at a 90 minute target were in place for individually requested tests.
- The ED track board would show “resulted” because a test was completed; not necessarily because useful results were achieved.
- 1400 samples were sent monthly w/o Control Copies of the Order.
ASSESSMENT

- Orders with (paper) Control Copies resulted in 38 lbs of paper being received daily—then scrapped weekly.
ASSESSMENT

Rainbow blood draws added over 500 extra vials to the Lab storage inventory daily—which were then scrapped weekly into hazardous waste.
The Main EHR database—unlike the Labs tracking software did not “result” a test but tracked the total event times even if the record was opened (2) days later for a pathology review. This gave a confusing tri-modal distribution for the CBC tests.

AUG CBCA DATA
(3964 data points)

TAT IN 6 MINUTE INTERVALS
ASSESSMENT

• For the CBC tests (6) software programs handle the information flows from the analyzer to middleware to the Lab software to middleware and then to the Main EHR and then to a reporting software.

• The analyzer tracks the finish time for a sample but not the start time. If a sample on the track board was at or over the 90 minute setting, a hunt would be initiated. Not a very proactive tracking method.
ASSESSMENT TOOLS

• LSS tools were applied to determine delays, defects, and deviations and included:

1. An ED/Lab gemba walk by the working team,
2. S-I-P-O-C, Gap Analysis, and high level VSM
3. Fishbone diagram
4. An internal Definition of a Reliable process; availability of the desired information in a timely manner (75 minute TAT) for a cluster of ordered tests per patient.
## Define Phase - SIPOC Diagram

<table>
<thead>
<tr>
<th>SUPPLIER</th>
<th>INPUTS</th>
<th>PROCESS</th>
<th>OUTPUTS</th>
<th>CUSTOMERS/PTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED RN</td>
<td>Pt Assessment</td>
<td>Incoming Pt to the ED Bed</td>
<td>Trauma or IV or &quot;x&quot; gage needle</td>
<td>Pt &amp; ED Physician</td>
</tr>
<tr>
<td>Patient</td>
<td>Blood Samples</td>
<td></td>
<td>Minimum LAB volume needed</td>
<td>RN &amp; LAB</td>
</tr>
<tr>
<td>ED Physician</td>
<td>Orders for samples</td>
<td>Assessment, diagnoses, &amp; orders</td>
<td>Lab Tests required</td>
<td>Pt &amp; RN</td>
</tr>
<tr>
<td>ED RN</td>
<td>Prep pt &amp; obtain samples</td>
<td></td>
<td>ID'd and prepped vials</td>
<td>Pt &amp; ED Physician</td>
</tr>
<tr>
<td>ED RN</td>
<td>Vials &amp; Orders (hard copy)</td>
<td></td>
<td>LAB (Clinical Support) receipt</td>
<td>Lab</td>
</tr>
<tr>
<td>LAB PROCESSES</td>
<td>Blood samples</td>
<td></td>
<td>Numerous hema &amp; chem data</td>
<td>Pt &amp; ED Physician</td>
</tr>
<tr>
<td>LAB &quot;RESULTED&quot;</td>
<td>Test results</td>
<td>Lab tests resulted</td>
<td>Data into LIS and over to HER</td>
<td>Physician, ED RN &amp; Pt</td>
</tr>
</tbody>
</table>
The Original Process
RECOMMENDATIONS

- Changing the Rainbow to (4) vials and RN education on sequence of draws.
- Add a cluster report for all Orders per patient and not just individual tests.
- Move to EHR Orders to replace paper control copies.
- Use the Lab software—not the EHR for process tracking charts.
RESULTS: FEWER VIALS

ED-LAB Extra Samples
JAN-NOV 2012

94% reduction of extra vials
Baseline v. Improved Process

1. Average of 12,600 accessioned samples from ED to Lab monthly—with average of 7-9 vials per sample.
2. Typical quantity of 500 “extra” vials of blood discarded daily.
Control Phase

UA 50TH PERCENTILE: TAT IN MINUTES

CBCA 50TH PERCENTILE: TAT MINUTES
Control Phase

BMP 50TH PERCENTILE: TAT IN MINUTES

TROPONIN 50TH PERCENTILE: TAT IN MINUTES
## RESULTS SUMMARY

<table>
<thead>
<tr>
<th>TOPIC or EVENT</th>
<th>CHANGE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainbow of 7-9 vials now 4-5</td>
<td>50%</td>
<td>Big impact on med waste of unused vials</td>
</tr>
<tr>
<td>500 unused/extra specimens daily</td>
<td>60%</td>
<td>Saves handling and cold storage space.</td>
</tr>
<tr>
<td>ED specimens w/o Orders</td>
<td>90%</td>
<td>Productivity gains in Clinical Support apparent</td>
</tr>
<tr>
<td>CBCA Median TAT</td>
<td>30%</td>
<td>New analyzers in June 2012</td>
</tr>
<tr>
<td>CBCA TAT Variation</td>
<td>50%</td>
<td>New analyzers in June 2012</td>
</tr>
<tr>
<td>Chem 7 Median TAT</td>
<td>5.0%</td>
<td>Time to focus on outliers</td>
</tr>
<tr>
<td>Chem 7 TAT Variation</td>
<td>9.0%</td>
<td>Nice gain in consistency of results</td>
</tr>
<tr>
<td>Troponin Median TAT</td>
<td>2.0%</td>
<td>Time to focus on outliers</td>
</tr>
<tr>
<td>Troponin TAT Variation</td>
<td>10.0%</td>
<td>Nice gain in consistency of results</td>
</tr>
<tr>
<td>URPN Median TAT</td>
<td>10.5%</td>
<td>Median approaching 15 minute TAT</td>
</tr>
<tr>
<td>URPN TAT Variation</td>
<td>18.2%</td>
<td>Very nice gain in consistency of results</td>
</tr>
<tr>
<td>ED RN new rainbow draw savings</td>
<td>2-5 mins</td>
<td>1 extra 8 hr shift per ED RN per year</td>
</tr>
</tbody>
</table>
Learning Beyond Lean

1. Individuals don’t recognize how their actions can impact an entire System (excess vials).
2. It WAS easier for the ED to overproduce. (rainbows)
3. We assume that RNs know the correct procedures for blood draws. (standard work)
4. Turnover leaves open projects open forever. (IS and paper Control Copies).
5. Personnel see but learn to ignore obvious waste since they feel helpless to change the System. (that’s the way it has always been)
Learning Beyond Lean

6. Not all computer systems communicate well and the “same data” from two systems can be misleading. (Lab vs EHR)

7. Consider the impact of R-T-Y when you discover middleware bridges. (measurement error)

8. Beware the misleading statistics of only using the average or mean. (trimodal distributions)

9. Assure track boards are proactive and not reactive to failures. (error prevention)

10. Ask “why” for your metrics. The 95th percentile per test is for the Lab—not the wait time of the ED pt.
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