Increasing Assay Efficiency using Value Stream Map Tool

Andrew Lochowicz and Lynne LeMense

Andrew Lochowicz
Telephone: 414-937-6437
andrew.lochowicz@bcw.edu

BloodCenter of Wisconsin
Diagnostic Laboratories

Abstract

The Serotonin Release Assay (SRA) became the highest volume assay in the Platelet and Neutrophil Immunology lab after experiencing a 69% increase in sample volume between years 2006-2007. Considering the rapid increase in sample volumes, along with the expectation of continued growth, re-evaluation of assay workflow to create efficiencies was undertaken.

Lab management and staff were educated on lean principles and as a group selected the value stream map (VSM) tool to improve efficiency by increasing capacity while decreasing turn around time (TAT) and waste. A VSM team evaluated the current assay procedure, documenting 65 steps including three sub-processes. The lab staff and management identified and prioritized 29 improvement opportunities. Four (eliminating dilutions, eliminating absorptions, adding a testing day, and clarifying sample requirements) were selected to be completed by the end of the year, which included the elimination of an entire sub-process.

The impact of the completion of these four improvement activities resulted in an increased sample volume capacity of 41.2% and a reduction in TAT by 4.9% between years 2007-2008. The elimination of the non-value added sub process and additional activities also led to a labor savings of greater than $24,500, a direct supply cost savings of greater than $2,300, and a 25% reduction in radioactive isotope reagent resulting in a cost savings of greater than $1,300 per year. Utilizing the VSM tool not only allowed staff to gain a better understanding of the entire process, but also enabled the laboratory to continue providing quality results to its clients.

Introduction

There has been steady sample volume growth for the SRA over the past several years. The burst of growth between years 2006-2007 was unmatched. The ability to batch, along with reactive improvements, helped absorb some of the impact and even resulted in a decrease in TAT. However, in order to maintain the quality of testing, it was determined that a more formal analysis of the assay process was needed to gain additional efficiencies.

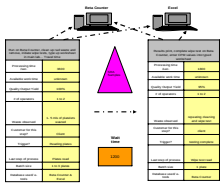
Methods

Lab management and staff participated in a gallery walk to document processes that were working well in the lab, as well as processes they felt were not.

Each individual then voted for the top 3 processes they wanted improved and felt were most critical to the operation of the lab. The votes were collected to determine the top 3 processes overall as identified by the lab staff. After discussion of the top 3, lab management and staff reached a consensus that improving the SRA efficiency was most critical to the lab.

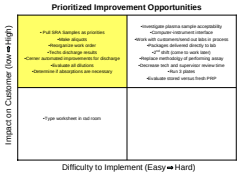
After lab management and staff were educated on LEAN tools and principles, it was determined that the VSM would be the most effective tool to utilize in this process improvement. A VSM team of 6 individuals was assembled to review the process in detail. The VSM team documented 65 steps, including 3 sub-processes for the assay (Fig 1).

Fig 1. Illustrates 2 of 65 steps documented in the SRA VSM.



The VSM team reviewed the documented procedure with the rest of the lab and management. 29 improvement opportunities were identified and prioritized (Fig 2).

Fig 2. Shows an example of the opportunities identified and how they were grouped into quadrants based on difficulty to complete versus impact on the customer.



Results

The lab was able to eliminate sample dilutions, and absorptions and perform the test an additional day per week. Changes also resulted in the clarification of sample requirements for clients. The positive impact of these improvements are reflected in the pre and post implementation data focusing on the amount of "hands on" time it takes to perform a task (cycle time), the amount of idle time (wait time), and the frequency at which a task is performed correctly the first time (first pass yield) (Fig 3).

Fig 3. Comparison of the cycle time, wait time, and quality first pass yield values before and after the implementation of process improvements.

With Problem Requisitions:

Pre-Implementation	Pre-Analytical	Analytical	Post-Analytical	Problem Requisitions	Absorptions	PRP	Total
Wait Time (hrs)	6.91	26.16	17.9	24.58	1	1.5	68.09
Cycle Time (hrs)	3.72	6.52	29.62	0.58	1.75	0.33	38.49
First Pass Yield (%)	75	90	94	86	100	88	87

Post-Implementation	Pre-Analytical	Analytical	Post-Analytical	Problem Requisitions	Absorptions	PRP	Total
Wait Time (hrs)	6.91	26.7	26	24.58	0	1	84.49
Cycle Time (hrs)	3.96	6.85	29.62	0.58	0	0.33	39.33
First Pass Yield (%)	75	99	95	86	100	88	86

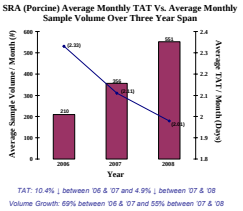
Without Problem Requisitions:

Pre-Implementation	Pre-Analytical	Analytical	Post-Analytical	Absorptions	PRP	Total
Wait Time (hrs)	6.91	26.16	17.9	1	1.5	53.47
Cycle Time (hrs)	3.72	6.52	29.62	1.75	0.33	39.94
First Pass Yield (%)	75	90	94	100	88	37

Post-Implementation	Pre-Analytical	Analytical	Post-Analytical	Absorptions	PRP	Total
Wait Time (hrs)	6.91	26.7	26	0	0	60.61
Cycle Time (hrs)	3.96	6.85	29.62	0	0.33	39.56
First Pass Yield (%)	75	99	95	100	88	81

Using the VSM tool allowed for additional improvements in decreasing the assay's TAT despite increasing sample volumes (Fig 4). The ability to batch samples certainly contributed to increasing efficiency; however, the elimination of non-value added diluted and absorbed samples had an even greater impact on the efficiency by increasing the assay's capacity 41.2%. As a result, more samples were completed in a shorter period of time, and were discharged at an earlier time. Discharging samples earlier in the day led to a decrease in customer inquiries about results.

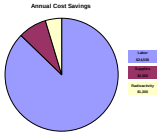
Fig 4. Average monthly TAT versus Average monthly sample volume over a 3 year span.



TAT: 10.4% ↓ between '06 & '07 and 4.9% ↓ between '07 & '08
Volume Growth: 69% between '06 & '07 and 55% between '07 & '08

The efficiencies gained led to many cost savings (Fig 5).

Fig 5. Annual cost savings generated from the improved processes.



Conclusions

Many efficiencies in the SRA process were achieved from improvements implemented in reaction to growth. However, the development of the enhanced SRA process would not have been possible without an in depth analysis using the VSM tool. The SRA is now a consistent and sustainable process with the ability to absorb continued growth. The new process of increased sample capacity and decreased TAT was successful due to the incorporation of ideas from all staff members, which was only possible with constant communication between VSM and non-VSM team members. While many efficiencies were gained in the new process, there are many additional opportunities for improvement within the SRA process. The lab is currently investigating opportunities in the pre-analytical and post-analytical sections of the VSM potentially focusing on the problem requisition issue and an interfacing solution, respectively.