

Reducing Length and Variability of Patient Wait Times in Patient Service Centres

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ABSTRACT

Category: Clinical Laboratory Process Improvement and Lean-Six Sigma Projects

Reducing Length and Variability of Patient Wait Times (PWT) in Patient Service Centres (PSC)

Calgary Laboratory Services operates 18 PSCs that provide sample collection and electrocardiogram services for over one million patients annually. The target for PWT from 'Patient Arrival to Collection complete' is 80% in 30 minutes. The mean monthly PWT in 2008 was 74% in 30 minutes with a range of 43% to 99%.

Objective: Increase percentage of patients seen in 30 minutes from 2008 mean of 74% to 80% by August 1, 2009.

Methods: An integrated approach of Six Sigma DMAIC methodology and Lean principles was applied.

Results: A 29% improvement in the weekly PWT was realized during the pilot followed by best practice roll out and implementation at all PSC sites.

Conclusion: Significant sustainable improvements can be achieved by using a combination of Lean and Six Sigma process excellence tools.

INTRODUCTION

Calgary Laboratory Services (CLS) operates 18 Patient Service Centres (PSC) which provide electrocardiogram and sample collection services for the city of Calgary and surrounding area. Over one million patient visits occur each year. The established target for Patient Wait Time (PWT) from 'Arrival at PSC to Collection of specimen' is 80% of patients seen in 30 minutes.

Problem Statement

CLS was not consistently meeting the established target for PWT. The mean monthly PWT in 2008 was 74% in 30 minutes with variability ranging from 43% to 99%. Variability across PSC sites ranged from 25% to 98% in the first quarter of 2009.

Challenges related to coping with marked growth in demand and an ever-increasing scope of testing requests were affecting productivity. Previous Lean-focused improvement events have had varied success with challenges in sustaining gains. True root cause has been difficult to pinpoint. See Table 1 for data depicting baseline performance.

Pilot PSC Defective Statistics - 2008	
Total Patients collected	24862
Defective cycle times (> 30 minutes)	10694
Defective Rate (% cycle times > 30 min)	43.01%
Compliance Rate	56.99%
Defective PPM	430734
Sigma level (long term from Minitab)	0.17612

Table 1. Baseline performance.

Objective

Increase percentage of patients seen in 30 minutes from 2008 weekly mean of 74% (SD = 12.8) to 80% (SD = 3.0) by August 1, 2009 at the pilot site. Reduce cycle time variation from 'Patient Arrival to Collection Complete' at the trial site from a mean weekly standard deviation of 4.5 to 3.0 by August 1, 2009.

METHODS AND MATERIALS

Internal expertise of the CLS Process Excellence office, under the guidance of a Six Sigma Master Black Belt, was utilized to apply an integrated approach using both Lean and Six Sigma tools. A team composed of a Lean Six Sigma Black Belt, a PSC Supervisor and four PSC frontline staff followed the DMAIC (Define/Measure/Analyze/Improve/Control) project format. The initial project occurred at one pilot location with planning for best practice rollout to the other 17 sites scheduled to occur after the trial at the pilot site.

DEFINE PHASE - Define and validate problem; verify customer requirements; create objective, scope, metrics; form team

Voice of the Customer (VOC) - What does the customer want?

- Previous patient surveys and complaint information did not focus on patient satisfaction regarding wait time.
- The project team designed and completed a patient self-survey to gather feedback directly related to patient expectations for acceptable wait times.
- Survey results verified the current established target reflected patient expectations. See Figures 1 and 2.

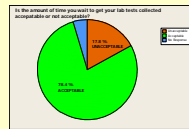


Figure 1. Entire wait time

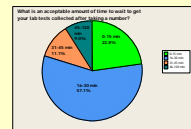


Figure 2. From patient reception

Data indicated that front end processes (Arrival to Order Entered) were the largest contributor to extended PWT and variability. See Figure 3.

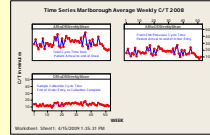


Figure 3. Time series

MEASURE PHASE - Gather current process information

During peak demand times large amounts of inventory, rework, process loop backs and non value-added activities were evident in patient reception and data entry. Some lack of standard process was linked to large variation in requisition clarity and complexity.

Using tools such as process flow diagrams, Fishbone analysis (See Figure 4), Cause and Effect Matrix and data analysis allowed identification of five key areas of opportunity:

- Staffing levels and scheduling
- Requisition/Order complexity and clarity - Requisitions present with missing or unclear information or require an extra sub-process due to type of order.
- Competency in 3 processes: Reception/Triage, Data Entry and Phlebotomy
- Waste in process - Series Process allowed for rework and high defect levels in each process step as well as inventory build up
- Waiting room control/communication to patient

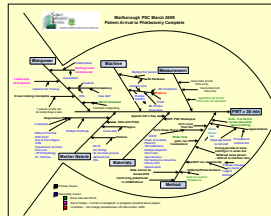


Figure 4. Fishbone (Ishikawa) Cause and Effect Diagram

ANALYZE PHASE - Evaluate data and determine significant root causes

The project team summarized two points as follows: Graphical and statistical analysis of the first two opportunities did not produce conclusive evidence of impact on 'Patient Arrival to Draw Complete' cycle time. The last 3 areas of opportunity included competency, waste/flow issues and patient waiting room control all of which do not lend very well to data collection. As a result of these conclusions a Failure Modes and Effects Analysis (FMEA) was completed to help assess risk to the customer if any of the key process inputs derived from the C&E Matrix failed.

The FMEA allowed focus on those areas that would produce the largest impact on PWT during the Improve Phase. The FMEA was also utilized to track changes to the process and assess the new process' ability to reduce the risk observed at baseline.

IMPROVE PHASE - Create experiment and recommend changes

Trial Results - WOW!

KPI's	Baseline 2008	2009 Q1	2009 Q2	Goal	PSC PWT 88 Trial 2009 Jan to Aug 14	Baseline 2009 Jan to Aug 14
Weekly average	74	72	69	80	89	71
SD	16.2	15.2	14.2	3	1.9	2.3
Actual to Cycle Cycle Time (min)						
Weekly average	30.3	31.4	32.0	20	21.8	32.0
SD	6.4	4.5	5.2	3	1.7	1.6
Daily average	30.7	29.8	32.3		21.6	31.9
SD	6.2	7.0	6.8		1.8	6.7
Percent to Cycle Cycle Time (min)						
Weekly average	16.9	16.3	20.2		12.4	17.9
SD	4.7	3.7	4.2		1.9	6.5
Daily average	17.3	17.3	19.8		12.2	17.8
SD	6.8	5.7	7.1		4.3	5.0
Other Key Metrics						
Weekly average	13.7	13.1	12.8		9.5	14.1
SD	2.0	1.1	1.0		0.8	1.0
Daily average	13.0	12.1	12.7		9.5	14.1
SD	2.4	2.1	2.4		1.4	2.4
Process time for						
Client Data Entry	4.7 min	3.8 min				

Table 2. Trial Metrics

'One on one' communication, feedback and training sessions were held with all staff members at the pilot site. Solutions implemented during the four week trial comprised:

- Reduced bench changes per day on rotation schedule
- Removed hand-offs in front end process
- Implemented parallel processes to ensure walk-in patients are dealt with in timely manner while appointments are completed in 10 minutes or less.
- Developed a visual requisition management system based on patient arrival time with visual signals to ensure flow and reduce inventory of patients waiting for their number to be called.

Pilot PSC Defective Statistics	Baseline Jan to May 2009	Post implementation Aug to Dec 2009
Total Patient Arrival to Draw cycle times	24862	18610
Defective cycle times > 30 minutes	10694	4500
Defective Rate (% cycle times > 30 min)	43.01%	28.04%
Compliance Rate	56.99%	71.96%
Defective PPM	430734	282600
Sigma Level (long term from Minitab)	0.17612	0.642113

Table 3. Pilot Site Performance

Table 3 illustrates the progress towards improving the performance Sigma level of front end processes at the pilot PSC.

CONTROL PHASE - Implement change; optimize and refine; control and monitor; hand off to process owner

Trial data were evaluated, solutions refined and a roll out to all PSC sites planned. Credit is due to the leadership and staff of the PSCs as all of this occurred during a time of limited resources due to intense training for the new Lab Information System (LIS) launch scheduled in December 2009 and H1N1 implications.

Control methods utilized included:

- Inspection/Audit
 - Statistical Process Control (SPC) charts
 - Solution Replication at all PSCs
 - Education - one on one training by supervisors
 - Regularly scheduled 'Frontline Walks'
- Future improvement opportunities identified were scheduled post event:
- Patient Waiting Room Control Sub-project
 - Data based staffing Levels and scheduling utilizing queuing model
 - Mistake proofing of Data Entry Processes post new LIS stabilization

RESULTS

Improved performance is demonstrated clearly in the pre and post fitted distribution plot of the PWT business metric - % Patients seen in 30 minutes. See Figure 5. The blue reference line at 80 percent is the mandated target.

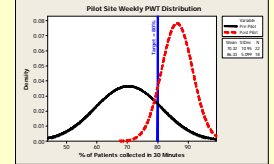


Figure 5. Pre and Post PWT population comparison

The time series plot of the project primary metric, Pilot Site cycle time for 'Patient Arrival to Collection Complete' in minutes, demonstrates that the solutions applied have controlled the rework and inventory enough to significantly impact our project goal. See Figure 6.

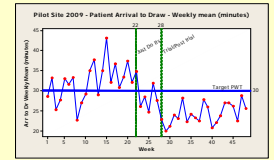


Figure 6. Time Series Plot of Cycle Time

Although there was some resistance to change at the beginning of the pilot, staff wholeheartedly agreed not to revert to the previous process and planning began for roll out to all 17 remaining sites. New LIS implementation occurred on December 7, 2009. Stabilization of the new LIS processes is indicated with recovery of the 'All PSC PWT' by August 2010. See Figure 7.



Figure 7. All PSC PWT

CONCLUSION

Initial process improvement activities utilizing Lean methodology to remove waste and introduce flow showed some success but performance was still below established target levels. Integration of Six Sigma and Lean tools provided momentum to make significant progress towards process excellence.

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