

Evidence-Based Management of the ED

Lean Six Sigma Process Improvement In a Performance
Dashboard-Enabled Emergency Department



Daniel Swedberg, President

dswedberg@synthesysllc.com

703.856.3008

www.synthesysllc.com

Summary

In the movement towards more real-time information for operating Emergency Departments (EDs), performance dashboards offer significant opportunities for implementing Lean Six Sigma process improvement projects and establishing an on-going Lean Management approach to ED operations. Drawing on experience from dashboard-enabled Lean Six Sigma process improvement in the Virginia Hospital Center's (VHCs) ED, the authors discuss a project combining the analytics capabilities of a performance dashboard with Lean Six Sigma process improvement and the value of implementing both as a comprehensive improvement strategy.

Introduction

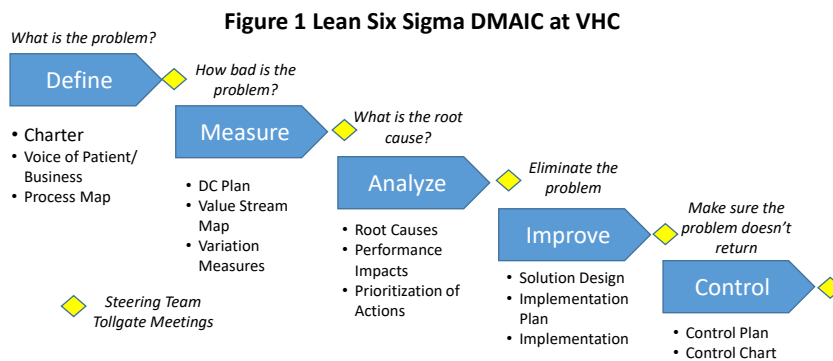
Strategies like population health, customer engagement, and clinical decision support currently lead the hype list of innovative "big data" strategies in healthcare. However, with the passage of the Accountable Care Act and the Centers for Medicare and Medicaid's implementation of value-based purchasing arrangements in Medicare, operational performance improvement has become an imperative for health care organizations. Performance dashboards, providing access to key operational metrics and analytic capabilities, represent a "big data" approach to addressing these imperatives. Turning that approach into an improvement strategy requires a methodology for using data to improve operational results.

Lean Six Sigma is an important methodology emerging in healthcare to address imperatives for improving operational results. Its focus on customer satisfaction, process improvement, and front-line staff involvement in improvement, have been used by some in healthcare and many in other industries to improve and sustain operational performance. Its focus on the on-going measurement and analysis of key metric performance data makes having access to timely, relevant, and accurate data a necessity for achieving and sustaining improvements over time. So, it is a data-intensive methodology and requires significant time and effort to manually capture, process, and present key metric performance data. This paper discusses a Lean Six Sigma project in an Emergency Department (ED) that had previously implemented a performance dashboard. The project goal was to leverage their performance dashboard solution to identify ED operational improvement opportunities and then employ a Lean Six Sigma methodology to demonstrate how leveraging a performance dashboard can support process improvement and provide the means to benchmark and track the impact of change implemented.

Virginia Hospital Center's ED Lean Six Sigma Project

VHC is a 350-bed urban hospital located in the Washington, DC metropolitan area that prides itself on its delivery of high-quality care, having been awarded CMS's 4-Star quality rating and the Leapfrog Top Hospital award in 2015. The VHC ED has 36 treatment bays and over 66,000 patients a year.

VHC implemented a performance dashboard in its ED in 2013. It integrates data from the hospital Emergency Department information System (EDIS), Admission, Discharge, and Transfer (ADT), and billing systems as well as patient satisfaction surveys, to generate ED process performance metrics and provide access to a rich set of analytic data for understanding those metrics. At the start of 2015 (and since performance dashboard tracking began in 2013) those metrics showed outstanding performance: 0.3-1.2% of patients were leaving without being seen, overall patient turnaround times for ED visits were approximately 200 minutes, and patient satisfaction with their ED visits was in the >90th percentile on Press Ganey "Likelihood to Recommend". In late 2015, those metrics indicated that patient throughput was slowing, left without being seen percentages were increasing, and patient satisfaction with their ED stay was declining. VHC determined that a process improvement effort was needed to reverse these trends and decided to engage a Lean Six Sigma expert and leverage the capabilities of its performance dashboard to do so. A Lean Six Sigma project was initiated to provide a way to focus the process improvement effort. Lean Six Sigma principles and the DMAIC (Define, Measure, Analyze, Improve, Control) methodology leveraging VHC's ED performance dashboard were adopted to guide the effort (Figure 1).



Leveraging data already available from their ED performance dashboard, a performance baseline and current status profile were quickly established. They depicted gaps in operational performance metrics from the last quarter of 2014 to a similar period in 2015. As is typical of most EDs, the gap analysis showed evidence of both "internal to the ED" and "external to the ED" factors responsible for process issues. While significant increases in hospital direct inpatient admissions were identified as having an impact, a "walk, before you run" decision was made to focus initial improvement efforts on "internal to the ED" process performance.

Two, full-day team sessions involving a team of 14 ED technicians, nurses, physicians, and ED managers highlighted the Measure and Analyze steps of the project. For the first session, value stream mapping, ED performance dashboard metric data was provided as background information to the team. The team agreed on the flow of patients and work activities from patient arrival to discharge, and established defect and process/work time estimates. Results were used to identify and prioritize 16 process issues for immediate attention (Figure 2). During the second session, the team assessed root causes of the 16 process issues. Next they evaluated the potential impact of 3 best practice improvement approaches—direct bedding, team nursing, and team discharge. Finally, they brainstormed other solutions to build a specification for the overall solution required. Historical data from the performance dashboard was used to project the potential impact of the solution on performance.

Figure 2 Priority Process Issues

Activity/Decision	Defect	P-W Time
Call Patient	99%	29
Assign Room	98%	37
Prepare Patient	30%	2
Alert Primary RN	70%	1
Initiate Protocol	20%	2.5
Place IV or Stick for Blood	92%	12
Discuss with Pt/Obtain Sample	80%	40
Print/Scan Order to Pharmacy	95%	10
Obtain/Adminster Meds	98%	22
Complete Passport/Prep	70%	15
Transport Patient to Radiology	99%	43
Review Results	95%	20
Call Consulting Doctor	90%	23
Print Rx/D/C Instructions	80%	2
Clean Room	75%	9
Clean Communicated to Charge	40%	9.5

(Virginia Hospital Center's ED Lean Six Sigma Project Cont.)

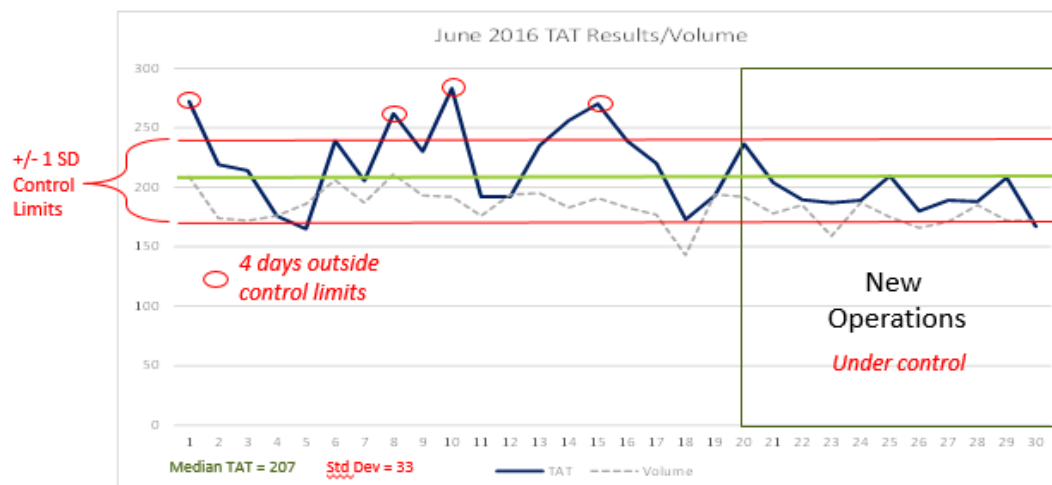
The Improve step was initiated at the end of the second session with agreement on a pilot implementation project to test and refine key elements of the solution. A two-day pilot was implemented and results were captured from the performance dashboard and staff input on what did and did not work. Those results showed the negative impact of significant on-the-job learning required by staff on day one. However, improvement was experienced by the team on day two as a new operational rhythm was established. Lessons from the pilot were used to refine the overall solution and it was implemented on June 20, 2016.

Rounding out the DMAIC methodology, Control procedures have been established that use daily performance metrics for turnaround times and patients leaving without being seen and plans have been established for weekly reviews of daily metrics to identify and assess out-of-control situations and changes in performance. The new control tools will be implemented through the performance dashboard to provide real-time access to information needed to manage performance.

Results

Initial results of the project were assessed after 11 days of operation in the new setting—from June 20 through June 30. Figure 3 provides a graphic representation of the improvement felt by patients and staff. It shows daily medians for ED patient turnaround times (from arrival to discharge) for each day of the month in the context of overall turnaround time (207 minutes) and control limits set to indicate a variation of 1 standard deviation. Two key changes are noticeable when comparing the New Operations period with earlier results.

Figure 3 June Turnaround Time (TAT) Results



There was both less variation in performance and a shorter turnaround time for all patients treated in the ED. These preliminary results were especially encouraging because the changes implemented through the project targeted both aspects of performance. Increased flexibility to respond to peaks in workload was a key objective in implementing team-based approaches and reduced turnaround times was a key objective of changes implemented to reduce process delays.

(Results)

Since June, key performance metrics have been tracked by the VHC ED on a daily basis to sustain the gains identified in that preliminary assessment and to position itself for further improvement as part of its Lean approach to managing ED operations. Figure 4 shows ED performance data from the 2-months following implementation compared to the two months prior and start of 2015 metrics.

Figure 4 Comparison Metrics

METRICS	New Ops	Comparison	Improve- ment %	Benchmark
	Jul-Aug 2016	Apr-May 2016		2014 Q4
Average Daily Patients	174	181		180
Left without Being Seen %	1.5%	3.7%	147%	1.2%
All ED Patient Turnaround (min)	194	221	12%	210
Discharged Home Turnaround (min)	167	193	13%	193
Admitted Patient Turnaround (min)	306	350	13%	292

As shown, the percentage of patients leaving without being seen improved significantly—from 3.7% immediately preceding implementation to 1.5% in the two months following (1.2% in August). Turnaround times overall and for both discharged to home and admitted patients decreased 13%—far surpassing a project goal for discharged patients of turnaround times less than 180 minutes. These improvements, when compared with beginning of 2015 benchmarks, show significant progress. Specific to discharge to home patients, the focus of the project, turnaround times have surpassed the benchmarks. That provides a solid foundation for addressing broader “external to the ED” factors that continue to affect ED operational performance.

Putting these results into financial terms, increased revenue opportunities as well as reduced operating costs can be projected from the improvements indicated to date. For VHC, the reduction in patients leaving without being seen results in a potential annual revenue opportunity of \$500,000 to \$900,000. Improved patient turnaround time results in a potential annual nursing cost reduction of \$700,000 to \$1.2 million. The performance dashboard provides a useful tool for making these projections and for managing on-going efforts to achieve those results.

Conclusions

To be effective, Lean Six Sigma improvement efforts must involve front-line staff in diagnosing and fixing process problems. Traditionally, that has required the investment of significant time and effort on their part gathering data for the EHR and other sources, interpreting the data to define performance issues, identifying process defects causing poor performance, and evaluating solutions. Performance dashboards enable a more efficient approach by providing access to current and historical data required to diagnose and fix process problems. They provide a more efficient way to involve front-line staff by providing the detailed data to quantify performance issues, facilitate the investigation of multiple factors causing them, and quickly assess the impact of improvements that are implemented and make refinements.

The two together provide both a tool and a transitional approach for implementing a Lean approach to managing ED operations. The Lean Six Sigma project helps define the operational metrics most important for managing and improving performance. The performance dashboard provides the tool for tracking those metrics over time and sustaining improvement. Making the connection is important—Lean Six Sigma without a performance dashboard is inefficient and not a sustainable approach, performance dashboards without Lean Six Sigma process improvement represents improvement potential without improvement results. Together, the two provide a path for transitioning to a new Lean way of managing ED operations. In a world where ED operational performance is becoming increasingly important for hospitals and health systems, that’s a “big data” strategy with immediate pay-off.