Improvement of Stroke Care in a Multi Hospital System using Six Sigma Methodologies

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BACKGROUND

Six Sigma is a measurement-based strategy which seeks to improve the quality of process outputs by identifying and removing the causes of defects and variation. Six Sigma methodologies were originally developed for implementation in the manufacturing sector starting with Motorola in 1987. In time its use has spread to other sectors as well. Today, the concepts and methodologies of Six Sigma are increasingly being used in the healthcare industry for improving the quality of services rendered. However, the use of Six Sigma in the healthcare industry is still a relatively new phenomenon.

Publication of national consensus guidelines alone has generally not been sufficient to produce substantial changes in physician behavior or patient treatment. The American Heart Association's Get-With-the-Guidelines℠ (GWTG) program, has become the national standard for application of evidence based guidelines and performance measurement for stroke care. Adherence to these guidelines and participation in the program has been associated with substantial and sustained improvements in hospital-based stroke care and secondary prevention.

OBJECTIVES/PURPOSE

While Six Sigma has been increasingly used in the Healthcare sector it has not been formally utilized at CHSLI. The data-rich environment of GWTG – where participating hospitals are required to log such patient statistics as arrival & admission information, medications, diagnosis, symptom timeline, therapies and discharge information – provided an ideal backdrop to introduce Six Sigma to this Multi-Hospital-System (MHS).

Catholic Health Services of Long Island (CHSLI) GWTG-Stroke defect-free scores for the ten consensus CDC/COV measures for 2008 was significantly lower ($p<0.001$) than the NYS benchmark, 40.3% vs 50.3%. The aim of this project was to introduce Six Sigma methodologies to CHSLI to improve GWTG stroke compliance and to access its utility in improving clinical care.

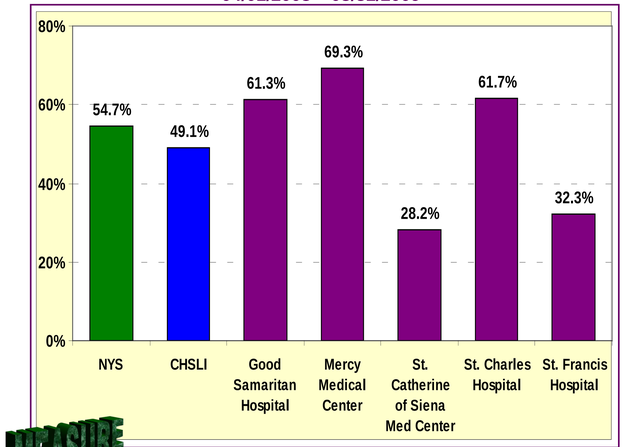
Six Sigma is a relatively new phenomenon in the fields of health and medicine, but many leading healthcare institutions are finding it useful in overcoming challenges not satisfied by traditional quality improvement initiatives. Six Sigma projects follow five distinct phases which bear the acronym DMAIC:

- *Define* the defect(s), project goals and the current process
- *Measure* key aspects of the process and collect data
- *Analyze* the data for root cause(s) of the defect(s) and to validate cause-and-effect relationships
- *Improve* or optimize the process based upon data analysis
- *Control* to ensure that any improvements which were made stay put

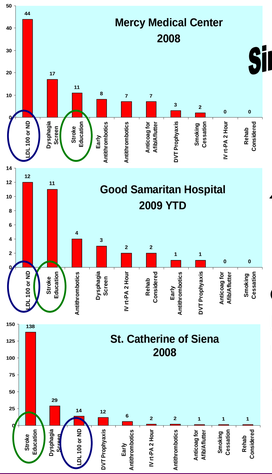
METHODS

1. Baseline performance was calculated using the defect-free score (% of patients receiving 100% of the eligible GWTG 10 Consensus CDC/COV stroke measures) for 1 year prior to project initiation for NYS, MHS, and each hospital (see Figure 1).
2. Multidisciplinary teams were convened at each of the 5 hospitals with support of clinical and executive leadership. A Six Sigma Black Belt introduced the methodology to each of the teams and facilitated their activities.
3. During the Define phase project charters were drafted and processes mapped at all the hospitals.
4. Data was analyzed, stratified and organized into Pareto charts to concentrate the teams on the measures with the lowest compliance rates and highest number of fall-outs.
5. During the analyze phase systematic defects in care processes at each of the 5 hospitals were identified and targeted, including use of standardized admission and discharge specific order-sets.
6. Based on the root causes of the defects immediate process improvements were made in all of the hospitals. Best practices were also shared among the hospitals.
7. Post process improvement implementation scores were obtained via GWTG program and compared to baseline.
8. Control plans were drafted to ensure continuous monitoring and improvements to the process.
9. Surveys were conducted to access the participants' satisfaction and further desire for Six Sigma.
10. Report-out with Executive Leadership

Figure 1: CHSLI vs NYS Defect-free Score of the 10 GWTG CDC/COV Measures 04/01/2008 – 03/31/2009



MEASURE



Similiar Issues

Historically the greatest # fall-outs for all 5 Hospitals are:

1. Stroke Education
2. LDL-100 Labs

Figure 3: Root Causes & Contributing Factors to Fall-outs

ANALYZE

- "CVA/TIA Physician Order Sheet" not used routinely
- Order Sheets cumbersome and not user friendly
- Multiple areas of documentation for "Stroke Education"
- Lipid profile not built into ED stroke labs
- "Discharge Instructions" did not prompt for Lipid Lowering Meds
- Lack of accountability & inconsistent education
- Responsibilities not clear (primary care physician vs neurologist)
- Inconsistent weekend chart review
- "Discharge Instructions" not specific for stroke
- Stroke forms & packets not always available
- Real-time data not available
- Stroke Flow Sheet not accurate or clear regarding Swallow-Screen
- Stroke patient identification/location inconsistent

IMPROVE

Figure 4: Process Improvements

- Mandatory use of "CVA/TIA Physician Order Sheet"
- Order Sheet revised to include an "auto check" for Lipid Profile
- Stroke Package Replenishment Initiative
- "Discharge Instructions" revised to include Lipid Lowering Meds info
- Dietary aid with Stroke Education
- Greater IT involvement with stroke patient identification (IT daily report used in Daily Rounds)
- Pharmacy intervention regarding LDL (only St. Charles)
- Revised Stroke Education Pamphlet
- GWTG Tracking Tool
- Stroke Flow Sheet revisions
- Fall-outs identified quicker with improved follow-up

Table 1: Defect-free Scores

	Baseline 04/08 – 03/09	Post-project 04/09 – 08/09	P-value	Increase*
CHSLI	49.1%	76.0%	<0.001	26.9%
Good Samaritan Hospital	61.3%	70.4%	0.08	9.1%
St. Charles Hospital	61.7%	97.6%	<0.001	35.9%
Mercy Medical Center	69.3%	92.8%	<0.001	23.5%
St. Catherine of Siena Med Center	28.2%	78.1%	<0.001	49.9%
St. Francis Hospital	32.3%	58.6%	<0.001	26.3%

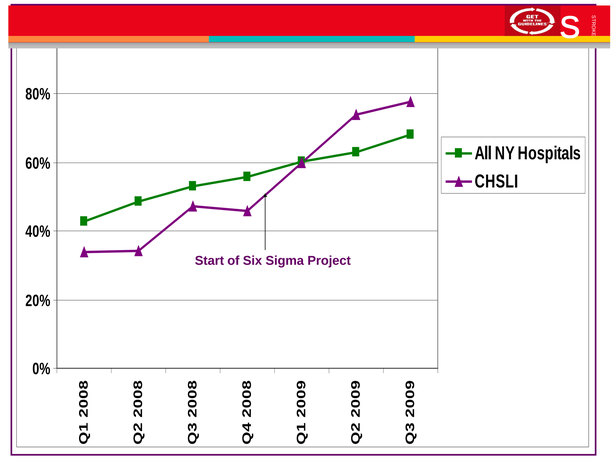
* NYS stroke-free score increased 9.5% during this time

Significant improvement in defect-free scores for the entire MHS and four of the five hospitals (Chi-square, $p<0.05$)

Table 2: CHSLI Stroke Compliance Scores Pre & Post Project

10 Stroke Quality Indicators	Pre Six Sigma	Post Six Sigma
IV rt-PA 2 Hour	70.6%	100%
Early Antithrombotics	96.8%	97.5%
DVT Prophylaxis	90.0%	94.4%
Antithrombotics	97.1%	96.0%
Anticoag for Afib/Aflutter	85.0%	94.6%
LDL 100 or ND	77.0%	85.1%
Smoking Cessation	96.3%	100%
Dysphagia Screen	75.1%	88.8%
Stroke Education	67.9%	91.1%
Rehabilitation Considered	97.5%	99.6%

Table 5: CHSLI vs NYS Defect-free Measure of the 10 Consensus GWTG CDC/COV Measures



CONTROL

Figure 5: Control Activities

- One-to-one communication of fall-outs to Medical and Nursing Staff
- Concurrent chart review
- IT daily reports (ID of stroke patients)
- Daily Interdisciplinary Care Coordination Rounds
- Display of data (order-set usage, pareto charts)
- Increased use of intranet
- Monthly Stroke PI Meetings
- OFI letter (fall-outs) to physicians
- Continuing Education
- Increased use of Hospital Extenders (weekends)

DISCUSSION

Compliance with GWTG 10 process quality measures were compared for the period before and after Six Sigma projects were implemented. To gauge overall stroke care pre and post comparisons were analyzed using the Defect-free scores for all 10 of the CDC/COV quality stroke measures. The Defect-free care measure shows the percentage of patients who received all eligible interventions, i.e. patients who received all the appropriate care, where 100% equals defect-free.

All 5 hospitals showed dramatic improvement (tables 1 & 2) in their defect-free scores and compliance with the measures after initiation of the Six Sigma projects. Four of these were significant ($p<0.001$). For the 1-year prior to the start of this initiative CHSLI trailed the NYS benchmark defect-free score 49.1% to 54.7%. However, after the completion of the projects the improvement made at CHSLI outpaced the NYS benchmark 76.0% to 64.2%, a dramatic 26.9% improvement in the defect-free score.

The value of simultaneous Six Sigma projects led by the same Six Sigma Black Belt were numerous. Since many issues were similar (e.g. low compliance with the LDL100 and stroke education measures) solutions in one hospital were shared and applied to other hospitals within the MHS. Furthermore, the limited duration of the projects (six meetings) and key clinical & leadership support and sponsorship helped keep the teams focused. The only drawback to the short duration of the projects was the difficulty of the Black Belt to teach in depth many of the core concepts of Six Sigma. The subsequent staff surveys revealed a high-level of satisfaction with the Six Sigma methodology and a desire for additional education and projects.

While Six Sigma is relatively new phenomenon in healthcare this study has shown that when coupled with administrative and clinical leadership support, it can be a powerful tool to improve patient care.

We would like to acknowledge the Stroke Teams of Good Samaritan Hospital, St. Charles Hospital, Mercy Medical Center, St. Catherine of Siena Medical Center and St. Francis Hospital