Performance Improvement in Safety-Net Hospitals: Survey Findings

By mandate, mission or location in their communities, U.S. safety-net hospitals play critical roles in caring for a large share of uninsured, Medicaid and other vulnerable patients. Safety-net hospitals also typically provide life-saving services unavailable at other hospitals, including trauma, burn care, neonatal intensive care and inpatient behavioral health.[1]

Because of the vulnerable populations safety-net hospitals serve and the costly stand-ready services they provide to the larger community, these hospitals often face intense financial pressures. Adopting evidence-based performance improvement (PI) techniques designed to improve patient outcomes and financial performance is one way for safety-net hospitals to respond to these challenges. Common PI approaches include Lean, Six Sigma and high-reliability organization strategies and other techniques.[2] (See Performance Improvement Techniques on the right for brief descriptions.)

Until now, relatively little research and policy attention has focused on safety-net hospital PI efforts. The Commonwealth Fund supported a study by the American Hospital Association (AHA) and researchers from NORC at the University of Chicago to analyze the results of a national survey of Lean and related PI initiatives in hospitals nationwide. The analysis of safety-net hospitals, in this national survey, shows that in spite of the financial and other

Performance Improvement Techniques

Performance improvement includes a variety of methodologies and approaches, with the aims of greater operational efficiency, improved quality, and better patient safety and patient experience. Commonly employed methodologies include:

Lean is defined as "an overall management/operating system that uses a continuous improvement culture that empowers front-line workers (nurses, physicians, other caregivers and support staff) to solve problems and eliminate waste by standardizing work to improve the value of care delivered to patients.[2]

Six Sigma, developed by Motorola, focuses on increasing performance while decreasing variation in business processes.[3]

Institute for Healthcare Improvement (IHI) *Model for Improvement* aims to help organizations accelerate improvement within their existing change models by forming teams, setting goals, testing change using Plan-Do-Study-Act (PDSA) cycle and measuring impact.[4]

Robust Process Improvement, adopted by The Joint Commission, uses a wide range of approaches to increase efficiency of operational processes; improve quality of products, treatment and services; and address complex work environments. This is done by partnering with appropriate staff and leaders, simplifying processes to eliminate defects, facilitating the use of data and analysis, and more.[5]

Figure 1. **PI Approaches in Use at Safety-Net and Non-Safety-Net Hospitals Using a Matched Sample***
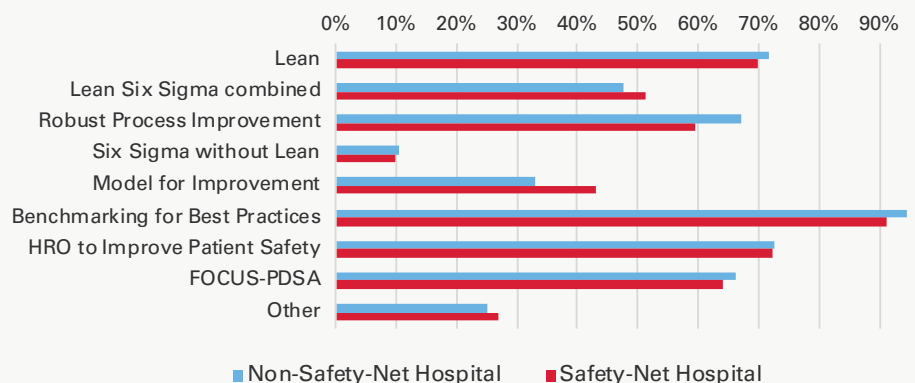
* N=237, of which 123 are safety-net hospitals; p-values ranged from .11 to .97.
Source: Center for Lean Engagement and Research in Healthcare.

challenges they face, these hospitals report conducting similar types and levels of PI activities as comparable non-safety-net hospitals. Overall, the findings indicate that safety-net hospitals are embracing PI efforts to gain operational efficiencies and improve patient safety, outcomes and experience, in the face of financial and other challenges of serving vulnerable patients.

Defining Safety-Net Hospitals

Currently, there is no standard quantitative method to define and determine safety-net hospitals. For purposes of this study, the researchers chose to adopt a definition developed by Dobson, et al. and based on the federal statutory definition of a deemed Medicaid disproportionate share hospital (DSH).[1] Under this definition, hospitals must receive Medicaid DSH payments because they serve a high share of low-income patients and must have a Medicaid inpatient utilization rate of at least one standard deviation above the mean for all hospitals in their state receiving Medicaid payments or a low-income inpatient utilization rate that exceeds 25%. The researchers arrived at this definition after consultation with a national advisory council that included hospital payment policy experts.

Where Safety-Net Hospitals Differ Structurally from Other Comparable Non-Safety-Net Hospitals

The researchers first studied the PI landscape at safety-net and non-safety-net hospitals by comparing self-reported data from a national survey of hospitals and health systems on the types and quantity of PI activities undertaken. The National Survey of Lean/Transformational Performance Improvement in Hospitals was developed by the Center for Lean Engagement and Research in Healthcare at the University of California, Berkeley, and fielded to U.S. general medical/surgical and pediatric hospitals by the AHA between May and September of 2017 (see Appendix).[2]

According to unadjusted overall survey results, safety-net hospitals differ structurally and operationally from their non-safety-net peers. For example, they tend to be larger (mean number of staffed beds 334 vs. 238, p<.001), have more full-time staff (mean FTE 2,097 vs. 1,426, p<.001) and admit more patients (mean admissions 15,027 vs. 11,153, p<.001). (See Table 1.)

Table 1. Characteristics of Safety-Net vs. Non-Safety-Net Hospitals

	N	Safety-Net	Non-Safety-Net	P-value
	820	165	655	
Hospital Size				
6-99 beds	210	35 (21.2%)	175 (26.7%)	< 0.001
100-299 beds	350	50 (30.3%)	300 (45.8%)	
300-499 beds	162	39 (23.6%)	123 (18.8%)	
500 or more beds	98	41 (24.9%)	57 (8.7%)	
Number of beds:[c] Mean (SD)	820	334 (261)	238 (237)	
Number of full-time staff: Mean (SD)	820	2,097 (2,326)	1,426 (2,106)	< 0.001
Number of admissions: Mean (SD)	820	15,027 (12,837)	11,153 (12,053)	< 0.001
Ownership Type				
Government, nonfederal	130	48 (29.1%)	82 (12.5%)	< 0.001
Not for Profit	607	102 (61.8%)	505 (77.1%)	
For profit	83	15 (9.1%)	68 (10.4%)	
Government, federal	0	0	0	
Teaching Status				
Major	100	45 (27.3%)	55 (8.4%)	< 0.001
Minor	374	63 (38.2%)	311 (47.5%)	
None	346	57 (34.6%)	289 (44.1%)	
Other Characteristics				
Urbanity				
Rural	202	35 (21.2%)	167 (25.5%)	0.254
Urban	618	130 (78.8%)	488 (74.5%)	
Hospital employs hospitalists				
No	37	12 (8.3%)	25 (4.5%)	0.067
Yes	668	133 (91.7%)	535 (95.5%)	
Total N	705	145	560	
Hospital established accountable care organization (ACO)				
No	411	84 (56.4%)	327 (56.5%)	0.982
Yes	317	65 (43.6%)	252 (43.5%)	
Total N	728	149	579	
Region				
Northeast	112	19 (11.5%)	93 (14.2%)	0.470
Midwest	221	51 (30.9%)	170 (26%)	
South	276	57 (34.6%)	219 (33.4%)	
West	211	38 (23%)	173 (26.4%)	

N (% or Mean (SD))

Source: AHA Annual Survey, 2016.

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Performance Improvement Activities at Safety-Net Hospitals

To account for these structural differences and accurately compare differences among safety-net and non-safety-net hospitals, the researchers then used a statistical approach called propensity score matching to identify non-safety-net hospitals that are structurally comparable (and hence, a relevant control group) to safety-net hospitals in terms of background characteristics that are associated with performance improvement and safety-net status.[6,7] The hospital characteristics that were used to create the control group included size (number of staffed beds, full-time staff, and admissions), ownership type and teaching status, as well as geographic and structural variables (urban or rural, region, employment of hospitalists, establishment of an accountable care organization, and geographic location).

After adjusting for these characteristics, the type of PI activities reported by safety-net hospitals did not vary significantly compared to non-safety-net hospitals (see Figure 1 on page 1). At both types of hospitals, the most frequently reported PI approach was benchmarking for best practices, reported by 91% of safety-net hospitals and 94% of non-safety-net hospitals.

The second most common PI approach was adopting principles of high-reliability organizations. Slightly more than 70% of both safety-net and non-safety-net hospitals reported using this approach, where hospitals "work to create an environment in which potential problems are anticipated, detected early and virtually always responded to early enough to prevent catastrophic consequences," by focusing on
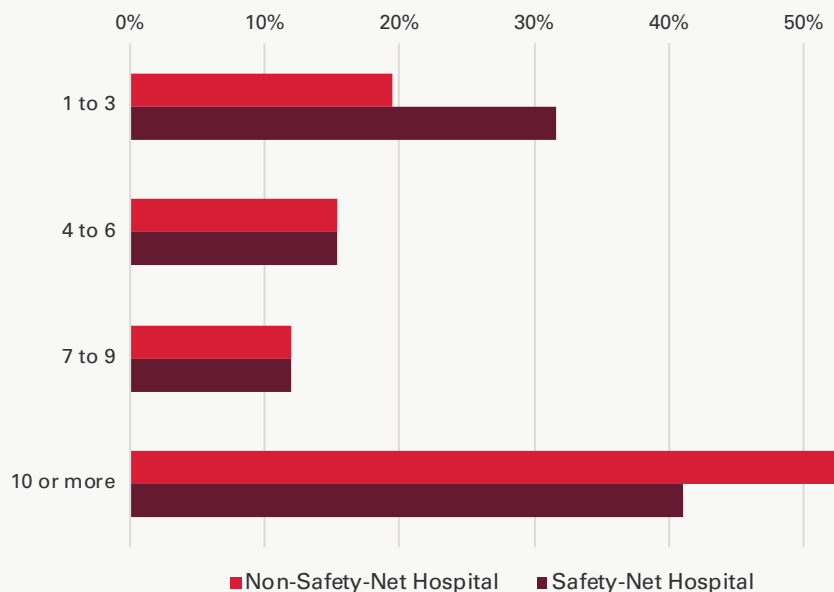
Figure 2. **Figure 2. Depth and Breadth of Lean Activities, Safety-Net vs. Non-Safety-Net Hospitals***
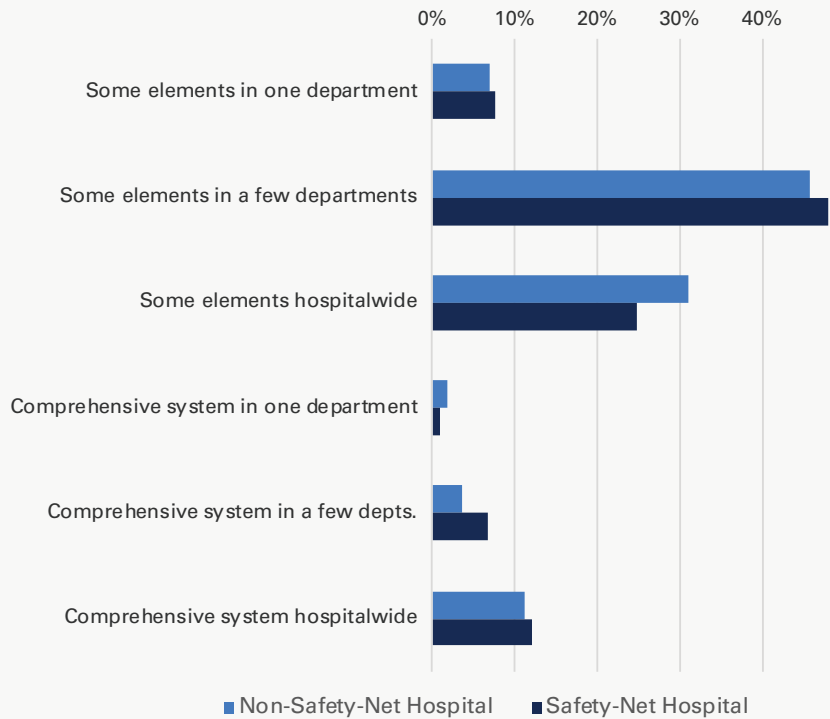
* N=233, of which 117 are safety-net hospitals; p=.52.

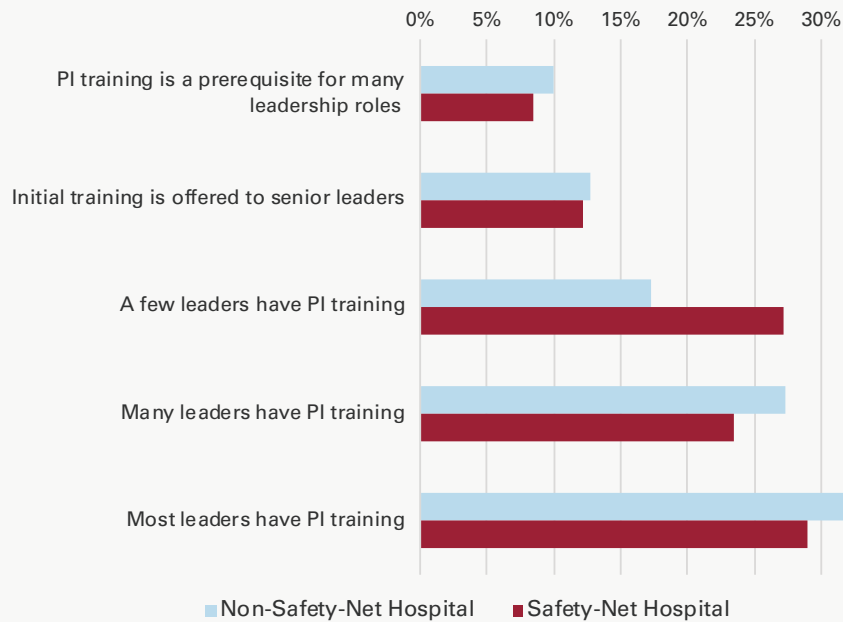Source: Center for Lean Engagement and Research in Healthcare.

Figure 3. **Reported Number of Lean Activities Being Implemented, Safety-Net vs. Non-Safety-Net Hospitals***

* N=235, of which 117 are safety-net hospitals; p=.152.

Source: Center for Lean Engagement and Research in Healthcare.

Figure 4. Hospital Leaders' PI Training, Safety-Net vs. Non-Safety-Net Hospitals*

PI training is a prerequisite for many leadership roles

Initial training is offered to senior leaders

A few leaders have PI training

Many leaders have PI training

Most leaders have PI training

■ Non-Safety-Net Hospital   ■ Safety-Net Hospital

* N=217, of which 107 are safety-net hospitals; p=.54.
Source: Center for Lean Engagement and Research in Healthcare.

Figure 5. Hospitals' PI Journey: Self-Reported Maturity of Safety-Net and Non-Safety-Net Hospitals*

Start-up

Beyond start-up but challenged

Expanding to units across the hospital

Mature, transformational PI hospital

■ Non-Safety-Net Hospital   ■ Safety-Net Hospital

*N=232, of which 117 are safety-net hospitals; p=.223.
Source: Center for Lean Engagement and Research in Healthcare.

"five characteristic ways of thinking: preoccupation with failure; reluctance to simplify explanations for operations, successes, and failures; sensitivity to operations (situation awareness); deference to front-line expertise; and commitment to resilience."[8]

Similarly, about 70% of responding safety-net and non-safety-net hospitals reported using Lean techniques (without Six Sigma), while using combined Lean Six Sigma approaches was reported by about half of both types of hospitals — 51% of safety-net and 48% of non-safety-net hospitals.

Depth and Breadth of Lean Activities across Hospitals

Mirroring the overall findings, the depth and breadth of Lean activities were similar between safety-net and non-safety-net hospitals, with nearly half of both reporting implementation of some elements in a few departments, and just over one in 10 reporting a comprehensive system across the entire hospital (see Figure 2).

With regard to number of reported Lean activities underway, again, there was no statistically significant difference found between safety-net and non-safety-net hospitals (see Figure 3). While non-safety-net hospitals more frequently reported engaging in 10 or more Lean activities (53% vs. 41%), the difference was not significant at p=.15.
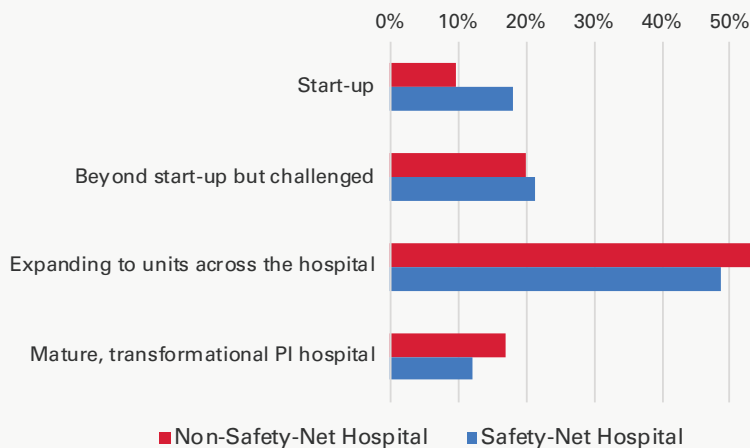
Leadership Training and PI

Whether hospital leaders had received training in PI also did not differ significantly between the two types of hospitals, with about a third of both safety-net and non-safety-net hospitals reporting that "most leaders have PI training." Similarly, about 10% of both types of hospitals reported that PI training was a prerequisite for many leadership positions (see Figure 4).

Maturity of PI Efforts

While safety-net hospitals and their non-safety-net counterparts reported somewhat different degrees of PI maturity, the differences were again not statistically significant (p=.22, Figure 5). More non-safety-net hospitals identified as "mature, transformational PI hospitals" (17% vs. 12%). Similarly, while nearly 20% of safety-net hospitals identified as being in the "start-up" phase of PI implementation, only 10% of non-safety-net hospitals reported the same.

Characteristics of Safety-Net Hospitals with High Levels of PI Activities

To understand whether safety-net hospitals may differ among themselves in important ways that might facilitate adopting and sustaining PI activities, researchers developed a composite measure to identify safety-net hospitals reporting a high degree of PI activity. The items included in the composite measure (α=.72) assessed how long a hospital had been engaged in Lean, number of Lean activities underway, breadth of Lean utilization across the hospital, extent of Lean utilization, achievements attributed to Lean, and leadership commitment to Lean. Given the variation of safety-net hospitals, researchers then stratified these hospitals by key characteristics, including size, location, teaching status, whether an ACO had been established, provision of primary care services, and geographic location.

One consistent finding was that hospitals that had established an ACO reported more PI activity. Specifically, safety-net hospitals with an ACO used Lean in more areas of the hospital — 13.4 areas on average compared to 9.4 areas for safety-net hospitals without an ACO (p<.01). Similarly, safety-net hospitals with an ACO reported greater leadership involvement across all levels — C-suite to managers — than those without an ACO. Safety-net hospitals with an ACO also reported more achievements attributed to PI/Lean — 7.5 vs. 5.2 for those without an ACO (p<.01).

Conclusion

This study, the first to compare the types and quantities of PI activities at safety-net hospitals with their non-safety-net counterparts, found that safety-net hospitals report being equally active in PI as non-safety-net hospitals. Given the challenging financial and operating conditions many safety-net hospitals face, this finding was unexpected. However, findings from a companion study that included interviews with leaders of safety-net hospitals engaged in a high level of PI activities suggest that these very conditions — narrow financial margins, medically complex patients, vulnerable communities, and shifting regulatory and compliance landscapes — may push safety-net hospitals to invest in PI as a way to increase efficiency while improving quality of care.[9]

Moreover, as the broader health system continues to focus on increasing value by improving patient outcomes and reducing costs through greater efficiency, safety-net hospitals may offer important lessons to other hospitals about how to adopt and sustain relatively low-cost PI approaches. Policymakers should continue to consider how to incentivize and reward improved performance on quality, cost and patient experience metrics for all hospitals to support the vital roles they play in their communities.

Endnotes

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Appendix.
How We Did This Study

While there is currently no consensus, quantitative definition of a *safety-net hospital*, for the purposes of this study the researchers chose to a adopt a definition developed by Dobson, et al. and based on the federal statutory definition of a deemed Medicaid disproportionate share hospital. Under this definition, hospitals must receive Medicaid DSH payments because they serve a high share of low-income patients and must have a Medicaid inpatient utilization rate of at least one standard deviation above the mean for all hospitals in their state receiving Medicaid payments or a low-income inpatient utilization rate that exceeds 25%. The researchers arrived at this definition after consultation with a national advisory council that included hospital payment policy experts.

To account for organizational and structural differences that might impact the analysis, the researchers matched safety-net hospitals with non-safety net hospitals through propensity score matching. The goal was to identify non-safety-net hospitals that are statistically comparable (and hence, a relevant control group) to safety-net hospitals in terms of background characteristics that are generally known correlates of performance improvement and safety-net status. Following matching, outcomes of the matched sample of hospitals were compared, resulting in less biased estimates.

Sample inclusion restrictions before matching

The researchers then merged survey data from the Center for Lean Engagement and Research in Healthcare (CLEAR) to the AHA Annual Survey data and retained hospitals that were common to both surveys for subsequent matching. This sample consisted of 820 hospitals (165 safety-net and 655 non-safety-net).

Adjusted outcome analysis using propensity score matching

First, the researchers employed a logistic regression model with a binary indicator for safety-net hospital as outcome and baseline characteristics as predictors to estimate the propensity score for each hospital.

Second, a one-to-one nearest neighbor matching with a caliper of 0.25 standard deviation was used. That is, each safety-net hospital was matched with the non-safety-net hospital that had the closest logit of propensity score within 0.25 standard deviation (or SD, where the SD is the standard deviation of the logit of propensity scores of all hospitals in the matching pool).

As a final step, the researchers checked whether matching produced safety-net and non-safety-net hospitals that were equivalent in baseline characteristics. Consistent with common practice in the propensity score matching literature, safety-net and non-safety-net hospitals were considered to be equivalent in a particular characteristic if the standardized mean difference in that characteristic between the two groups is less than 0.25 standard deviation. In addition to comparing the standardized differences, the researchers checked whether there was a good overlap in the distributions of the logit of propensity scores between the two groups, another indicator for baseline equivalence.

Once equivalence had been established on available baseline characteristics, the patterns of outcomes of the two groups in the matched sample were compared using Pearson's chi-squared test of association. The matched sample consisted of 314 hospitals (157 SN and 157 NSN).

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