

Ohio Children's Hospitals' Solutions for Patient Safety: A Framework for Pediatric Patient Safety Improvement

Anne Lyren, Richard Brill, Michael Bird, Nicholas Lashutka, Stephen Muething

Abbreviations:

- ADE = adverse drug events;
- CEO = chief executive officer;
- CLA-BSI = central line associated blood stream infections;
- HPI = Healthcare Performance Improvement;
- HRO = high reliability organization;
- OCHA = Ohio Children's Hospital Association;
- OCHSPS = Ohio Children's Hospitals' Solutions for Patient Safety;
- SHI = serious harm index;
- SSE = serious safety event;
- SSI = surgical site infections;
- VAP = ventilator-associated pneumonia.

The need for rapid and profound improvements in the healthcare delivery system in order to protect the lives of millions of patients was clearly articulated by the Institute of Medicine in its quality reports and has been substantiated by many other publications (Institute of Medicine, 2000, 2001). In addition, multiple studies document remarkable quality and safety improvements in specific domains of patient harm, such as central line associated blood stream infection (CLA-BSI), ventilator-associated pneumonia (VAP), medication errors and adverse drug events (ADEs), and serious safety events (SSEs; Bigham et al., 2009; Brill et al., 2013; Miller et al., 2011; Muething et al., 2012; Peterson, Teman, & Connors, 2012; Pronovost et al., 2006; Sharek et al., 2008; Tham et al., 2011). Nonetheless, the overall pace of change across the country has been slow and is not matched by the urgency called for by current rates of patient harm. Why the pace of change is slow is a complicated issue associated with priority setting, unclear methods by which to implement improvement, and certainly financial challenges to subsidize safety and quality work. However, one thing is clear: In order to make real progress in quality and safety, a framework must be created that can actualize bold strategies, broadly share learnings in real time, promote transparency of outcomes,

Abstract: Objectives: Building upon their previous collective success and a clinical imperative for rapid improvement, the eight tertiary pediatric referral centers in Ohio sought to dramatically decrease the most serious types of harm that occur to hospitalized children by collectively employing high reliability methods focused on safety culture.

Methods: With the support of the hospitals' executives, the Ohio collaborative obtained legal protection and built will by clearly identifying types and frequency of harm events that occur in each participating hospital and across the state. The improvement efforts were divided among task forces designed to incorporate the principles of high reliability organizations into the work of all employees, focusing primarily on the consistent application of error prevention behaviors.

Results: Between January 2010 and October 2012, the serious safety event rate among the participating hospitals decreased by 55%, equating to 70 fewer children per year who experienced this most severe type of event in the participating hospitals. Between January 2011 and October 2012, all events of serious harm were decreased by 40%, meaning 18 fewer children per month suffered serious harm.

Conclusion: Rapid and significant improvement in pediatric patient safety is possible through collaboration of children's hospitals dedicated to the application of high reliability principles and the noncompetitive sharing of outcomes and best practices.

and rapidly and openly spread successful methods. With this challenge in mind, a group of Ohio hospital leaders sought to dramatically improve pediatric patient safety. This article will describe that journey thus far and provide results to date.

Methods

Collaborative Organizational Framework—Historical Framework

The Ohio Children's Hospital Association (OCHA) is a group of six tertiary care referral hospitals organized in the 1980s to advocate for appropriate reimbursement of pediatric healthcare in Ohio and other legislative and regulatory issues affecting children's healthcare. Over time, the OCHA aim broadened to emphasize quality and safety issues for children.

Keywords

culture/safety culture
patient safety
pediatrics

Working collectively, the group committed to improving the quality of healthcare delivered for children. By pursuing this common goal, the hospitals developed the necessary trust to share the sensitive outcome data required to identify best practices and drive improvement. Currently the only statewide children's hospital collaborative focused on quality improvement, OCHA leaders explicitly refuse to compete on matters related to patient safety. For example, every OCHA board meeting begins with a quality report that details collective and individual hospital outcomes. This trust and transparency created an environment in which the quality and safety mission now drives the group's core work.

Project-specific process improvement work within OCHA began in 2005 with an initiative to develop and implement medical response teams in all OCHA hospitals (Figure 1). The goal of this initiative was to eliminate preventable cardiac and cardiopulmonary arrests outside the intensive care units. The collaborative achieved a 46% reduction across all hospitals (OCHSPS, 2011). At that time, the Ohio Department of Health's Hospital Advisory Committee was developing a set of quality measures for public reporting. Because of OCHA's experience, the state asked OCHA to make detailed recommendations regarding the measures for pediatrics. In doing so, OCHA reached out to the two other pediatric tertiary care referral centers in Ohio that were not historically part of the original organization and developed consensus recommendations for the five pediatric quality measures that were ultimately adopted by the state. This effort not only resulted in publicly reported measures developed and endorsed by the doctors and nurses of the state's children's hospitals, but also was the origin of the next phase of improvement work.

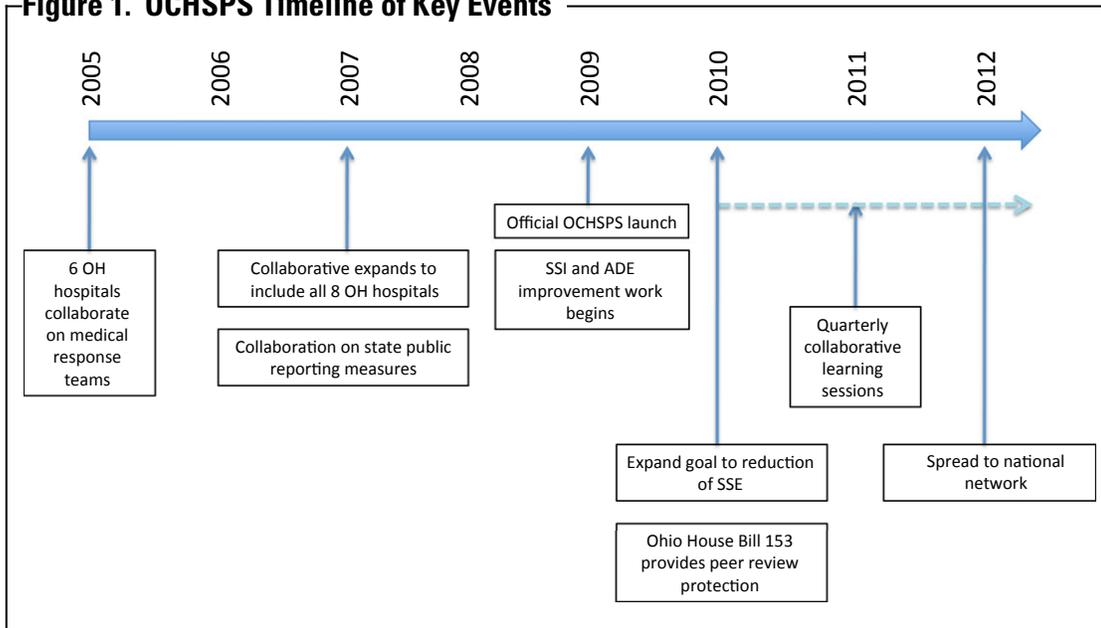
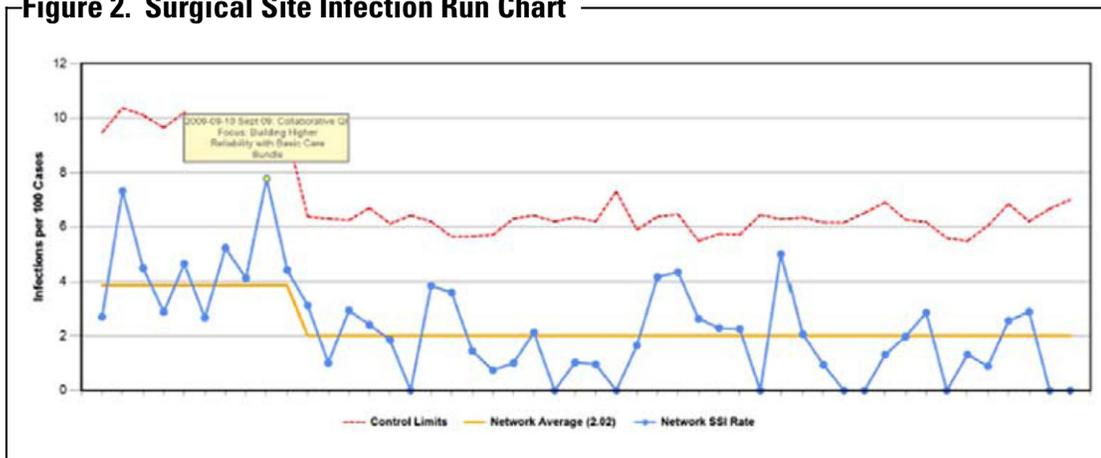
As a result of collaboration with Ohio state officials and the Ohio Department of Health, the Ohio collaborative expanded to include all eight pediatric referral centers and to focus on additional quality improvement projects. With this expanded effort and with all Ohio children's organizations participating, the Ohio Children's Hospitals Solutions for Patient Safety (OCHSPS) was launched in early 2009. This learning and improvement network was initially designed to tackle two critically important (and now publicly reported) pediatric healthcare measures—surgical site in-

fections (SSI) and ADE. Importantly and for the first time, this new OCHSPS work was financially supported by private industry as OCHSPS garnered the attention of the Ohio Business Roundtable and large employers in the state, most notably Cardinal Health. This public/private partnership proved critical to the success of both projects as well as future work. Standard definitions for SSI and ADE were used (OCHSPS, 2012). Hospital teams used individuals from various Ohio children's hospitals who were trained in the Model for Improvement and Plan/Do/Study/Act cycles to teach all hospital teams, thereby building improvement capability at all participating institutions (Langley et al., 2009). Simultaneously, event prevention bundles were established and implemented in each site. Compliance with bundle elements was measured. All data were submitted to a central data registry and aggregated for reporting to each hospital and their leadership. Complete data, including hospital event rates, were available to every participating hospital. This full transparency allowed hospitals to learn in real time from the best performing organizations within the collaborative. As a result, SSI in high-risk children were reduced by 60% (Figure 2); and ADE were reduced by 50% across all eight children's hospitals in Ohio (Figure 3; OCHSPS, 2011).

As the ADE and SSI projects achieved marked improvement, OCHSPS leaders began to appreciate the power of this collaborative effort. Consequently, OCHSPS leadership identified a transformative goal—to be the safest state in the country for children to receive healthcare. The general aim was to eliminate serious harm in the State of Ohio by the end of 2015. During a meeting in early 2010, attended by all hospital chief executive officers (CEOs) and hospital quality leadership as well as Board Quality members from most of the state's children's hospitals, a vote was taken; and the aforementioned goal and aim were unanimously endorsed.

Collaborative Organizational Framework—Aims

The specific quality aims for this OCHSPS network were as follows: Aim 1—reduce by 50% serious harm for hospitalized children in the OCHSPS network hospitals as measured by the serious harm index (SHI) by the end of 2013 and by 95% by the end of 2015 (Table 1; Brilli et al., 2010; Pronovost & Colantuoni, 2009);

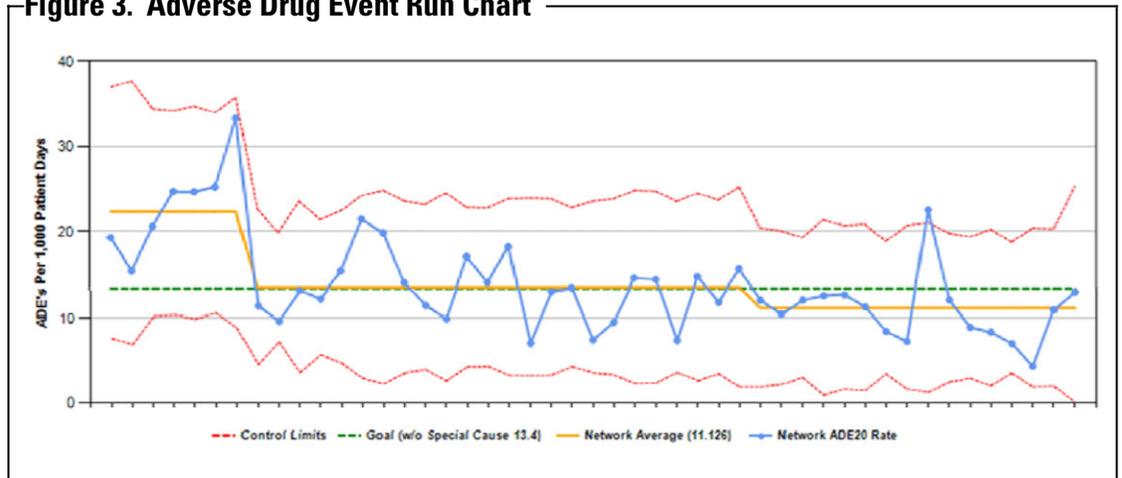
Figure 1. OCHSPS Timeline of Key Events**Figure 2. Surgical Site Infection Run Chart**

Aim 2—decrease by 50% the incidence of SSEs in OCHSPS network hospitals by the end of 2012 and by 75% by the end of 2015. SSEs include the most serious harm events that occur in hospitals and are defined by serious patient harm events that directly result from a deviation in best practice or from standard of care (Healthcare Performance Improvement, LLC, 2012).

Collaborative Organizational Framework—Legal Protection

A solid legal framework that allowed for transparent sharing of critical data while protect-

ing the hospitals from undue liability was essential and required the collaboration of not only legal counsel from the participating hospitals, but also the state legislature. The law that existed when the work was initiated provided clear protection for individual hospital peer review protection on quality work but was silent on collaboratives. In support of the OCHSPS work and in recognition of its important mission, Governor John Kasich and members of the Ohio General Assembly agreed in Ohio House Bill 153 in 2010 to expressly provide peer review protection for OCHSPS and the eight children's hospitals (State of Ohio 129th General Assembly, 2012).

Figure 3. Adverse Drug Event Run Chart**Table 1. Serious Harm Index Elements**

| |
|----------------------------------------------|
| Ventilator-associated pneumonia |
| Catheter-associated blood stream infections |
| Catheter-associated urinary tract infections |
| Serious falls |
| High-risk cases surgical site infection |
| Adverse drug events (level 6–9; F-I) |
| Pressure ulcers (stage 3–4) |
| Non-ICU preventable codes |
| Serious safety event |

Collaborative Organizational Framework—High Reliability Organization Implementation

The strategic approach to execution of the work involves two essential and inextricable components. The first component involves changing culture through the application of key principles borrowed from high reliability organizations (HROs) in other industries, such as nuclear power and naval aviation. HROs, which exist in extremely high risk and stressful environments similar to the hospital, have created cultures in which safety behaviors are reliably and effectively practiced. Despite their taxing environments, HROs experience many fewer incidents of error (Weick & Sutcliffe, 2007). Still, changing the culture of an organization by practicing behaviors that focus on patient safety is insufficient unless paired with specific processes targeting domains of frequent harm (e.g., serious falls, pressure ulcers, or hospital acquired infections). For this reason, the second component of the strate-

gic approach was designed to complement the culture-changing work and involved the development of microsystem-driven process improvement in the specific areas of harm. These process improvements require the engagement of content experts, quality improvement specialists, data managers, and bedside providers who can test ideas and implement best practices targeted to eliminate specific domains of harm. The theory of this two-pronged approach is that neither process improvement nor culture change is independently sufficient to create markedly safer hospitals; they must be intertwined in implementation so as to potentiate one another.

The OCHSPS learning network received considerable guidance at the inception of this work from Healthcare Performance Improvement (HPI), a consulting organization that assists hospitals in building and sustaining a culture of safety using methods based on reliability science and HRO best practices (Healthcare Performance Improvement, LLC, 2012). As part of its early work to facilitate the cultural changes necessary to convert Ohio children's hospitals into HROs, OCHSPS developed state-level task forces that were charged with implementation of HRO techniques. Each of task forces was composed of representatives from the eight participating hospitals.

- The *Error Prevention Task Force* facilitated the training of over 30,000 hospital employees across the state in basic error prevention behaviors. These behaviors include standardized handoff and communication techniques, team member

checking and coaching, and the use of tools that strengthen verification and attention to detail. In addition, this group organized the development of a safety coach program. From all across the state, hundreds of volunteer healthcare providers and staff were trained to act as champions for patient safety on every unit, during every shift, at each of the Ohio's children's hospitals.

- The *Leadership Methods Task Force* facilitated the training of all hospital leaders—from the executive suite to patient care managers—in specific methods to continuously reinforce these basic error prevention behaviors and hold all employees accountable. As part of this task force's work, all key executive and clinical leaders engage in structured safety rounds, learn ways to effectively influence staff on rounds, implement routine safety huddles, as well as participate in a daily organizational safety briefing.
- The *Cause Analysis Task Force* organized a robust and thorough process for analyzing events that do occur or nearly occur so that appropriate root causes are identified and rectified. In addition, hospitals carefully categorize events and near-miss events so that trends are appreciated and resources appropriately deployed. This group has also facilitated the effective sharing of SSEs (including their root causes, remedial actions, and associated tools) across hospitals so that partner hospitals can act to prevent similar events in their own organizations.
- The *Lessons Learned Task Force* worked with the communication, risk management, and legal departments of all the hospitals to facilitate the sharing of safety events as well as good catches both within individual hospitals and among hospitals within the network. All organizations have developed mechanisms to routinely share safety stories with their hospital employees.
- Finally, the *Safety Governance Task Force* is directed specifically at the CEOs and Boards of Trustees of both individual hospitals and the leadership of OCHSPS to enhance their ability to support this complex work. This group supported the development of safety dashboards for both individual hospitals and the collaborative as a whole that are reviewed at each OCHSPS Board meeting.

The task forces met monthly to set and review quarterly and annual goals, share identified barriers, potential solutions, and best practices. The collaborative adopted an All Teach/All Learn philosophy that mandated sharing and participation by all on conference calls and at the quarterly in-person learning sessions. The goals and deliverables of each of the task forces were guided by an HRO Leader Group composed of a representative from each of the participating hospitals and a steering committee of hospital safety leaders. Further, the goals and deliverables were approved and monitored by the hospital CEOs who comprise the Board of OCHSPS.

The first phase of the work focused on efforts to reorient the hospital culture and conduct an honest and methodical review of 15 months of safety data at each hospital in order to identify a statewide baseline of SSEs and serious harm that comprise the SHI. This included a review of all quality assurance committee minutes, incident reports, patient complaints, legal claims, sentinel events, and deaths. Each participating hospital completed a comprehensive review with the support of an HPI consultant and then shared the results with the rest of the network. In most cases, this review revealed information heretofore unknown regarding the degree to which children were harmed in their hospitals. The results were compelling and continue to provide poignant impetus for change.

Results

Hospitals provided baseline SSE rate data for time period of July 2008 to January 2010 and baseline data for SHI for time period of January 2010 to January 2011. Prior to the initiation of this work, 127 children experienced SSEs in the participating hospitals across the state per year (Figure 4). To date, the OCHSPS Network has decreased SSEs by 55%. This translates into 70 fewer children who experience an SSE each year. In the same baseline period, 45 children per month experienced incidents of harm as defined by the SHI (Figure 5). To date, the OCHSPS Network has decreased serious harm events by 40%. In other words, 18 fewer children experience an incident of serious harm per month across the network hospitals. All hospitals experienced improvement in their individual serious safety event rate (SSER) during the 2 years between January 2011 and December 2012 (Table 2).

Figure 4. Serious Safety Event Rate Chart

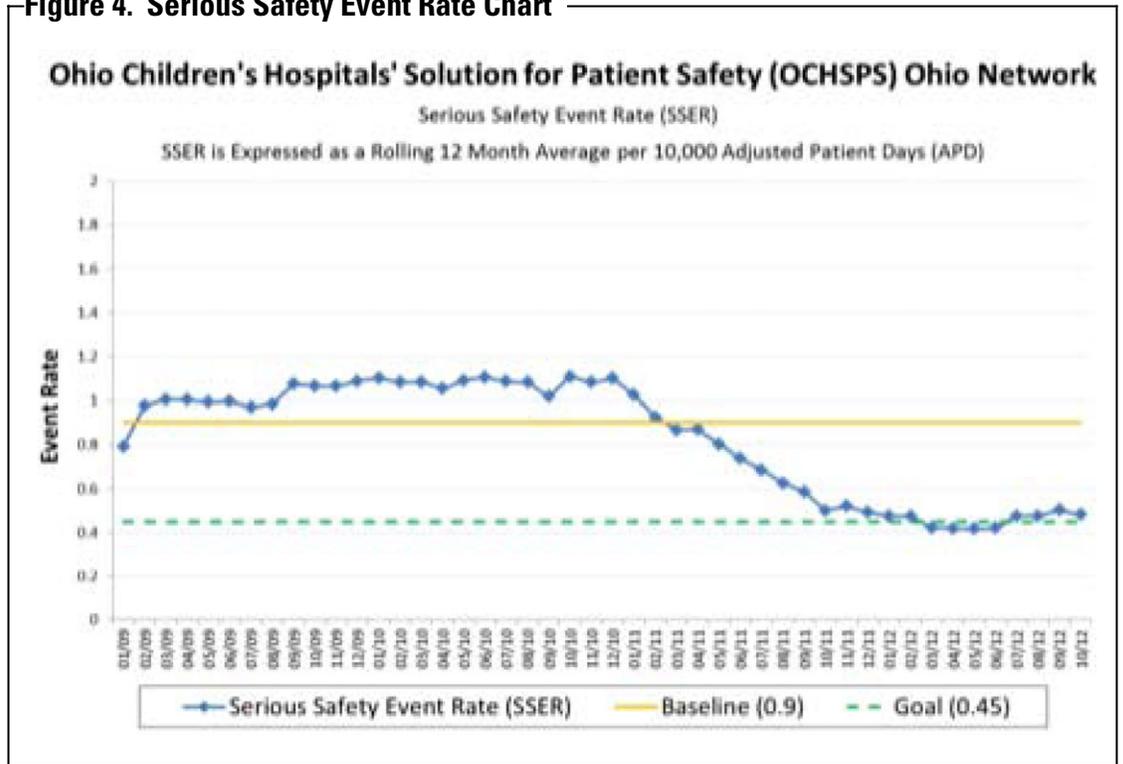
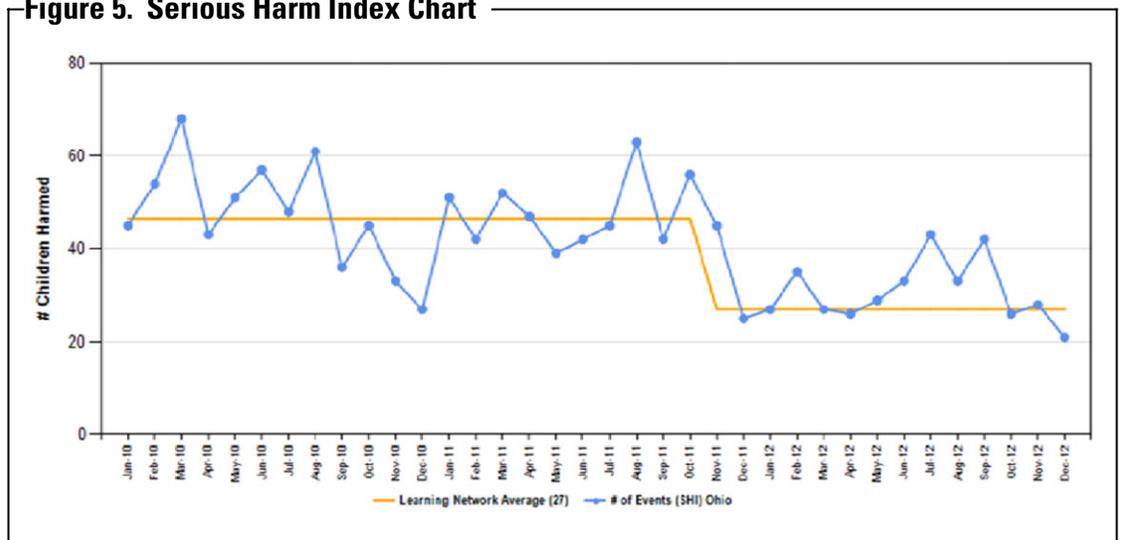


Figure 5. Serious Harm Index Chart



Discussion

OCHSPS established bold goals to improve pediatric patient safety. The early results of this work are encouraging, and many lessons have been learned. Certainly, strong will from the most senior levels of the organization is critical; the CEOs of Ohio children’s hospitals chose to lead OCHSPS as well as their hospitals with

an enthusiasm and focus that placed the highest value on patient safety. The trust and confidence both executive leaders and interhospital task forces show in one another were hard-won, but have created tremendous momentum for improvement. A comprehensive and protective legal framework backed by the hospitals’ legal counsels as well as the state government

Table 2. Percent Improvement in Ohio Hospitals' 12 Month Rolling SSE Rates (Total SSEs/10,000 Adjusted Patient Days) from Baseline at January 2011 to December 2012

| OCHSPS Hospitals | Percent Improvement |
|------------------|---------------------|
| Hospital A | 93 |
| Hospital B | 69 |
| Hospital C | 55 |
| Hospital D | 27 |
| Hospital E | 25 |
| Hospital F | 22 |
| Hospital G | 10 |
| Hospital H | 2 |

provided the necessary reassurance to support transparent sharing, which was also a key driver for rapid improvement. In addition, the public/private partnerships that developed over the course of the recent improvement work have been invaluable in providing critical financial support and enhancing accountability beyond the hospitals themselves. Finally, the All Teach/All Learn network approach wherein each hospital, no matter how large or small, can both teach and learn strategies to improve patient safety has inspired a shared responsibility for patient safety across the state and empowered hospital teams to deftly take and share in the best interest of all patients. Quarterly collaborative learning sessions serve as opportunities to strengthen collaborative relationships and provide chances for teaching and learning by all.

A goal of the OCHSPS network was to transform outcomes and improve safety for children in Ohio hospitals and therefore the metrics that were chosen (SHI and SSE) to measure the success of the effort needed to be clear, easily measured, and truly reflect the improvements we sought to achieve. SSEs are incidents that dramatically impact both patients and healthcare providers. Not linked to one specific process, patient problem, or area of the hospital, SSEs have tragic consequences of which providers are keenly aware. For this reason, hospital administration, providers, and staff are eager to work toward their elimination. The impact of other types of harm such as catheter-associated urinary tract infection and

pressure ulcers and the motivation to eradicate them are sometimes lost on those engaged in improvement work when the results of medical errors and harm are expressed in complex rates. The SHI measure was specifically chosen to highlight the consequences that quality and safety issues have on individual children. Compelling motivation developed by several authors for the thousands of people involved in carrying out this work is the concept of elimination of all serious harm (Brilli et al., 2010; Denham et al., 2009; Hendrich et al., 2007; Pronovost & Colantuoni, 2009; Pryor et al., 2006); and the best way to make that comprehensible to hospital employees and healthcare providers, whether on the front line or in the back office, is to focus less on rates of harm and more on the number of children suffering harm in hospitals. In this way, a bedside nurse in the intensive care unit can quote the number of children who suffered a CLA-BSI rather than recalling a fraction per thousand line days. For the purposes of comparison over time and identifying best practices among hospitals, rates of harm events are also measured; but the primary outcome measure is number of human beings harmed. The other advantage of a numerator-only goal (SHI) is that it mitigates the ability to easily compare across hospitals and instead encourages hospitals to focus on their own drive to zero harm. If every hospital achieves zero, then the network achieves zero.

Barriers

The results of the collaborative to date have been hard-won as many barriers exist. From a financial perspective, children's hospitals face a climate of slim margins; and creating a culture of safety does not come without significant cost. The financial support provided by the collaborative's business partners was essential, but considerable resources also were invested by each individual hospital to support the collaborative and execute the training and improvements. Nearly all participating institutions added human resources to implement the improvements; and substantial redeployment of current employees was required as the priority shifted to safety. These resource demands were significantly more challenging for smaller hospitals within the network as their resources could not easily stretch or expand to meet the demands of the work. Individual hospitals' financial contributions were not prospectively

characterized as part of this effort. However, recent case-control studies have demonstrated the tremendous costs associated with some of these harms, which help to justify the investment pediatric hospitals make to improve safety (Brilli et al., 2008; Nowak et al., 2010; Sparling et al., 2007). A deeper investigation of both the financial investment and the financial return is the subject of ongoing research and safety work. In addition, the degree of transparency that currently exists within the network has developed slowly and has required considerable perseverance and patience. Liability concerns, particularly associated with the sharing of individual hospital rates and SSE details, continue to worry organizations. Finally, a perennial issue Ohio's children's hospitals face is the potential for distraction by any number of important competing priorities—electronic medical record implementation, patient satisfaction or capital improvement efforts, treatment innovation opportunities, and talent recruitment. Resolution on the part of the hospitals' CEOs and Trustees to place safety as the ultimate priority is obligatory.

Next Steps

The first phase of the OCHSPS work has focused on addressing the culture of the organization, and further work is necessary to hard-wire the essential behavioral and leadership changes that promote safety in Ohio hospitals. However, to be successful, these cultural improvements must be married to solid process improvements focused on common types of hospital-acquired harm. Although continuing efforts to decrease SSI and ADE, the OCHSPS network is currently focusing efforts on decreasing other common types of harm, including catheter-associated urinary tract infections, pressure ulcers, VAP, venous thromboembolism, catheter-associated blood stream infections, and serious falls.

The success shared by Ohio's children's hospitals so far has inspired efforts to test the theory of this work on a broader group of hospitals that care for children. The OCHSPS has now expanded to include an additional 25 children's hospitals across the country, and efforts are underway to encompass 50 more in 2013. Several states have expressed an interest in organizing a collaborative within their states focused on quality improvement and patient safety using the Ohio model. The imperative for improvement in patient safety across the country

is apparent, and the OCHSPS has developed an informed framework that aspires to make the changes necessary to transform healthcare for all children.

Conclusion

In sum, this statewide collaborative has successfully implemented widespread changes that have improved patient safety for hospitalized children in Ohio's children's hospitals. The OCHSPS statewide collaborative may be a model to boldly drive change and improve safety on a regional or even national scale. The challenges that children's hospitals face in competing for market share and revenue can be overcome by focusing upon the compelling goal to improve safety for children and eliminate their harm.

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