

**Appendix C. High Reliability Organization Learning  
Network Operational Advice from the Cincinnati  
Children’s Site Visit**

# Contents

- Overview.....3
- Organizational Transformation.....4
  - Background.....4
  - Creating a Shared Vision for Transformation.....4
  - Identifying Essential Elements for Transformation.....5
    - Leadership.....5
    - Developing an Institutional Infrastructure to Support Transformation .....6
      - Support Infrastructure .....6
      - Technology Infrastructure.....7
    - Rigorous Measurement.....8
    - Transparency.....8
    - Accountability and Alignment.....9
  - Conclusion .....10
- Building a Business Case for Quality and Organizational Transformation.....11
  - Background.....11
  - Engaging the CFO.....11
  - Building the Business Case.....12
    - Value Proposition.....12
    - Value Orientation.....12
    - Value Commitment.....12
  - Use of Evidence-Based Care .....13
    - Effective Discharge Planning .....13
    - Reducing Ventilator-Associated Pneumonia and Surgical Site Infections.....14
  - Conclusion .....16
- Specific Improvements Toward Organizational Change.....18
  - Emergency Department .....18
  - Pharmacy Redesign.....19
  - Preventing Codes Outside of the ICU.....19
  - Decreasing Errors Through Computerized Work Orders .....20
  - Reducing SSIs.....21
  - Increasing Safety of Handoffs .....22
  - Neonatal ICU .....23
  - Transitional Care Area.....24
  - Operating a High Fidelity Simulation Center.....25
- Lessons Learned.....26
- Acknowledgements.....27
- Contact Information.....27

# Overview

This document summarizes practical suggestions on how to transform an organization by creating an infrastructure for supporting improvement initiatives that are geared toward making the organization more reliable. All ideas reflected in this document were suggested by representatives of Cincinnati Children's Hospital Medical Center and other healthcare systems attending a site visit as part of the AHRQ-sponsored High Reliability Organization (HRO) Learning Network.

Cincinnati Children's is a world-class facility, with an endowment of more than \$1 billion, more than \$900 million in research contracts and grants, and a history of innovation that includes a Robert Wood Johnson Foundation (RWJ) Pursuing Perfection grant. As a prestigious children's hospital, Cincinnati Children's attracts 50% of its patients from outside of its service area.

Participants in the site visit were interested in how Cincinnati Children's is transforming itself into a national leader in quality improvement and safety initiatives, as well as in how its efforts could be adapted for different systems.

This document synthesizes the site visit discussion to answer several key questions about organizational transformation toward high reliability:

- What does it mean to transform a hospital using high reliability concepts?
- How can an organization build a business case for organizational transformation and quality?
- How has the broad commitment to organizational change been translated into specific initiatives to improve patient care and the patient experience?
- What can be learned about how process redesign efforts can drive organizational transformation?

The discussion of these questions relates specific activities and initiatives to a framework for high reliability organizing. In addition, specific examples are provided to help illustrate the tangible impact of a commitment to organizational transformation. Finally, by focusing on change processes and not just end-products of improvements, other systems can understand the processes that led to Cincinnati Children's improvements and be better able to take these insights and create processes that will work in their own systems.

Other materials that were shared at the site visit, including slides from the presentations and other examples of improvement materials, are available on the HRO Learning Network extranet as well as from AHRQ and Delmarva staff.

# Organizational Transformation

## Background

Although Cincinnati Children's has been nationally prominent for many years, the organizational commitment to fundamental improvement is less than 10 years old. When Cincinnati Children's received the RWJ Pursuing Perfection grant in 2001, it lacked a comprehensive quality improvement strategy or clear understanding of where its improvement efforts should be focused. The IOM Report, *Crossing the Quality Chasm*, provided a conceptual framework for the organization to think about its quality improvement efforts and aspects of care in which improvement could occur. While Cincinnati Children's has made great progress on its transformation journey, key leaders from Cincinnati Children's strongly emphasize that they are still on the transformation journey and believe that improving reliability will be a continuous process.

This section addresses two key questions one would ask when starting to transform an organization into one that provides highly reliable, high quality care:

- How can a vision for transformation be created?
- What key components need to be addressed as the transformation process begins?

## Creating a Shared Vision for Transformation

Cincinnati Children's spent a significant amount of time defining what transformation should mean for its organization. These discussions led to the conclusion that achieving organizational goals requires more than a series of incremental performance improvement projects. Instead, the vision for transformation emphasized:

- **The need to focus on large-scale, organizational changes that are linked directly to the strategic plan.** Particularly given Cincinnati Children's size, the only way the organization as a whole could be transformed was through aligning strategic planning with the investments being made in safety and quality improvement.
- **Goal setting for systems based on 100% performance and 0% defects.** Leaders agreed to establish these perfection-oriented goals even when it was not clear whether those goals were achievable. They reasoned that these standards of excellence were the only way to avoid accepting errors and defects that were inconsistent with the organizational mission.
- **An emphasis on creating transparent processes for sharing successes and failures back to both internal and external customers.** To build a foundation for a culture in which ongoing improvement was the norm, Cincinnati Children's accepted that almost every process in the system could and should be better and that leaders needed to talk about what they were learning as they attempted to improve these processes. By creating extremely high standards, the leaders made it easier for staff to discuss failures and opportunities for improvement because the failure to achieve something extraordinary is not anything to be embarrassed about. But high standards also made it more difficult to

remain complacent, even in systems where performance was comparable to those of their peers.

## Identifying Essential Elements for Transformation

Like other organizations who have committed to major change, leaders at Cincinnati Children's view transformation as a continuous process that requires persistence. A mantra that senior leadership has used to avoid "over planning" was to "start before they were ready"; this coupled with setting audacious goals has helped them begin the transformation process more quickly.

CCHMC leadership has found it useful to think about the following five elements as key focus areas for their journey:

- Leadership
- Institutional infrastructure, organizational alignment, and resource investment
- Rigorous measurement
- Transparency
- Accountability

**Leadership.** Leadership at the system and unit levels has proven to be essential for jump-starting and sustaining organizational transformation. Cincinnati Children's identified three leadership essentials that help to clarify how leaders drive organizational change:

- *Leaders must own the process of creating the culture and focus required for transformation.* It is up to leaders to help others to clearly understand priorities. Leaders also have to model the transparency and accountability that transformation requires. Perhaps most importantly, leaders are responsible for ensuring that staff can succeed in their improvement efforts and for sustaining the positive outlook that encourages people to continue trying to make changes successful even when progress is slow. Each example of major change within a unit reflected the efforts of a leadership team who exhibited these characteristics.
- *Leaders must remain united.* A key success factor at Cincinnati Children's is support for transformation from the entire leadership team. This process did not happen immediately. Key leaders, including the chief financial officer (CFO), only gradually bought into the commitment to a quality-based transformation of the organization. Over time, some leaders who remained uncommitted to transformation left or were replaced by others who were supportive. As the commitment to transformation grew, it has become easier to attract and retain leaders committed to transformation. Now that transformation is central to organizational culture, there is a consistent senior leadership response to complaints related to the transformation: "This is how we work, and this is now part of your work." Although this response might have been inconceivable or highly risky 5 years ago, unity among leaders now enables Cincinnati Children's to respond to complaints in ways that help to drive organizational transformation.
- *Leaders are more effective when working in teams.* Many improvement projects have a team leadership structure that bring complementary skills and influence to a project and

may include a physician, nurse, and sometimes an administrator. This structure is used for several reasons:

- *It helps to avoid the perception of winners and losers, which can lead perceived losers to withdraw from the improvement effort.* Problems owned by the physician and nursing staffs are much more likely to be solved in ways that are supported and sustainable for both groups.
- *It fosters a breakdown of the traditional cultural barriers between physicians and nurses and leads to an atmosphere where everyone recognizes the contributions of multiple staff types.* Transformation requires a culture that rejects hierarchy and embraces relevant expertise. By creating leadership teams, Cincinnati Children's is modeling the type of culture required for all types of staff to feel that their insights are valued and that their warnings of potential risks to patients will be taken seriously.
- *It creates more favorable conditions for stimulating enthusiastic physician engagement and involvement.* In some hospitals, physicians are regarded as obstacles to quality improvement, and those perceptions create resentments that lead to self-fulfilling prophecies. Cincinnati Children's works extensively to provide resources and expertise that will allow its physicians to help lead improvement efforts. Each Clinical System Improvement Integrating team is led by a physician and a non-physician. In this capacity, physicians work collaboratively to help develop and lead initiatives that improve systems and processes. The net effect of this effort is a growing number of physician leaders who can provide valuable perspectives and ideas required to drive the transformational goals that have been established.

**Developing an institutional infrastructure to support transformation.** Having a well-developed organizational infrastructure is key to efforts to achieve organizational transformation. Typically, infrastructure is equated with technology and information systems required to support an organization's mission. But when Cincinnati Children's began its transformation, it defined infrastructure development more broadly. This section addresses infrastructure at two levels: support infrastructure and technology infrastructure.

*Support Infrastructure.* Initial efforts focused on developing a support infrastructure for improvement that would provide the units and teams working on initiatives the expertise and resources they would need to be successful. This investment supports efforts to make the right thing to do the easy thing to do.

Cincinnati Children's also regarded support infrastructure as essential for addressing quality improvement at points where distinct subsystems intersect with one another. Facilitating improvement and breaking down silos within the system were major emphases. Developing this support infrastructure made it easier for Cincinnati Children's to establish unit and leadership accountability for improvement efforts by ensuring that units and their leaders had the resources necessary for them to succeed. The remainder of this section describes in more detail the support infrastructure that was created.

Central to the support infrastructure is the Division of Health Policy and Clinical Effectiveness, which was created to support the needs of the improvement teams. This division has grown to 30 full-time employees including experts in patient safety, evidence-based care, measurement and analysis, and quality improvement. Rather than hiring clinical experts who had some training in quality improvement, or people who really wanted to help improve care processes, Cincinnati Children's has chosen to hire quality improvement consultants from outside the field of healthcare. Several factors make these consultants unique:

- They have established track records for improving processes that give them credibility with the clinicians they work with. Because they do not have clinical backgrounds, they are well suited to ask process and flow questions without threatening the clinical staff. Most of these consultants have a minimum of 5 to 7 years of experience in quality improvement and training in Lean methodology and Six Sigma.
- Their role is to serve the teams working on the improvement rather than the leads responsible for achieving the change. This consultative role ensures that ownership of the improvement efforts remains with the units and teams that provide the patient care. This approach increases staff buy-in as well as the sustainability of improvement efforts.

In addition to these consultants, the division also includes data analysts. Typically, data analysts have master's degrees; a background in clinical or health services research; and competency in precise definition of metrics, study design, internal review board (IRB) process, and project management. Beyond these skills, the analysts must have the capability to communicate effectively with clinical staff to define measures, explain results, and support the development of processes for collecting and reporting data in ways that help drive improvement.

In addition to supporting improvement efforts, Cincinnati Children's support infrastructure encompasses the budgeting of:

- Time for staff training off of their unit on quality improvement strategies.
- Resources, such as additional staffing, funding, and enhanced data analysis capabilities, to support staff working on high priority quality improvement projects and to support the testing of new ideas and innovative practices to determine whether they work and can be spread across the organization.

*Technology Infrastructure.* Cincinnati Children's has invested a substantial amount of time and money in technology in order to collect and monitor key clinical and efficiency measures more easily and efficiently. Although it regards these initiatives as critical, a major emphasis has been placed on ensuring that processes are designed well before they are automated.

At present, the organizational infrastructure is the foundation for efforts to monitor performance at the unit and system levels. This allows clinical systems improvement teams, business units, and clinical divisions to be held accountable for improving and sustaining performance measures. This infrastructure also supports the commitment to rapid cycle improvement driven by current and accurate data.

Some participants in the site visit were impressed with the resources available at Cincinnati Children's to help drive organizational transformation, so group discussion addressed similarities and differences between the organization's situation and those of other hospitals. Cincinnati Children's does not believe that additional funding and extra staffing were key to the success of its initiatives, and that there are many examples of organizations with a great deal of funding and limited staffing constraints who have accomplished very little. At Cincinnati Children's, there is a clear recognition of ongoing challenges that it must still address, including:

- Building capability for widespread use of improvement and reliability sciences
- Creating sufficient time to do improvement work and embedding it into daily activities
- Recognizing improvement work as a legitimate academic pursuit

Clearly, investments in the infrastructure required for transformation are important, but even organizations that may lack capital for major technology investments can profit from what Cincinnati Children's has learned about how to most efficiently invest in support infrastructure.

**Rigorous measurement.** Although it is a world-class research center, Cincinnati Children's began its transformational journey with comparatively little data about many important clinical outcomes. Absent such information as well as much research on expected outcomes for pediatric care drawn from the published literature, it was difficult to determine where to focus improvement efforts and hard to motivate units to work on improving outcomes. Recognizing the importance of these limitations, a major effort was made to develop, implement, and monitor an expanding set of process and outcome measures. Several important insights from these efforts to promote rigorous measurement have broad relevance:

- Concentrate on developing useful and measurable outcome measures as a main goal. Through its transformational development, Cincinnati Children's has learned that it is more important to measure fewer, yet significant outcomes and resist the temptation to measure too much too soon.
- Ask key questions before starting the data collection process:
  - What do we want to know?
  - How are we going to collect that information in the clinical process?
  - What are we trying to show at the end of the data collection?
- Hire a manager for data infrastructure, if possible, who will lend credibility to the process.
- Establish regular reporting schedules and stick to those schedules, be it a monthly, quarterly, or yearly.
- Use the information collected to help drive improvement. If information is not used, it is important to understand why so that either the measures can change to ones that are more relevant or the information can be compiled and shared in ways that are easier for people to use.

**Transparency.** In a culture that stresses continuous improvement, easy and open access to information is essential. Like other organizations that have embraced high reliability organizing,

Cincinnati Children's embraces the belief that open communication is necessary for its transformation to succeed. The following are key aspects of transparency:

- *Transparency must span all levels of the organization.* Holding information about organizational successes and failures at the leadership level often can be counterproductive. Without making information available to all staff, they cannot fully participate in rapid cycle improvement. Moreover, in order to motivate staff to change behaviors and give them freedom to think creatively about potential improvements, they need full access to information about what is working well and what could be working better. Once information is shared, the opportunity exists to actually address the underlying cause.
- *Transparency must include recognition of successes as well as failures.* Improvement can only occur if failures are identified and addressed, but building a culture of trust that encourages staff to report failures is difficult. Cincinnati Children's has worked with one unit in particular to increase reliability and celebrate successes. When a near-miss event takes place, and a staff member accurately records the event, that staff member is acknowledged for reporting the event. Because continuous improvement efforts will entail both successes and failures, communicating about both is essential for transformation to occur.
- *Transparency should include patients and families.* Sharing information with patients and families can actually alleviate questions and concerns that may arise during the course of care. The key is to ensure that any information shared is presented in a way that is meaningful to the families and is easily understood. Involving families in organization-wide advisory councils and unit-based improvement teams is an effective way of sharing information and soliciting feedback on opportunities for improvement. In some units of systems in the HRO Learning Network, information about unit performance is posted in public locations where it can be seen by patients and their families.
- *Transparency should occur through multiple media.* Reporting information in multiple locations and through multiple media increases the odds that the information will be seen by a larger audience. Cincinnati Children's takes advantage of bulletin boards, computer screen savers, its intranet, and the Internet to share information with staff, patients, and families. Although it is a challenge, the organization has made a commitment to posting information in ways that patients and their families will be able to understand and use.

**Accountability and alignment.** To drive system change, people and units must know what they are being held accountable for, and these goals must be aligned with one another and a range of performance incentives. Developing a culture of accountability for outcomes takes good data and time. Cincinnati Children's has found value in taking the following factors into account:

- *Recognition and responsibility for outcomes have to be at the unit or division level to make the leaders more aware of, engaged with, and accountable for the initiatives.* This requires plausible data at the unit and division level, not just data that are aggregated across the entire facility.
- *Individual providers must clearly understand and buy into their role and contribution and that they are accountable for outcomes.* Discussion at the site visit addressed the issue of whether this is easier or more difficult when physicians are directly employed by

the hospital. On one hand, physician employees may be easier to incentivize through bonuses; on the other hand, physician employees who are uncooperative are more difficult to replace or eliminate than physicians with looser connections to the hospital.

- *Accountability at the provider and all other levels should be embedded into the annual review.* Beyond the ability of the review process to reward achievements, embedding performance metrics into the annual review reinforces the importance of performance measurement and quality improvement to the organization. Unit directors and division and department heads should be responsible for delivery system performance metrics because system performance is a key aspect of their responsibilities.

## **Conclusion**

Much discussion at the site visit focused on the role that resources play in achieving substantial and rapid organizational transformation. Cincinnati Children's clearly has made a major financial commitment to its organizational transformation. Although resources may have enabled the organization to attempt more transformation efforts more rapidly than would be possible in other systems, they are convinced that the success factors relate to the dimensions noted previously. Although resources are essential, leadership, support infrastructure, rigorous measurement, and accountability are the keys to maximizing available resources in support of transforming the organization.

# Building a Business Case for Quality and Organizational Transformation

## Background

Building a business case for quality is critical to achieving the unified support for organizational transformation on which success depends. If quality, safety, and continuous improvement are not regarded by the CFO and the board as key elements of the business model, the organization will lack the full alignment required to achieve substantial change. When Cincinnati Children's began its transformation, it did not have the CFO's full support. Instead, the CFO asked the leadership team at Cincinnati Children's to help him understand the benefits of investing in quality improvement initiatives so that he could set up a business model based on science and data that would still protect the institution's financial well-being.

Being a pediatric hospital, Cincinnati Children's generates much of its revenue from patients with highly complex conditions who travel distances to receive care at their institution, because of the quality of care they believe they can obtain. Pediatric hospitals receive little revenue from Medicare, so their revenue is directly linked to the services they provide as opposed to the DRG-based system through which most adult hospitals are paid. Despite the differences between pediatric and adult facilities, the process Cincinnati Children's used to engage its CFO and build its business case is one that, potentially, can be applied in other systems.

## Engaging the CFO

Three themes emerged in the presentation by Scott Hamlin, Senior Vice President, Finance and Chief Financial Officer of Cincinnati Children's, and subsequent discussion:

- Getting the CFO on board is critical. To the extent that the CFO influences resource allocation decisions, interacts with the board, and shapes compensation strategies for organizational leaders, organizational transformation is unlikely without the full support of the CFO.
- Getting the CFO on board is a gradual process. The CFO needs to be tactfully and patiently educated about issues related to quality and safety, as well as how these issues affect the hospital's financial performance. In Mr. Hamlin's case, it took several years for him to evolve from a skeptic about issues related to quality to a champion for quality's role in the hospital's business case. CFOs are trained to be skeptical and focused on financial issues, so it is unrealistic to think that a single presentation, workshop, or set of data will lead to a dramatic change in their outlook. More time and patience will be required.
- Giving CFOs data and tools that they can use to convince themselves of the business case for quality is essential. Cincinnati Children's helped to train the CFO's staff to perform analyses using matched case designs<sup>1</sup> that helped convince the CFO of the business case for quality. Analyses performed by quality staff would have been suspect, but once the

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<sup>1</sup> Defined on Page 16

## **Building the Business Case**

Cincinnati Children's business case grew out of some basic assumptions that leaders made about what the organization must do to attract patients. Over time, these assumptions have been synthesized into three value statements that form the basis of their business case for quality.

### **Value proposition: Success requires providing things of value to our patients.**

- Elements of value: Patients and their families place value on:
  - Quality (the best opportunity for a positive outcome and an experience with the hospital and its staff that is better than with competitors)
  - Cost (both direct costs of care and indirect costs associated with travel, length of hospitalization, etc.)
- Value goal: To provide the highest possible quality in our target price range (we will earn our price)

### **Value orientation.**

- Conclusion about value: Improving quality (outcomes and experience) will create value for which customers will pay. More often than not, improved quality can either reduce cost or create opportunities to generate more revenue.

### **Value commitment.**

- We must continuously prove our current value (which is only possible through the measurement and analyses that are part of improvement initiatives)
- We must constantly be in position to improve our future value (which requires ongoing strategic improvement activities)

A key insight to creating this business case was the recognition that better utilization through quality improvements can increase revenue. Most hospitals try to increase revenue by building more buildings and adding more staff. Although such growth was a part of its strategy, Cincinnati Children's leaders also recognized that they could increase revenue by more efficiently using existing resources. For example, preventing infections and other complications through a commitment to quality allowed patients to spend less time in the hospital. Beyond greater levels of patient and family satisfaction associated with shorter hospital stays, reduced infections also made more beds available for sicker patients, who generate more revenue for the hospital in the early days of their hospitalizations. Cincinnati Children's has created demand for

these beds and increased its patient population by positioning themselves as a leader in treating rare and complex childhood disorders, which has led to referrals and patients outside of the Cincinnati region. These efforts have led to a 17% annualized revenue growth over the past 5 years, with 50% of that revenue coming from outside the region.

Beyond a general recognition that quality is a key component to the value proposition of its system, Cincinnati Children's leaders have monitored their investments in quality infrastructure to assess their ability to simultaneously increase quality and reduce costs. Three examples of these efforts are provided to illustrate an approach for building a concrete business case.

## Use of Evidence-Based Care

The organization works in a collaborative effort with community physicians to improve care given at home to children with asthma, bronchiolitis, fever of an uncertain source, and gastroenteritis. Evidence-based medicine (EBM) shows that for many children, these conditions can be effectively treated by community physicians without admission to the hospital. In addition, they are low revenue-generating conditions. As a result of this effort, length of stay and need for hospital admission has decreased from 1996 to 2005 for children with the diseases targeted by clinical guidelines and improvement initiatives.

**Table 1. Reduced Inpatient Bed Utilization**

Condition	Decrease in Admission
Asthma	376%
Bronchiolitis	436%
Fever of uncertain source	586%
Gastroenteritis	6%

Because Cincinnati Children's has limited capacity, the bed space created by keeping these children out of the hospital created space for patients whose conditions generated more revenue for the hospital. Being able to schedule care more rapidly for these patients with complex needs contributed to greater patient and family satisfaction and probably reduced the number of patients who went elsewhere with shorter waiting times.

**Effective discharge planning.** Cincinnati Children's recognized that an improved discharge planning process would free beds for other patients and cut the number of beds occupied by patients who were generating little revenue for the hospital. The impact of their efforts to improve flow and inpatient capacity is illustrated as follows:

**Table 2. Percentage of Patients on General Pediatric Unit Who Go Home Within 4 hours of Meeting Discharge Goals**



**Effective discharge planning improves flow and inpatient capacity**

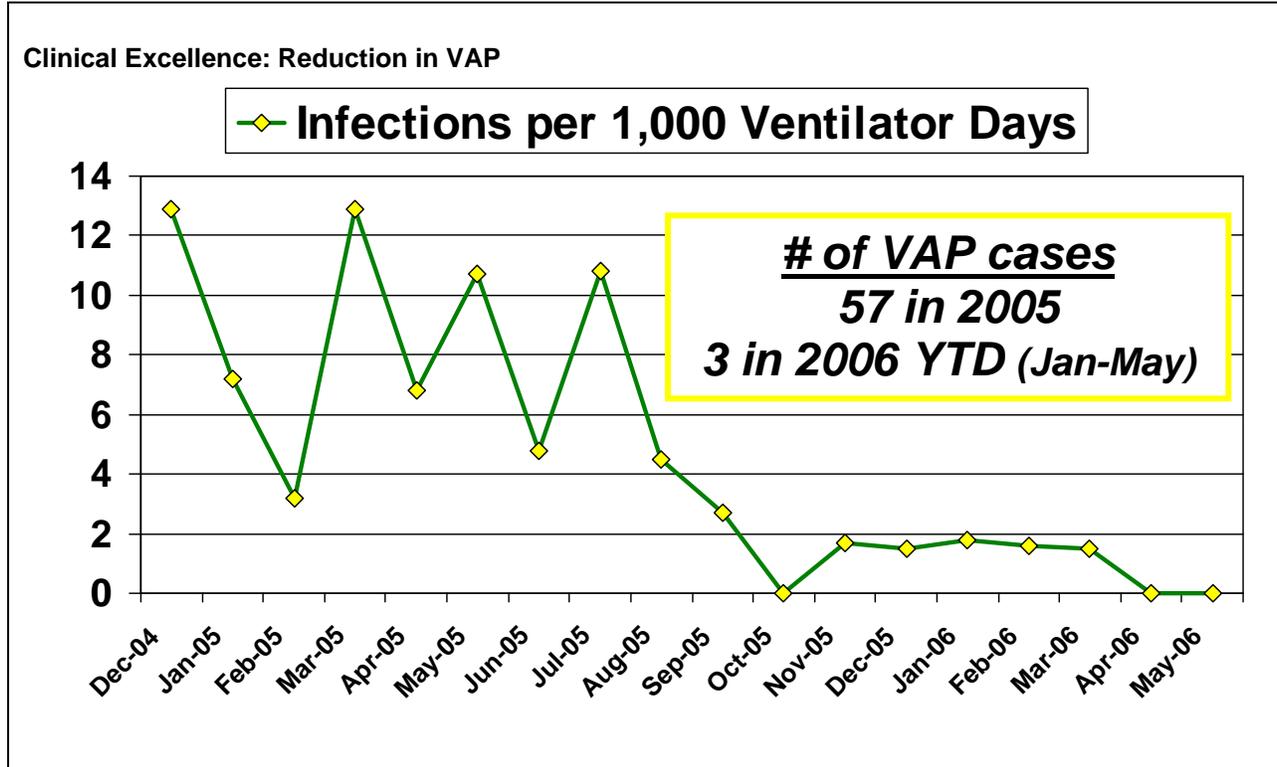
Beyond the clear impact that improved discharge planning had on bed capacity, this initiative also allowed Cincinnati Children’s to better monitor the availability of different types of hospital beds required for patients of different ages and with different medical issues. Initiatives such as this make a compelling case for increasing capacity without the expensive capital investments required to expand hospital facilities.

Discussion at the site visit also turned to the impact of improved flow on a range of staffing issues. To the extent that better flow reduces delays and ensures that beds will be available, Cincinnati Children’s reduces the need to reschedule surgical procedures that inconvenience both patients and the surgical teams. Moreover, improved ability to manage bed space is key to staffing units assuming full capacity rather than assuming less than full capacity and needing to pay expensive overtime or to add additional staff when a unit is full. Converting to this staffing model helps to reduce staffing costs while also providing employees with a more consistent schedule.

**Reducing ventilator-associated pneumonia and surgical site infections.** Using a bundle of interventions to reduce ventilator-associated pneumonia (VAP), Cincinnati Children’s saw an increase in days since the previous VAP move from 7 days in December 2003 to 238 days in May 2005. VAP increases mortality as well as the patient’s length of stay and cost of hospitalization.

In addition to VAP, Cincinnati Children’s is implementing an IHI bundle of interventions to reduce surgical site infections (SSIs). To date, there has been a decrease from 1.5 infections per 100 procedure days in December 2004 to just over 0.5 in May 2006.

**Figure 1: Clinical Excellence: Reduction in VAP**



Some hospital administrators might regard these initiatives not as improvements in quality, but as reductions in the amount of revenue generated by the hospital. Cincinnati Children’s examined the financial impact of these activities more closely using a matched case–control design study. Their analysis matched patients who did not have SSIs with the same or equivalent surgical procedure, age, procedure date, and co-morbidities with patients who had SSIs. Chart reviews were conducted to refine candidates and assess whether the SSI was preventable.

As they expected, the SSIs added on average 10.4 days to the length of stay and \$60,480 in additional charges. They also found, however, that the SSIs in their study caused a loss of 208 days of time that beds could have been occupied by higher utilization, sicker patients. Moreover, because many of Cincinnati Children’s patients are on Medicaid, which pays only one rate for a stay regardless of an SSI, the costs associated with the SSI for these patients were entirely born by the hospital.

Figure 2: SSI Study Results: Aggregate Cumulative Charges

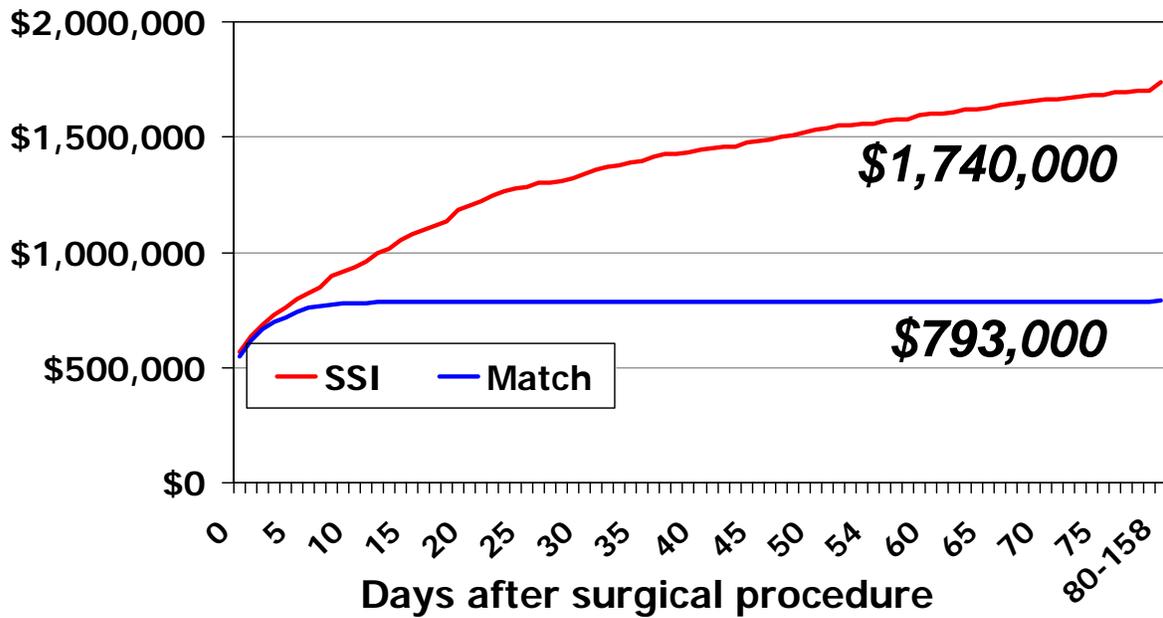


Table 3: SSI Overall Results

	Aggregate 16 Patients		Average per Case (n = 16)	
	Hospital Days	Gross Charges	Average Length of Stay	Gross Charges
Pre-SSI	74	\$772,000	4.6	\$48,250
Post-SSI	166	\$968,000	10.4	\$60,480
<b>Total SSI</b>	<b>240</b>	<b>\$1,740,000</b>	<b>15.0</b>	<b>\$108,730</b>
<b>Total match</b>	<b>70</b>	<b>\$793,000</b>	<b>4.4</b>	<b>\$49,563</b>

This example illustrates how a matched case design can help assess and document the business case for many quality improvement initiatives. By considering costs resulting from complications, the extent to which those costs are (and are not) passed on to payers, and the lost opportunity costs associated with those complications, Cincinnati Children’s was able to provide compelling financial reasons for supporting a key quality improvement initiative.

## Conclusion

Building a business case for quality is a slow process that requires the ability to measure quality, assess costs accurately, and engage the CFO and financial analysts in developing analyses to assess financial impact accurately.

# Specific Improvements Toward Organizational Change

**How has the broad commitment to organizational change been translated into specific improvements that make patient care and the patient experience better than it used to be?**

More often than not, more improvement opportunities exist than an organization has time to tackle at any given point in time. Given the excess of projects and the competing demands for time and resources, how can improvement priorities be set?

At Cincinnati Children's, several factors influence improvement priorities including: the significance of the clinical outcome, national imperatives for improving patient safety, and national benchmarking, but leaders at Cincinnati Children's have also developed a system for setting improvement priorities based on managing internal demands which is described below.

All new initiatives at Cincinnati Children's are classified as a system-level, department-level, or unit-level project. An upfront determination about the project level will help to determine the scope and resources needed to complete the project. A unit-level project, for example, may require a greater time commitment from the nursing staff on a specific unit and less time from a senior executive. By recognizing the difference, additional staffing resources can be planned for the unit in order to compensate for time invested in the project.

Once initiatives are classified by level, how are they prioritized at each level? Cincinnati Children's prioritizes initiatives with what it calls the DICE methodology, which is an acronym for a set of guiding questions to help with the prioritization process. The DICE guiding questions are:

- Duration: How long will this initiative take to complete?
- Integrity: Will this initiative break down if manipulated?
- Capability: Do we have the skill set within our staff to successfully complete this initiative?
- Effort: How much effort is required for this initiative?

Initiatives that score high on the DICE scale receive highest priority and access to resources.

After improvement priorities are set, the work of implementing the initiatives begins. The following are examples of improvement initiatives from Cincinnati Children's that helped to make processes and systems more reliable. These specific examples were highlighted during walkabouts on the first morning of the site visit. The information reported below is a reflection of the information reported back by the groups who participated in those walkabouts.

To make this section easier to navigate, each example is structured to answer the following questions:

- What is the challenge being addressed in this initiative?
- What are some of the HRO concepts taken into account during this initiative?
- What was the transformation process for this initiative?

- How did Cincinnati Children’s know whether the process changes represent improvements for this initiative?

## Emergency Department

**Identified challenge.** The Cincinnati Children’s emergency department recently underwent physical plant renovations. As a result of the renovations, the emergency department had a new opportunity to change the existing process for admissions, triage, and electronic registration to ones that would be more reliable and efficient. To date, the emergency department has not shown significant improvement in the flow measures, yet the team is continuing to look for and test factors in trying to find that breakthrough.

**HRO concepts employed.** The emergency department process redesigns primarily involved two high reliability concepts:

- Preoccupation with failure
- Deference to expertise

**Transformation process.** The new admissions process in the emergency department employs clerks at the front desk who greet and admit the patient, asking only for the patient’s name, age, and chief complaint. The patients are directed to the newly designed waiting area and are called back by pager to the desk when a nurse is ready for triage. Sensitivity to patient privacy has ruled out the old method of calling the patients name out to the group. Using the HRO principle of deference to expertise, the new admissions process requires a clear understanding that admitting clerks are not assessing patients beyond the “first look” method in which they have been trained. If they, or the family, believe that there may be reason for concern, a nurse is made available immediately to assess the patient’s condition.

During triage, a nurse assesses the patient in an individual room located in a separate triage area. A process change based on preoccupation with failure has made it more reliable for nurses to document and monitor each patient’s condition by having access to a computer terminal in each triage room instead of entering and referencing information with the electronic medical record (EMR) system at a central terminal after the triage examination. Similarly, like in the example above, deference to expertise is practiced during the nurse triage process in that the nurses do not give any medication beyond Tylenol or fever reducers, and if they, or the family, believe that immediate medication or treatment is needed, an emergency department physician is made available.

The EMR process further helps staff to be more preoccupied with failure by using a color-coding system that alerts all staff to the progress of a patient’s care, monitoring levels of acuity and sending alerts to staff based on certain preset parameters about the patient’s condition. All staff have received training on the EMR system.

**Observed improvements.** For more information about the observed improvements in the emergency department, please feel free to contact a Cincinnati Children’s representative. Contact information can be found at the end of this document.

## Pharmacy Redesign

**Identified challenge.** The pharmacy department at Cincinnati Children's faced three challenges: alleviate inefficient use of workspace in the pharmacy; decrease the number of missing, wasted, or returned medications from patient rooms; and reduce the processing time for medication orders.

**HRO concepts employed.** The high reliability principles used to address the pharmacy challenges were:

- Sensitivity to operations
- Preoccupation with failure

**Transformation process.** One way in which the pharmacy addressed some of the challenges was by using a real-time observation and implementation plan. A team was formed and asked to observe the process and workflow of pharmacists and pharmacy technicians during a regular workday. In one example, the observation team noted an inefficient use of lab workspace and asked the technicians for improvement suggestions. The technicians suggested that the addition of extra shelves would create a less cramped and more reliable workspace. A member of the observation team phoned the maintenance staff in the moment, and temporary shelves were installed so that the team could determine whether the additional shelves had a positive impact on the workspace. Following subsequent observations of that space, it was determined that the shelves had made a positive impact on the reliability of the technicians' work, and permanent shelves were installed.

The second way in which the pharmacy addressed some of the challenges was to adopt the Lean methodology coupled with physical plant renovations to remove waste in existing processes. A Lean consultant was hired to train staff on how to look for waste in processes. Physical plant renovations also reduced the distance that pharmacy staff had to walk in order to process and deliver medication orders.

**Observed improvements.** Results have shown a 50% reduction in the number of returned medications from patient rooms. Process efficiency measures also show a 58% reduction in pharmacy technicians' walking distance, a 43% increase in workspace and a 75% reduction in processing time, shortening the lengthy full day process to just 5 hours.

## Preventing Codes Outside of the ICU

**Identified challenge.** Cincinnati Children's staff on unit A6S noticed that there was a higher than expected rate of codes occurring outside of the ICU. To address this problem a decision was made to try and decrease the rate of codes occurring outside of the ICU by focusing on prevention in their unit, which had already begun adopting high reliability concepts to improve quality and patient safety. The unit developed the Pediatric Early Warning Score (PEWS) as an improvement initiative aimed at reducing codes.

**HRO concepts employed.** The PEWS initiative primarily involves two high reliability concepts:

- Preoccupation with failure
- Sensitivity to operations

**Transformation process.** While A6S tried to find solutions to help prevent codes in the unit, the clinical director found an early warning score system for adults in the United Kingdom. Adapting that to children, the unit developed PEWS, which is an objective assessment of every patient to determine their clinical deterioration and how likely they may be to code. Depending on the score (ranging from 0–10), staff must take certain actions to ensure proper treatment and decrease the likeliness of a code.

When the unit first began implementing the initiative, it discussed PEWS with unit staff. Because staff were already doing the different clinical assessments, they just needed to change how they were reporting and using this information. The PEWS chart has specific instructions for what to do depending on a patient’s score. This is sensitive to the fact that sometimes nurses are reluctant or hesitant to call interns and residents if they are unsure of the necessity. Instead, the PEWS algorithm makes this decision for the nurses, so no debate or questioning is necessary. In addition, the unit discussed the initiative with patient families and got family buy-in for the display of a large PEWS chart in the hallway, which shows each patient’s PEWS and allows the staff to review it regularly as they walk by.

**Observed improvements.** There are two major ways that Cincinnati Children’s knows that the PEWS initiative has made a difference. First, at the time of the site visit, it had been 164 days since the last code in the unit, which is an improvement. The unit has a goal of reaching one full year since the last code. Second, the staff has incorporated PEWS review as part of their daily activities. After reviewing the PEWS chart, they are immediately aware of the overall status of each patient and where and how to devote their attention.

## Decreasing Errors Through Computerized Work Orders

**Identified challenge.** Another area where Cincinnati Children’s wanted to focus its improvement efforts and become more reliable was with physician order entry. The challenge was to reduce errors in orders and transcriptions.

**HRO concepts employed.** The implementation of Computerized Physician Order Entry (CPOE) was successful because of its focus on:

- Deference to expertise
- Reluctance to simplify

**Transformation process.** Cincinnati Children’s began using a Siemens Web product for its CPOE, although the system has been greatly customized to meet the organization’s specific needs. Cincinnati Children’s first began implementing the CPOE in a few of its inpatient units

and then expanded the implementation to almost all of its inpatient units within 18 months. In most of these units, two mobile laptops now are used on clinical rounds. One of these computers is devoted to computerized work orders so that staff can enter work orders during the rounds. In addition, there are workstations in the hall where work orders are entered. During the initial implementation, residents found the order sets too complicated, and they actually got actively involved in redoing the design.

One of the unique aspects of Cincinnati Children's CPOE system is that the help desk support team is comprised of clinical staff as well as technical staff. This means that the help desk staff fully understand clinicians' language, needs, and processes.

**Observed improvements.** Immediately upon implementing the CPOE system, Cincinnati Children's found fewer clarification calls about orders, an elimination of transcription errors, and a 52% decrease in medication delivery time to the unit. The intermediate results included a decrease in unsigned verbal orders from 40% to 8%. The system itself has built-in improvements, such as automatic hard stops and automatic links for certain drugs. If a clinician ignores a system recommendation, he or she must give a reason why in the comment box. Therefore, the work order system is designed to be comprehensive and to improve care, not to be the quickest to navigate and put in entries.

## Reducing SSIs

**Identified challenge.** Cincinnati Children's recognized the need to address the challenge of surgical site infections in both inpatients and outpatients. Evidence-based studies demonstrate that patients receiving prophylactic antibiotics before surgical incision have lower SSI rates. Cincinnati Children's same-day surgery and inpatient surgery units are implementing evidence-based practices to reduce Class I and II nosocomial SSIs to 0.75 and 0.25 per 100 procedure days, respectively, by July 2006. The outcome measure is: nosocomial SSI rate/100 procedure days for Class I and II procedures. Process measures include timely antibiotic administration (percent given within 0–60 minutes before incision) and complete preoperative antibiotic orders received before 10 a.m. the day before surgery for same-day surgery patients and timely antibiotic administration (percent given within 0–60 minutes before incision) for inpatients. The site visit focused on same-day surgery.

**HRO concepts employed.** The SSI initiative primarily involves two high reliability concepts:

- Preoccupation with failure
- Sensitivity to operations

**Transformation process.** Cincinnati Children's used a bundle of interventions in this initiative. The transformation process included the following phases: define opportunities, measure performance, analyze opportunity, PDSA (plan, do, study, act), improve and sustain performance, and spread improvement. Two examples of how it implemented the bundle are as follows:

- Cincinnati Children’s recognized the need to ensure that all patients wear a proper indicator identifying whether they received a preoperative antibiotic. To do this, a patient wrist band is placed over the patient identification band on the same wrist to remind the clinician to check whether the patient received preoperative antibiotics when he or she checks the patient identification wrist band. In addition, other preoperative antibiotic reminders, such as stickers, all use the same color: orange. Cincinnati Children’s engraved this into the minds of its staff through a marketing campaign: ABC—Antibiotics Before Cutting. These methods of preoccupation with failure work to minimize errors.
- As an example of sensitivity to operations, Cincinnati Children’s recognized the need for one form for surgical prophylaxis antibiotic orders for all physicians to use. In addition, the department realized the need for a nurse to check all orders the day before the scheduled surgery. The nurse checks the next day’s schedule, the antibiotic list, and the physician order form, paying particular attention to missing information. Because of the time it takes for the nurse to perform this function (2 hours), the role of “antibiotic nurse” was created. Some nurses on the floor are trained, and the 2 hours of time is built into their schedule to be used for this function only.

**Observed improvements.** Efforts have led to a decrease in Class I infections from an average of 1.57 per 100 procedure days in 2004 to 1.15 in April 2006. Class II infections decreased from an average of 0.76 per 100 procedure days in 2004 to 0.30 in April 2006.

## Increasing Safety of Handoffs

**Identified challenge.** A lack of clear communication amongst staff may have contributed to a child’s death during a transfer from a unit to surgery. In response to this event, Cincinnati Children’s is in its third year of an effort to improve communication between clinicians when a patient is transferred between departments.

**HRO concepts employed.** The handoffs initiative primarily involves two high reliability concepts:

- Deference to expertise
- Reluctance to simplify

**Transformation process.** A checklist for patient transfers has been created and is used throughout the hospital. In addition to the checklist, Cincinnati Children’s requires the anesthesiologist to receive a handoff before the child is transported to surgery. After surgery, the attending surgeon or fellow must accompany the child back to the receiving floor for a handoff. Handoffs are measured on a 200 point scale where 100 points are based on objective measures regarding the completion of the handoff, 20 points are based on physician satisfaction, and 80 points are based on nurse satisfaction. A score of less than 180 is considered a failure. The HRO site visit focused on transfers to and from the cardiac care ICU.

The transformation unfolded over the course of 3 years. Cincinnati Children’s rolled out this initiative with cardiac surgeons and otolaryngologists. As the improvement initiative spread,

other specialties were included. Gaining the support of one neurosurgeon in particular was the tipping point for gaining the support of the rest of the surgeons.

In addition, when this initiative was initially instituted, the attending physician, fellow, and residents could act as the single physician present during the handoff. It was soon realized that residents did not have enough knowledge to be the sole physician at a handoff, and the rule was changed to attending physicians or fellows. This shows the organization's commitment to defer to expertise, which the residents had yet to develop. However, residents may accompany attending physicians or fellows.

Finally, the patient transfer checklist indicates the names of the physician and nurse present, and although many in the hospital know one another, Cincinnati Children's requires all handoffs to begin with introductions by all present. This reluctance to simplify a process addresses instances where staff do not know one another, which could occur often because of the various schedules both nurses and physicians keep.

**Observed improvements.** For more information about the observed improvements in improving the safety of handoffs, please feel free to contact a Cincinnati Children's representative. Contact information can be found at the end of this document.

## Neonatal ICU

**Identified challenge.** The neonatal ICU (NICU) at Cincinnati Children's faced the challenge of decreasing occurrences of VAP on its unit. In March 2005, the NICU experienced 11.3 VAP infections per 1,000 device days. At that time, Cincinnati Children's believed that the number of occurrences of VAP could be reduced and began working to create a more reliable process for preventing VAP.

**HRO concepts employed.** In working to reduce the occurrence of VAP, the two primary HRO principles that emerged during the transformation process were:

- Preoccupation with failure
- Sensitivity to operations

**Transformation process.** To address the challenge of the increasing occurrence of VAP, the NICU chartered a VAP team to create a bundle for preventing VAP using evidence based medicine as well as an education plan for teaching staff how to use the bundle. By May 2005, a bundle had been created, and education had begun. With the implementation of the bundles, the NICU saw the VAP infection rate drop to 0 per 1,000 device days by July 2005.

During August and September 2005, a small spike in VAP infection rates prompted the team to become more preoccupied with failure. The team put together a couple of job aids, including a ventilatory care checklist, to help nursing staff document and remember the important points outlined in the bundle. In addition, the bundles were attached to all ventilators for quick reference.

Being sensitive to operations, the NICU partnered closely with the infection control department to receive information about potential VAP cases earlier. This allowed the ICUs to conduct real-time investigations. Root cause analyses are always conducted for process and practice failures, and changes to the process are made immediately to improve patient care.

**Observed improvements.** Since the implementation of the new checklist in August 2005 and the addition of a few new heaters in September 2005, the NICU has been able to track and post infection rates of 0 per 1,000 device days between October 2005 and May 2006.

The NICU credits sustainability of the reduced VAP infection rate to the following:

- Ownership of work at the staff level
- Hardwiring the VAP bundle into flow sheets
- Including improvement work measures in performance evaluations
- Updating orientation competencies to include the VAP bundle
- Measuring compliance with the bundle elements as well as patient outcomes continuously
- Testing the use of real-time notification of VAP from infection control

## Transitional Care Area

**Identified challenge.** The transitional care area at Cincinnati Children's is a step-down unit. The challenge this unit, as well as other units the hospital area faced, was figuring out ways to involve families in the discussions about the care being provided in a way that is meaningful and makes the families feel like they are part of the decision-making team.

**HRO concepts employed.** In working to create ways for families to become more involved in the discussion about the care being provided for the patients, the primary HRO principle was:

- Preoccupation with failure

**Transformation process.** Involving families in the discussions about the care being provided for the patients in the transitional care area has been done in two ways. The first is to ask families whether they would like to be present and involved during rounds so that they are up to date on the plan of care for the patient. Using the HRO principle of preoccupation with failure, staff in the transitional care area uses a job aid in the form of a blue note card to cue them to the family's preference. This blue card is taped to the outside of the patient's door and indicates the family's preference to be present during rounds, to be woken up if they are asleep, to decline the opportunity to be present during rounds, and to just receive an update on the patient's condition at a later time. When rounding occurs, the caregivers simply refer to the blue card to determine whether the family would like to be involved.

Families of children awaiting or who have had liver transplants are provided with a portal that allows them to see important information, such as the medications list, dosages, improvements in condition, physician names, and other relevant information. Families also can use the portal to send messages to the patients' caregivers as well as to track the patients' progress over time.

**Observed improvements.** For more information about the observed improvements in the transitional care area, please feel free to contact a Cincinnati Children's representative. Contact information can be found at the end of this document.

## **Operating a High Fidelity Simulation Center**

**Identified challenge.** High fidelity simulation is widely regarded as an important way to train staff to work as teams on patients experiencing the range of conditions observed in a busy emergency department. The simulation center at Cincinnati Children's wanted to maximize the value of the training for participants and demonstrate its value to other hospital departments and healthcare providers so that the costs of its operations could be spread as broadly as possible.

**HRO concepts employed.** The simulation center emphasizes the creation of a realistic experience that will require teams to work together to successfully treat multiple patients at the same time as well as to respond to family members' concerns about the welfare of their child. Effective teamwork presumes all of the aspects of a high reliability system, including:

- Preoccupation with failure
- Deference to expertise
- Sensitivity to operations
- Reluctance to inappropriately simplify the care of a patient
- Resilience

**Transformation process.** Several innovations make the simulation experience at Cincinnati Children's one of high perceived value for physicians, nurses, and other staff:

- Staffs are trained as multidisciplinary teams, which allow them to practice principles of effective teamwork and to receive feedback on what could allow their team to function more successfully.
- Patients experience complications that challenge participants to monitor and adapt to changes in the patient's condition, as reflected in real-time monitors of heart rate, pulse, and other vital signs. Beyond the clinical care of the patient, the teams also must address the concerns of parents and others in the room so that the experience matches the norm in many emergency departments.
- Participants receive immediate feedback on their performance as a team. Performances are scored so that progress can be trended over time and so that future training sessions can avoid duplicating experiences that the team handled effectively. The center has found that the impact of training tends to lessen after about 6 months, so continuous retraining is regarded as critical.

**Observed improvements.** The center retains scores and videotapes for all simulation sessions. It uses multiple strategies for assessing the impact of this training. Evidence of impact includes:

- Improvements in simulation scores for teams that have more training
- Observation of videotapes to establish improvements in team performance following additional training and practice.

- High levels of repeat and new business from departments other than the emergency department, from the nursing school, and from other healthcare providers outside of Cincinnati Children's.

At present, the center gets some funding from the emergency department; some comes from the training budgets of other departments; and some support comes through an AHRQ grant. A major ongoing challenge of the center is the creation of a sustainable business model. Key to this model will be the ability to support not only the equipment required for high fidelity simulation, but also the staff who program the simulators to exhibit complications and medical conditions that meet the needs of the center's constituencies.

## Lessons Learned

### What can be learned about how process redesign efforts can drive organizational transformation?

Many insights were shared at the site visit about organizational transformation. Following are a few key lessons that consistently emerged as critical knowledge for effective transformation:

- **Reducing resource investment in quality improvement initiatives during lean times is a mistake.** Optimally, dedicating resources to quality improvement initiatives should be a priority before an organization faces lean time, but if lean times are upon the organization, continuing to invest resources in quality improvement initiatives is imperative, especially if there is waste in the system. Additional savings and resources can be realized over time by eliminating wasteful practices and implementing more reliable, safer practices. Consider how efficiencies can be realized in all departments, not just in clinical areas. In order to determine which initiatives will make the best investments, one may use the DICE methodology and assess the initiatives on duration, integrity, capability, and effort.
- **Beware of bucketing errors into preventable and unpreventable categories.** Once errors fall into the unpreventable category, they often fall prey to the "out of sight, out of mind" phenomenon. Subscribe to the philosophy that all errors are preventable, but recognize that knowledge has yet to be created to prevent some errors. Invest research dollars and time in understanding how to make errors preventable.
- **Transformation requires ambitious targets and setting transformational versus incremental goals.** Pursuing perfection goals can help one to quickly identify serious system-level barriers that need to be addressed. Cincinnati Children's focuses on designing systems that will achieve 100% effectiveness and 0% defects and believes that it is not that much harder to strive for 100% effectiveness versus small incremental goals.
- **Start before you are ready.** Don't be paralyzed by the pursuit and creation of a perfect implementation plan. Much can be learned during the process of actually doing the work. If one is careful to prioritize initiatives ahead of time, then it is easier to strike a balance between working on what can be done now and slowly "peeling the onion."
- **Involving leadership at every level is critical.** Without engaged leadership, transformation is difficult to start and even more difficult to maintain. Leaders must take ownership for

setting the climate and focusing the work. Cincinnati Children's believes that the role of leaders is to make the job easier for those at the department level.

- **Create a culture of accountability and responsibility.** Helping staff to recognize that quality is everyone's responsibility will help to create a platform for making systems more reliable.

## Acknowledgements

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## Contact Information

If you are interested in acquiring more details about any of the information provided in this document, please find contact information below for representatives from Cincinnati Children's Hospital Medical Center.

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