

Becoming a High Reliability Organization: Operational Advice for Hospital Leaders

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Executive Summary

This document is written for hospital leaders at all levels who are interested in providing patients safer and higher quality care. It does not contain the views of researchers or theorists on how you can do better. Instead, it presents the thoughts, successes, and failures of hospital leaders who have used concepts of high reliability to make patient care better. It is a guidebook for leaders who want to do the same.

High reliability concepts are tools that a growing number of hospitals are using to help achieve their safety, quality, and efficiency goals. These concepts are not an improvement methodology like Six Sigma[®] or Lean. Instead, they are insights into how to think about and change the vexing quality and safety issues you face. Hospitals do most things right, much of the time. But even very infrequent failures in critical processes can have terrible consequences for a patient. Creating a culture and processes that radically reduce system failures, and effectively respond when failures do occur is the goal of high reliability thinking.

At the core of high reliability organizations are five key concepts, which we believe are essential for any improvement initiative to succeed:

- **Sensitivity to operations.** Preserving a constant awareness by leaders and staff of the state of the systems and processes that affect patient care. This awareness is key to noting risks and preventing them.
- **Reluctance to simplify.** Simple processes are good, but simplistic explanations for why things work or fail are risky. Avoiding overly simple explanations of failure (unqualified staff, inadequate training, communication failure, etc.) is essential to understanding the true reasons why patients are placed at risk.
- **Preoccupation with failure.** When near-misses occur, these are viewed as evidence of systems that should be improved to reduce potential harm to patients. Rather than viewing near-misses as proof that the system has effective safeguards, they are viewed as symptomatic of areas in need of more attention.
- **Deference to expertise.** If leaders and supervisors are not willing to listen and respond to the insights of staff who know how processes really work and the risks patients really face, you will not have a culture in which high reliability is possible.
- **Resilience.** Leaders and staff need to be trained and prepared to know how to respond when system failures do occur.

This document shows how hospital leaders have taken these basic concepts and used them to develop and implement initiatives key to enhanced reliability. The document shows how the concepts have been used to:

- Change and respond to the external and internal environment
- Plan and implement improvement initiatives
- Adjust how staff does their work

- Implement improvement initiatives across a range of service types and clinical areas
- Spread improvements to other units and facilities

Summaries of applications in each of these areas are followed by more extended discussions of them drawn from a series of site visits and case studies of systems that participated in AHRQ's High Reliability Organization (HRO) Learning Network. Beyond the table of contents, there are two ways to easily locate the issues of most interest to you. One index allows you to locate particular clinical issues to which high reliability concepts have been applied while a second index allows you to locate discussions of particular high reliability concepts.

Applying high reliability concepts in your organization does not require a huge campaign or a major resource investment. It begins with leaders at all levels beginning to think about how the care they provide could become better than it is. We hope that this document will help you see what is possible, and that it will help you begin the process of transforming your organization into one where safe, high-quality, and efficient care is received by each of your patients.

Appendixes are available on AHRQ Web site: <http://www.ahrq.gov/qual/hroadvice>

Report

Transforming Hospitals into High Reliability Organizations

Introduction and Overview

The Institute of Medicine (IOM) and others have stressed the urgency of transforming hospitals into places where each patient receives the best quality care, every single time. This is a daunting challenge, and there are many reasons why most hospital leaders would candidly admit that they are far from this goal. In conversations with leaders of hospitals with national reputations for their accomplishments in the areas of patient safety and quality there is one recurring theme: the need to change their systems and processes to achieve substantial increases in reliability over present levels. In their efforts to achieve these changes, innovators have looked outside the health care industry to identify examples of extremely high reliability organizations, which can, and do, achieve exceptional levels of reliability. Of course, commercial aviation, nuclear power, aircraft carriers, and other sectors known for high reliability differ from the health care system in critical ways. Concepts and approaches they have used cannot be directly duplicated in American hospitals. Instead, they needed to be adapted before being applied to hospitals' challenges.

In September 2005, the Agency for Healthcare Research and Quality (AHRQ) convened a group of leaders from 19 hospital systems that were committed to the application of high reliability concepts. While some of the hospital systems had national reputations for quality, others were less advanced. All, however, wanted to learn from each other—and from experts inside and outside of health care—about how they could apply concepts of high reliability organizing in ways that would make their hospitals better for their patients.

This document brings together many of the lessons that have been learned working with these systems for the past 18 months. It is important to stress a few things this document is not. It is *not*:

- A cookbook for producing high reliability. All hospitals are different, have different challenges, resource levels, and cultures. Any cookbook that prescribed exactly what you should do to become a high reliability organization is bound to fail.
- An exhaustive summary of the latest literature and theorizing about high reliability. We understand that readers of this document are focused on providing high quality care (and staying solvent)—not on becoming experts in high reliability. So we explain the concepts, cite sources where you could learn more, and focus on applications and insights which have proven the most valuable for the leaders with whom AHRQ has been working.
- A description of a new methodology for quality improvement. Different members of the HRO Network use approaches including Six Sigma[®], Lean, Baldrige, and Total Quality Management (TQM). High reliability concepts help focus attention on the mindset and culture that is essential for any of these approaches to work. While high reliability concepts are very useful, you shouldn't view them as conflicting with strategies or vocabularies that you already may be using to promote quality and safety.

A roadmap to help you arrive at a state of high reliability, in which your hospital has reached a permanent state of high reliability where patients always receive exactly the care they need and

the care is provided in systems that have no inefficiencies or waste. High reliability organizing is an ongoing process that is never perfect, complete, or total. Commercial aviation is highly reliable in preventing crashes, but crashes still occur. And while we are willing to trust airlines to protect our lives, we are much less confident that we can trust them with our baggage. So while this document will help explain the processes that you can use to improve the reliability of your hospital, it also will help you understand why high reliability is a continuous action—not a program you can successfully implement and then move on to other things.

The purposes of this document are to:

- Define high reliability concepts and describe the importance of these concepts to hospitals like yours. The first section of this document will give you a working understanding of the mindset needed for high reliability organizing and why this mindset is indispensable to efforts to improve patient safety and quality.
- Describe applications of high reliability concepts within the field of health care. The examples we describe in this section are drawn from the experiences of the systems who have participated in the AHRQ HRO Learning Network. These systems were able to invest considerable time and effort in learning from other industries and experimenting with a range of high reliability applications in their hospitals. They have been eager to share what they've learned through this process with each other, and with leaders from other hospital systems. We believe there is much to be gained from seeing how these hospitals dissected their problems, tried to fix them, and what they learned about high reliability through this process. These systems are among the first who have operationalized high reliability concepts within health care. Describing what they have done may help you identify your own opportunities to radically enhance the reliability of your own systems.
- Suggest applications of high reliability concepts that you may want to consider for your organization. This section is followed by an appendix that provides additional detail about the AHRQ-sponsored HRO Learning Network.

What are High Reliability Organizations and Why Do They Matter?

Challenges Calling for High Reliability

High Reliability Organizations (HROs) are organizations with systems in place that are exceptionally consistent in accomplishing their goals and avoiding potentially catastrophic errors.¹ The industries first to embrace HRO concepts were those in which past failures had led to catastrophic consequences: airplane crashes, nuclear reactor meltdowns, and other such disasters. These industries found that it was essential to identify weak danger signals and to respond to these signals strongly so that system functioning could be maintained and disasters could be avoided.^{2,3}

As the responses of these industries to risks were studied, a set of challenges was identified that all the organizations pursuing high reliability had in common.⁴ Many of these characteristics exist in the average hospital as well.

- **Hypercomplexity.** HROs exist in complex environments that are dependent on multi-team systems that must coordinate for safety. The safety of a hospitalized patient depends on the effective coordination of physicians, nurses, pharmacists, medical technicians, technicians who maintain equipment, support staff who provide meals and maintain the physical environment, and many others. Hypercomplexity describes hospitals as well as it describes nuclear power plants.
- **Tight coupling.** HROs consist of tightly coupled teams in which the members are dependent on tasks performed across their team. A safe surgery depends on the ability of nurses, medical technicians, the surgery team, housekeeping, and transport to coordinate their efforts so that the patient arrives in surgery at the right time, with the right preparation, and with the right tools and supplies available for the operation to proceed smoothly. Every hospital leader recognizes that this coordination is critical, but is often far from perfect.
- **Extreme hierarchical differentiation.** In HROs, roles are clearly differentiated and defined. Intensive coordination efforts are needed to keep members of the teams working in a cohesive manner. During times of crisis, however, decisionmaking is deferred to the most knowledgeable person on the team, regardless of their position in the organization.
- **Multiple decisionmakers in a complex communication network.** HROs consist of many decisionmakers working to make important, interconnected decisions. Like all hospitals, HROs must develop processes that allow these decisionmakers to communicate effectively with each other.
- **High degree of accountability.** HROs have a high degree of accountability when an error occurs that has severe consequences. In this respect, hospitals differ somewhat from many HROs, since medical errors tend to affect single patients rather than large groups of people at once. Moreover, despite flawless care, patients in hospitals do die, so distinguishing those patients whose deaths were inevitable from those whose deaths the hospital could have averted is not easy.

- **Require frequent, immediate feedback.** HROs exist in industries where it is critical that team members receive frequent feedback at all times. This feedback and the opportunity to make continuous adjustments based on it are essential to anticipate and avert problems before they become crises. Hospitals also are filled with equipment and personnel offering this type of feedback to staff. But for them to function as HROs they need systems and a mindset that will allow people to receive and respond to feedback, rather than being overwhelmed by information.
- **Working under compressed time constraints.** Time constraints are common to many industries, including health care. In HROs, the systems and culture allow people to identify when they lack time to reliably complete all needed tasks and obtain additional assistance. Hospital staff faces the same challenge, but do not always have staff members with the resources and training needed to maintain high reliability when facing a significant time constraint.³

We suspect that the seven environmental challenges noted above describe your hospital, just as they describe the industries in which high reliability concepts were originally developed. From our conversations with health care leaders, two other challenges make high reliability in health care even more difficult—and important. These include:

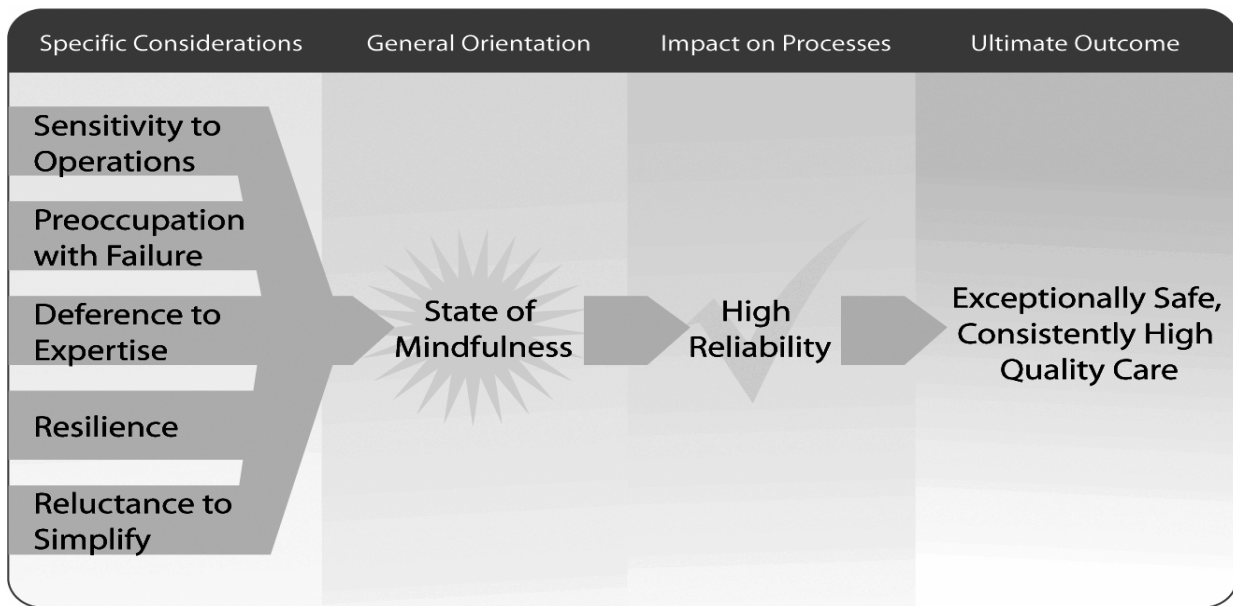
- **Higher workforce mobility.** Hospitals tend to have a workforce that has higher turnover and less intact teams than in many other industries. This makes training more critical (and expensive) and increases the importance of standardization of equipment and procedures.
- **Care of patients rather than machines.** Most of the industries emphasizing high reliability deal with machines and processes that are mechanical, and whose design and condition is meticulously documented. But at the heart of hospital care are patients, about which little is often known, and whose behavior (and whose families' behaviors) varies from others and can change over time. These factors create a degree of unpredictability that challenges hospitals in ways other industries do not.

High Reliability Organizing Concepts

Weick and Sutcliffe² have identified five characteristics that need to guide the thinking of people in an HRO. We think it is important to emphasize that these are approaches to thinking about issues rather than behaviors, plans, checklists, etc. If a high reliability mindset does not exist among the people running an organization, no set of behaviors or rules will ever produce extremely high reliability within the organization.

Figure 1 illustrates the relationships between the five characteristics of mindfulness and the ultimate goal of health care organizations: exceptionally safe, consistently high quality care. We regard these five characteristics as fundamental to successfully reengineering care processes to achieve exceptionally low levels of defects. Without a constant state of mindfulness, an organization will be unable to create or sustain highly reliable systems.

Figure 1. The five specific concepts help create the state of mindfulness that is necessary for reliability, which in turn is a prerequisite for safety.



This section describes these five operational processes. A later section will apply them to health care operations more directly.

Sensitivity to operations. HRO’s recognize that manuals and policies are ever-changing, and are mindful of the complexity of the systems in which they work. They work quickly to identify anomalies and problems in their system to eliminate potential errors.¹ Maintaining “situational awareness” is important for staff at all levels because this is the only way anomalies, potential errors, and actual errors can be quickly identified and addressed. Sensitivity to operations will both reduce the number of errors that do occur and allow errors that occur to be quickly identified and fixed before their consequences become larger.

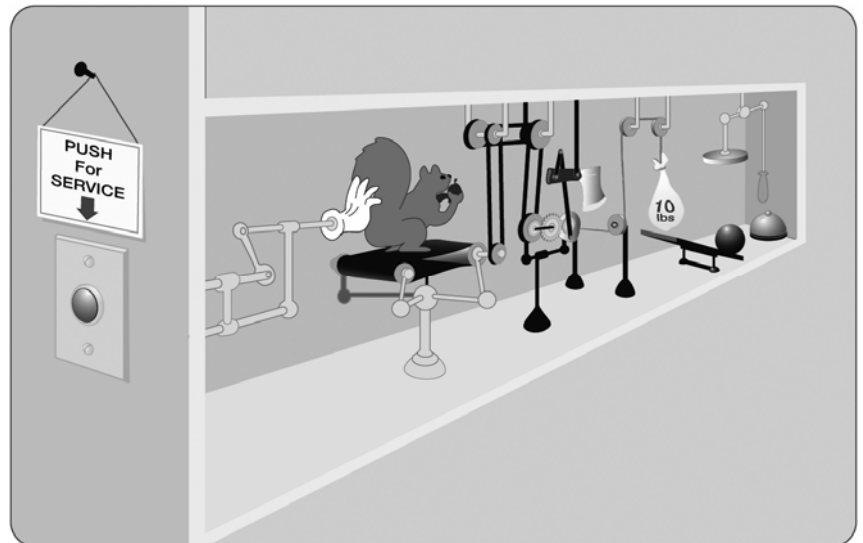
Figure 2. Sensitivity to operations



Sensitivity to operations encompasses more than checks of patient identity, vital signs, and medications. It includes awareness by staff, supervisors, and management of broader issues that can impact patient care, ranging from how long a person has been on duty, to the availability of needed supplies, to potential distractions that can impact patient care.

Reluctance to simplify. HROs refuse to simplify or ignore the explanations for difficulties and problems that they face.⁵ These organizations accept that the nature of work is complex, and do not accept simplistic solutions for challenges confronting complex and adaptive systems.⁵ They understand that their systems can

Figure 3. Reluctance to simplify



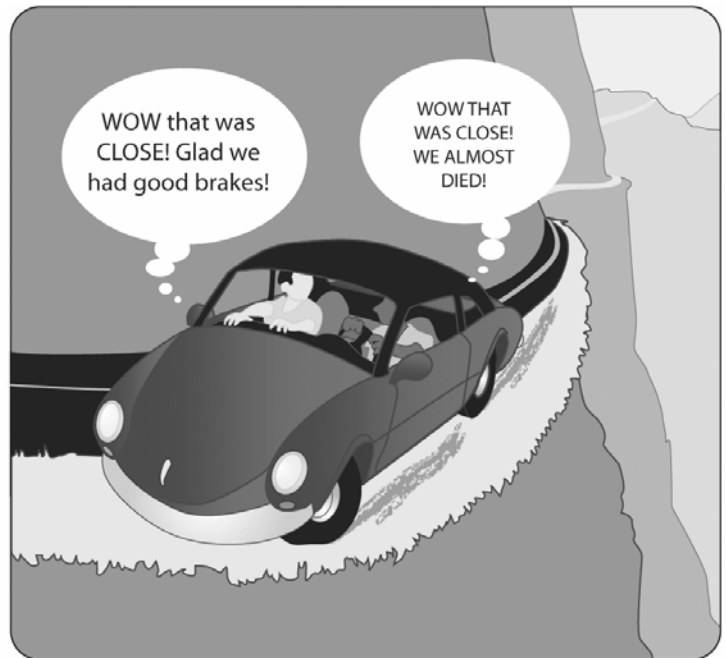
Oversimplifying explanations for how things work risks developing unworkable solutions and failing to understand all of the ways in which a system may fail, placing a patient at risk.

fail in ways that have never happened before and that they cannot identify all of the ways in which their systems could fail in the future.⁵ This does not mean that HROs do not work to make processes as simple as possible. They do. But it does mean that all staff members are encouraged to recognize the range of things that might go wrong and not assume that failures and potential failures are the result of a single, simple cause. HROs build diverse teams and use the experiences of team members that understand the complex nature of their field to continually refine their decisionmaking methods.¹

Preoccupation with failure. HROs are focused on predicting and eliminating catastrophes rather than working in reaction to them.⁵ These organizations constantly entertain the thought that they may have missed something that places patients at risk. “Near-misses” are viewed as opportunities to improve current systems by examining strengths, determining weaknesses, and devoting resources to improve and address them.^{1,5} Near misses are not viewed as proof that the system has enough checks in it to prevent errors, since that approach encourages complacency rather than reliability. Instead, near misses are viewed as opportunities to better understand what went wrong in earlier stages that could be prevented in the future through improved processes.

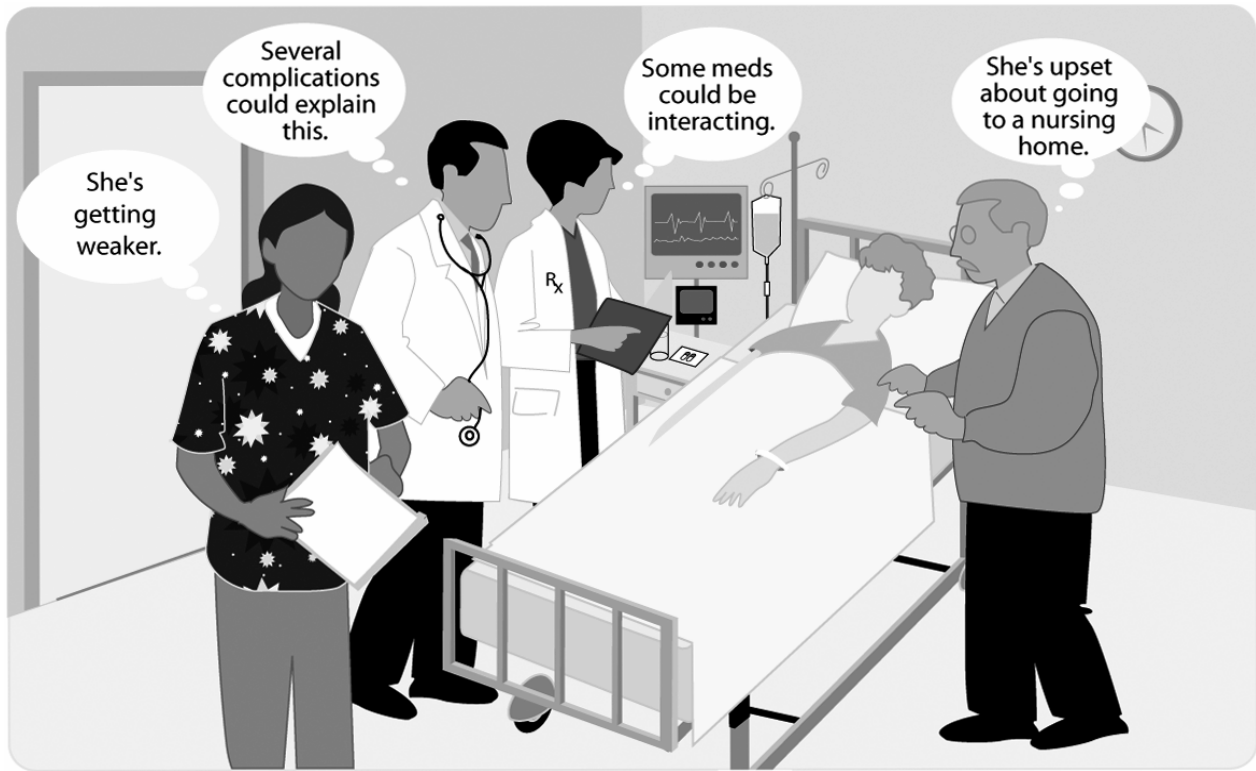
Deference to expertise. HROs cultivate a culture in which team members and organizational leaders defer to the person with the most knowledge relevant to the issue they are confronting. The most experienced person or the person highest in the organizational hierarchy does not necessarily have the information most critical to responding to a crisis.¹ A high reliability culture requires that staff at every level are comfortable sharing information and concerns with others—and that they are commended when they do so. A de-emphasis on hierarchy is essential for organizations to prevent and respond to problems most effectively.⁵

Figure 4. Preoccupation with failure.



A preoccupation with failure means that near misses are viewed as invitations to improve rather than as proof that a system has enough checks to prevent a catastrophic failure.

Figure 5. Deference to expertise



In many situations, different staff members as well as the patient and family may have information essential to providing ideal care. Deference to expertise entails recognizing the knowledge available from each person and deferring to whoever's expertise is most relevant to the choices being made.

Resilience. HROs pay close attention to their ability to quickly contain errors and improvise when difficulties occur. This allows systems to continue functioning despite a set-back.^{1,5} An HRO assumes that, despite considerable safeguards, the system may fail in unanticipated ways. So they prepare for these failures by preparing staff to perform quick situational assessments, working effectively as a team that defers to expertise, and practicing responses to system failures.^{2,5}

Figure 6. Resilience



A good boater never leaves the dock without being prepared for many eventualities that are unlikely, but possible. Oars, pump, life jacket, and fire extinguisher are brought to assure the boater can quickly respond to unexpected system failures.

Using High Reliability Concepts in Hospitals

Organizations have explicitly pursued high reliability concepts for more than 20 years, but these concepts have a shorter history within health care.³ Reasons for interest are numerous. Lack of reliability contributes to medical errors, inconsistent quality, and inefficiencies. And with scrutiny from a growing number of external stakeholders, hospitals must become more reliable to compete and to provide care that meets the needs of their patients. Three specific trends in the overall environment have contributed to a growing emphasis on high reliability concepts:

- **Public awareness of medical errors and quality.** Never before have patients, their families, and other stakeholders known as much about the quality and existence of errors in hospitals. The IOM report made hospital errors a part of the public consciousness; public reporting by CMS and a growing number of states allows consumers to see and ask questions regarding care quality. Hospitals and the boards that govern them are using these data to compete in the market place—or these data are being used against them. Public advertising campaigns encourage consumers to request information from their providers.
- **Health Information Technology.** Health IT has allowed some hospitals to more precisely monitor their systems of care, the dispensing of medications to patients, and the amount of system waste. This data has focused attention on the frequency with which the ideal care is not provided for the patient. But Health IT has also affected hospitals in

another way. Hospitals embracing Health IT have found that automating flawed systems can make their operations less efficient rather than more. As a result, making systems reliable before they are automated has become a priority.

- **Emergence of quality improvement methodologies.** A wide range of specific improvement methods have been embraced within health care, ranging from total quality management and continuous quality improvement, to ISO and Six Sigma, to Lean Thinking and Baldrige. While each of these methods has a distinct vocabulary, philosophy, and method, each approach emphasizes the need to make all aspects of care better and more reliable than they currently are.

Applying High Reliability Concepts in Hospitals

Applying high reliability concepts in hospitals is not easy—or easy to explain. While practitioners want concrete steps to take, the challenge of becoming a high reliability organization is more complex. In fact, this transformation must occur over a period of time and take into account factors ranging from general environmental issues, to the training and oversight of staff, to processes for planning, implementing and measuring new initiatives, to the specific work processes occurring on units. A high reliability mindset views each of these levels as important, and as a source of both opportunities and threats to achieving exceptionally high quality patient care.

Discussing and enhancing applications of high reliability concepts was the focus of the AHRQ HRO Learning Network. This section is based on a series of site visits and case studies drawn from hospital systems participating in the Network. These documents are included in their entirety as appendices. This section synthesizes themes from these documents so you can understand how a high reliability mindset impacts the following issues:

- Changing and responding to the external and internal environment
- Planning and implementing improvement initiatives
- Approaches to doing work
- Approaches to measuring progress
- Specific improvement initiatives
- Spreading improvements to other units and facilities

The table of contents and index will allow you to locate topics of interest easily across the appendices attached to this document.

Changing and Responding to the Hospital's Environments

Hospitals and their staff operate within an external environment shaped by government regulations, characteristics of their patient populations, the job market for health care professionals, and the extent of competition from other sources of care. Hospital workers also confront an internal environment shaped by leadership priorities, resources available for training and improvement initiatives, and policies regarding responses to medical errors and quality defects. This section summarizes how a high reliability mindset impacts these environmental issues.

Figure 7: Leaders of hospitals must juggle many environmental factors that impact their facilities.



External Environment

Leaders of hospitals and hospital systems are the people most aware of the environmental factors that impact their facilities and they are also the ones most capable of attempting to change this environment. In Minnesota, a set of these leaders began to meet informally to discuss issues of mutual concern. Each knew that their facilities had safety and quality concerns, but they recognized that these issues had causes that were more complex than simplified explanations such as inadequate staff training, poor communication, or the failure to follow defined policies. This reluctance to simplify was combined with an awareness of operational failures, which sometimes hospital leaders lack. These informal discussions gradually led them to recognize and collaborate on environmental issues that had previously undermined their efforts to become more reliable and safe. Their collaboration allowed them to:

- **Address environmental barriers more effectively.** Collaborating on community level barriers to improve safety and reliability through collaboration was more likely to be successful than individual organizations' attempts to address the same barriers. These collaborations made it easier to work with legislative groups and occupational oversight boards to change policies needed for a culture of high reliability. Broad-based support was also critical to efforts to develop an innovative and successful system for reporting near misses and errors.
- **Achieve cross-hospital standardization.** Sharing a workforce among hospitals, including nurses and specialists was a great motivation for standardizing forms and processes across all institutions. This strategy reduced variations in work patterns as well as the potential for errors and unnecessary re-work. The collaboration also created opportunities for standardizing the measuring and reporting of quality issues. This made it easier to more accurately set priorities, develop consistent requirements, and to evaluate progress.

As leaders of these hospitals reflected on these efforts to collaborate, they identified a number of tangible recommendations for how to make as much progress as possible. These included:

- **Do not compete on patient safety.** It is essential to agree at the beginning of any collaboration that the organizations involved will not compete on patient safety initiatives such as preventing wrong site surgery and medication abbreviation errors. Competing on patient safety will both derail collaborative efforts towards improvement and cause misalignments between individual system focuses and established priorities. Even in areas where hospitals do compete, there still may be grounds for collaborating with each other. In Minnesota, even though there is competition related to performance on quality measures, hospitals have worked collaboratively to develop common quality metrics that can be used to measure comparative performance.
- **Do not underestimate the value of incremental muddling.** Many of the successful collaborations began with informal conversations between relevant leaders about issues of potential interest. While some of these discussions did not progress, others evolved into more focused discussions and formal agreements to work together to achieve important goals. This approach to planning allowed ideas to be explored without major

commitments of time or resources, and reduced the likelihood of a major investment in an idea that lacked widespread support.

- **Local level community collaborations can be more powerful than national collaborations.** Geography is an important factor in collaboration because the people involved have a common understanding of the local conditions such as the market, transportation, and money. National collaborations are sometimes scoped too broadly to be applicable to local health care systems and practitioners. Collaboration can be very effective at the local level for this reason.
- **Expect building community collaborations to take time.** One criticism of collaboration is that there are so many possible focuses of work. Rather than attempting to involve all of the organizations and their leaders in all initiatives at the same time, Minnesota has been successful by developing collaborations one at a time and including only the relevant groups for specific initiatives. Trying to do too many things too quickly is always in tension with trying to make sure particular initiatives have enough traction to be successful. Building a coalition over time and bringing in different stakeholders with different needs at the appropriate time makes collaborative work more feasible.

Working together, the organizations in Minnesota have made substantial progress shaping external environmental factors. Three examples reflect the range of what is possible:

- **Changing perceptions of medical errors.** Working together was necessary to educate legislators and regulators, and members of the media regarding the importance of a non-punitive approach to medical errors that focuses on understanding and fixing system failures rather than singling out individuals for blame. Punitive cultures discourage the open communication needed in order to respond quickly so that small errors do not become large ones. Working together, leaders of these organizations were more successful in educating those in oversight positions as well as media members regarding best approaches to diagnosing and fixing errors and quality issues.
- **Standardizing aspects of care community-wide.** Leaders recognized that workforce members often worked in multiple facilities in which “correct” ways of doing work were inconsistent. They also understood that efforts by one facility to insist that physicians comply with policies regarding surgical markings or medication abbreviations would be compromised if the physician could simply practice elsewhere in a place that was more accommodating. By working together, the leaders created community-wide standards for medication concentrations, surgical site markings, and the use of only appropriate abbreviations for medications. Creating and implementing these standards together allowed these leaders to reduce threats to reliability in each of their hospitals.
- **Standardizing approaches to measuring and reporting results.** Hospital leaders also worked together to develop and implement common measures and approaches for reporting on quality. This enabled them and other stakeholders to have more accurate data regarding their facilities’ comparative performance and made it easier to meet the reporting requirements of payers and regulators.

More details on how this community collaboration worked to modify the external environment so that their systems could be more reliable are provided in the Fairview and Allina Site Visit Appendix.

Internal Environment

Hospital staff operate within an internal environment shaped by executive leaders, financial constraints, and HR policies. Creating an internal environment that supports an HRO mindset is essential in order to achieve the goals of safety and quality. Four key elements in a supportive internal environment are:

- **Executive leadership support.** Exempla CEO Jeff Selberg discussed the importance of supportive executive leadership in achieving high reliability. His observations on what leaders must do reflect many of the HRO principles described above, including:
 - ***Culture is the foundation for vision and strategy.*** A culture characterized by fear and self-protection will not lend itself to openness, learning, and improvement.
 - ***Transparency is the key to change the culture.*** An unwillingness to face and share the hard facts is an indicator of denial, and denial is not compatible with a safe environment.
 - ***Safety must be the overarching strategy.*** Safety should be the root cause of achieving efficiency and effectiveness. If the inverse of this relationship exists, the likelihood of having unsafe, yet highly efficient processes increases. Only if safety is the starting point can the correlation among safety, efficiency, and effectiveness remain positive.
 - ***Leaders must take ownership for setting the climate and focusing the work.*** Generating clarity, setting the example, and demonstrating confidence will help to transform organizational culture. However, without an outright acceptance of ultimate accountability for setting organizational direction, a leader's vision will not be legitimized in the eyes of his or her followers.
- **Alignment with your business case.** Hospitals can be highly reliable producers of adequate profit margins at the expense of providing highly reliable safe and quality care. The only way to assure that the pursuit of reliability encompasses both is to work to align the business case with the case for quality. This is not easy, but Scott Hamlin, the CFO from Cincinnati Children's Hospital, offered his perspective on how this can be achieved. He noted that:
 - ***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 required to convince the CFO of the business case for quality. Analyses performed by quality staff would have been suspect, but once the financial analysts could evaluate data independently to draw financial conclusions, the results were credible to the CFO. The approach used at Cincinnati Children's involved providing the CFO with the data and tools that he and his staff could use to convince themselves of the business case for quality.

- **Linking staff behavior with desired outcomes.** Sentara is highly reflective about creating and reinforcing these links, since they recognize that their staff will probably do the things they are rewarded for doing. So if they want staff to be sensitive to operations and preoccupied with failure, they need to make sure that these behaviors are rewarded. Recommendations based on their experiences include:
 - ***Don't introduce interventions unless they are fully linked with policies and aligned with incentives for performance.*** Several systems expect all new initiatives to be linked to dashboards reviewed by executives or the board before the initiative can begin. Sentara and other systems also incentivize improvements in areas where they are looking to improve. For example, employee bonuses linked to improvements on behavior based expectations for error prevention (BBE's) amounted to the equivalent of two weeks pay. Effective alignment helps new initiatives get running quickly and effectively.
 - ***Make sure there are clearly identified owners for all actions that are key to a successful implementation.*** Systems reported substantial improvements in performance when actions are assigned to specific owners. When an action is owned by a team rather than an individual, it is less likely to happen.
 - ***Make sure that safety and quality issues are carefully linked to the operational issues.*** When quality improvement (QI) staff attempt to develop an intervention without close coordination with operational leadership, the project is unlikely to work. But if operational and improvement planners work together to link their goals and processes, the project is more likely to have a successful start.
- **Fostering a just culture.** A just culture is one where people can report mistakes, errors, or waste without reprisal or personal risk. This does not mean that individuals are not held accountable for their actions, but it does mean that people are not held responsible for flawed systems in which dedicated and trained people can still make mistakes. All staff must feel empowered to identify errors, defects, and system failures that could lead to an unsafe environment for patients.
 - Christiana Care actively promotes a just culture in their innovative electronic intensive care unit (EICU). A major key to making the EICU successful was to allay concerns that EICU staff were judging the quality of the work performed by staff providing direct patient care in the ICU. The wall of their EICU is covered with fish—each fish represents a good catch of a problem that protected a patient from potential harm. Rather than covering up near misses or threats to patients, Christiana actively acknowledges that these threats exist, and celebrates, rather than hides, the fact that they are detected and prevented. It is an approach that reinforces a non-punitive view of errors and one that encourages preoccupation with failure.

- Cincinnati Children’s has worked with units 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. Similar approaches are used in many of the other hospitals.
- Christiana Care and Sentara staff both relayed the importance of stories in fostering a just culture. When stories are told by staff about being validated rather than criticized by leaders for reporting mistakes, these stories become a part of a culture in which potential risks can be discussed and reduced rather than concealed and allowed to continue.

Planning and Implementing Improvement Initiatives

Improving quality and safety requires both knowing what to do and how to do it. Many initiatives are excellent ideas, but still fail because the approach to implementation is poorly designed. A high reliability mindset must be applied to how your organization plans and implements improvements. If you don’t understand the pressures and challenges facing the people key to your implementation, you probably won’t succeed. You also will not succeed if you oversimplify your implementation strategy, fail to listen to people with most expertise about what success requires, or if you aren’t constantly considering what can go wrong and working to avoid those challenges.

Systems in the network offered considerable practical advice about how to apply high reliability concepts to their planning and implementation activities. This advice falls into three general categories:

- Processes
- People
- Resources

Process Applications

Success requires introducing innovations into systems that are prepared to respond to them. Systems in the Network have learned much from their successes and failures in rolling out new initiatives. Preconditions for success that they have identified include:

- **If an improvement cannot be integrated into an ongoing initiative or process, do not try it.** Until it is integrated it will not be successful. A key to high reliability is simplifying systems and processes so that they can be performed consistently. The more separate initiatives or processes that exist, the less reliable the overall system will be.
- **Negotiate in advance where savings from an innovation would go.** This will assure that resources that are freed up can support top priorities and will increase motivation by key people necessary to make the innovation successful. Because not all innovations do result in cost savings, it is even more important to agree on where savings from those that do are allocated.

Rollouts also work better if they are sequenced or staged in ways that make them more palatable to staff. Key observations related to success include:

- **Christiana Care embeds initiatives into the training that they provide to new staff.** This creates the expectation that the initiatives are essential and avoids having to retrain staff after they begin work.
- **Start by simplifying policies and procedures to make it possible for staff to comply.** Shortly after Sentara introduced BBEs, they began work to simplify processes so that people could see that changes would not be a net increase to their workload. Gaining buy-in and appreciation for making jobs easier before adding new procedures or processes help employees to not regard the new things as extra burden.
- **Roll initiatives out incrementally and begin with ones that are non-punitive.** For example, Sentara introduced and educated staff regarding the BBEs first before implementing Red Rules. They did this because they wanted people to believe that they had the training and clarity required to be successful before Sentara introduced Red Rules, which focused on actions that should always be prevented. Without a culture that supports disclosure and questioning, introducing Red Rules could be counterproductive.
- **Exempla uses Lean thinking approaches to rolling out initiatives.** By drawing together key people and allowing them to spend an extended period of time working together to map out the process and then redesign it, they reduce the likelihood of redesign efforts that are likely to fail. Even then, Exempla has learned that further adjustments should be expected once the process redesign is extended to other units or work shifts.

People Applications

Although the importance of people is obvious, many initiatives in hospitals still fail because key perspectives are overlooked, physicians are not included (or do not want to be included), or because improvement staff are different from operational staff. Anticipating the people problems that can prevent your improvements from succeeding is a key dimension of preoccupation with failure. Observations from Network members related to people include:

The key to involving physicians is to avoid systems or procedures that decrease their efficiency. Physicians do not mind changes in how they do medicine if those changes make them more efficient (or at least do not decrease their efficiency). Involving them in the planning process is crucial toward preventing the implementation of changes that they will perceive as making them less efficient.

- **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.
- **Include people from multiple shifts and work units.** Each site visit involved at least one story of an implementation that was developed by one set of people and resisted by another because they were not involved in planning. Christiana Care found that their EICU initiative benefited greatly from involving staff from the ICU in its planning, and

having them spend time in the EICU to understand how it works. Exempla found that their pharmacy redesign was resisted by night shift staff who were not involved in its planning. Every system reported that initiatives developed in particular units or hospitals were not as well received in others. So including as broad a set of people who will be affected by the initiative is critical.

- **Encompass multiple staff types in planning.** Sentara's medication dispensing machine system redesign succeeded in part because they included nurses, pharmacists, supervisors, and other staff in the planning process.
- **Avoid having quality improvement staff design initiatives without input from operational staff.** The role of quality improvement staff at Cincinnati Children's is to serve the teams working on the improvement rather than function as 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.

Resource Applications

Having adequate resources is critical for many initiatives to succeed, and the most important resource is sufficient time for key leaders to focus on the effort. Systems have used a variety of strategies to assure that sufficient resources are available. These include:

- Exempla provides replacement staff for people participating in the Lean Change Process Efforts (Kaizen). It is unreasonable to expect staff to focus on these planning efforts while still attempting to do their normal jobs.
- Cincinnati Children's budgets a substantial amount to support personnel on high profile initiatives. Particularly for physicians, this support is essential to ensure their participation.
- Resources and labor are always in short supply. So many systems actively monitor the number of priorities to assure there are not too many to support. Cincinnati Children's stresses keeping a short priority list. The only way something goes onto this list is if something on the list is completed or removed. This assures the focus new projects require. At the micro-system level, several systems use strategies that require managers to list all of the things they are trying to do and then to classify these things based on whether they can and cannot do them. Management then must respond to these lists by setting priorities and making decisions about more resources. This is very difficult for managers, but helps avoid starting new things that personnel feel cannot be done.

Approaches to Doing Work

HRO concepts emphasize a different way of thinking about and performing work at every level. If tasks are too complex it becomes impossible to distinguish doing the work right from doing it wrong. If there are no opportunities to talk about issues with other staff, there is little chance that people will be exposed to views or information others possess and little opportunity to discuss near-misses. And if leaders aren't routinely observing and talking with staff providing direct patient care, they will not understand the operations for which they are responsible.

The Sentara site visit and subsequent case study at Sentara focused attention on a range of strategies that they (and other systems) are employing to encourage high reliability thinking as people do their work. These strategies include:

Simplifying Work Process

If you cannot reduce what you want staff to do into a limited set of clearly defined behaviors, your system will not be reliable. As noted above, Sentara has created a set of behavioral-based expectations (BBEs) for their staff. These BBEs were associated with a substantial reduction in sentinel and other serious events and substantially reduced insurance claims over a three year period.

Daily check-ins. These short, focused meetings of leaders and staff on a unit follow a set agenda and occur at the same time each day. The meetings allow staff to raise questions, give them information that may affect their work, and provide a forum for raising issues, which are delegated and handled outside the meeting.

Executive rounding. Executive rounding enables hospital leaders to retain an awareness of operations that is needed for good decision making. These rounds also create an opportunity for staff to raise issues with leaders and leaders to model the behaviors they want staff to exhibit, including following up on issues that are raised. They are key to supporting a culture that defers to expertise and encourages staff to speak out about safety and quality concerns. In order for executive rounding to be most effective, however, hospital leadership must follow-up on the concerns voiced by staff members in order to ensure receiving continual feedback.

Safety huddles. Sentara uses these huddles in units every 12 hours. This assures that the unit is thinking specifically about safety issues at least twice a day as a team. The huddles are very short, but allow people to comment on any safety issues they had observed or were concerned about. They also allow people to comment on their own condition so that people can receive extra assistance on days when they may need it.

Performance management. Many systems in the HRO Network have very rigorous processes for managing performance and rewarding individual and team accomplishment. These approaches often include behavioral observation of staff by trained supervisors and substantial bonuses linked to fulfilling the behavioral-based expectations. Performance management is key to assuring staff are rewarded for desired behavior and discouraged from other actions.

Approaches to Measuring Progress

It is impossible to be preoccupied with failure or to respond to system breakdowns if information is not available to measure system performance. A general theme across repeated discussions of measurement with HRO Network systems is that measuring is essential, but often does not work as planned. Missing baseline information makes progress hard to assess; excess complexity makes results difficult to understand or use; measures that are too labor intensive are unsustainable over time.

This section identifies several general insights about effective measurement shared by systems in the Network. It also addresses issues related to several specific areas where measurement is important.

Measurement Insights

- **Measure fewer things better.** Multiple systems in the network noted the common problem of having too much data to attend to. Paradoxically, too much information can make it harder to be truly sensitive to operations and to noticing important failures that occurring within key systems. Cincinnati Children's uses a series of basic questions to assure that it is measuring the right things, but not too many things:
 - 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?

These questions reduce the tendency to measure everything that is measurable, which in systems with strong technology infrastructure can be much more than is meaningful or usable.

- **Stories count and simplify.** We heard as many examples of improvements stemming from a story about a problem than we did about initiatives based on data. Both are very important, but leaders noted that sometimes problems are well known and the need to collect data regarding them is irrelevant and slows the process. If there is agreement related to a problem and a way to fix it, then resources should focus on the fix, not documenting the obvious. Over time, measures become more crucial and their accuracy must be refined, but in many cases, stories are the starting place.
- **Couple measures with high performance standards.** Data can desensitize people to system failures. If a certain failure rate is the norm, then trending data that shows no change in that failure rate can contribute to complacency. Each system we visited place very high importance on establishing goals that were well above current levels of performance on key indicators. This approach reduces complacency and contributes to a culture in which continuous improvement is essential.

Specific Measurement Areas

Many of the specific initiatives described below include descriptions of how progress was measured over time. The three examples shown here illustrate important measurement concepts: Anything can be measured, measures can be quite simple, but sometimes multiple measures are essential to track system performance.

- **Measuring Leadership.** Jeff Selberg's discussion of leadership's role in creating a high performance culture posed several important questions useful for assessing leadership performance.
 - *Are you committed to your own growth as you grow your organization? Your organization's ability to transform and improve is directly correlated to your ability as a leader to transform and improve.*
 - *Are you creating the environment so that the right and, most of the time, the wicked questions are asked? It is not your role to have an answer for all of the questions, but rather to create an environment where the right questions are asked and greater personal and organizational awareness are achieved. Asking these*

types of questions may feel risky, but the result will be a greater organizational tolerance for diversity of thought.

- *Are you engaging in patient-centered versus ego-centered conversations?* You must take yourself out of the center of your strategy and replace yourself with the patient to ensure that you are protecting your patients first and foremost. A great deal of self-awareness is required to know where you are in every conversation.
- *Are you embracing challenges that stretch your capacity as a leader?* Your approach must be that every situation, no matter how challenging, is the perfect opportunity to learn, grow, and meet long-term objectives.

While these questions are basic and the answers subjective, they reinforce the importance of assessment of all aspects of an organization's behavior, including the actions of its leaders. If they are unwilling to assess themselves, they will find it hard to create a culture where assessment is the norm.

- **Measuring chemotherapy orders.** Exempla made changes designed to reduce risks and improve efficiency of chemotherapy orders. The safety metrics they developed (number of abbreviations, use of standardized order sets, illegibility, etc.) were all quite simple and easy for staff to measure before and after the initiative was introduced. But these measures were combined with assessments of nurse's satisfaction with the process and changes. Exempla realized two important things. If they could not make changes that were easy to assess and that were supported by staff, the changes would not be sustainable. In other words, Exempla wanted to ensure that the processes implemented for measuring chemotherapy orders were working effectively for the staff members' actually measuring the medications. Tracking both dimensions was simple, but also vital to knowing whether they were achieving their goals.
- **Measuring errors and near misses.** Measuring safety events is quite complex. Some systems reported experiencing increases in reported events as they worked to make their cultures more transparent and attuned to safety issues. Other systems reported instances where a large percentage of some kinds of errors (i.e. medication) were not reported. There was general agreement about several issues relating to measuring errors:
 - *Measure both minor and major events so that both can be trended.* In a punitive culture, both will be underreported. In a just culture, both will be reported more frequently, but major events should decline more substantially than minor ones.
 - *Look for alignment between these measures and other indicators of safety.* Sentara became more confident in their measures because their improvements on event measures correspond to reduced insurance claims.
 - *Consider measures that examine the ratio of major to minor safety events.* Such measures may encourage reporting of small errors and allow hospitals to see whether the ratio of major to minor errors is declining over time.

While measuring too much can be unhelpful, systems have recognized that for issues like safety, no single metric will provide them a clear sense of how they are actually doing. This reluctance to simplify safety into a single indicator prevents measurements that can be useless, or potentially even dangerous to patients.

Specific Improvement Initiatives

Applying HRO concepts to specific improvement initiatives is what truly matters. If the concepts cannot be used to make specific aspects of hospital care safer, higher quality and/or more efficient, then they are of no value to hospital leaders. This section highlights the breadth of applications of HRO concepts to improvement initiatives, all of which are described in more detail in the site visit summaries and case studies. Those sections reflect an important aspect of HRO thinking: that changes are often driven by several or all of the HRO concepts.

- Christiana Care applied concepts of resilience and preoccupation with failure to successfully create an EICU that provides an additional level of support to staff caring for their sickest, highest risk patients.
- Sentara's preoccupation with failure led them to notice and reduce the number of interruptions experienced by people at the medication dispensing machines. This resulted in lowering the risk of drawing the wrong medications and reducing the amount time lost for staff associated with required rework when medications were forgotten.
- Exempla applied Lean concepts to the challenge of improving chemotherapy orders. In a relatively short period of time they raised staff satisfaction with the process and reduced problems in orders that increased the risk of medication errors.
- Cincinnati Children's identified flaws in their discharge planning process that kept patients hospitalized longer than necessary and limited bed space for patients scheduled for surgery. Their initiative substantially raised the percent of patients leaving the hospital within four hours of meeting their discharge goals.
- Cincinnati Children's applied a range of strategies to substantially reduce ventilator acquired pneumonia cases among their patients. The reduction reduced patients' length of stay and freed hospital beds to care for additional patients, which also generated more revenue for the hospital.
- Working together, hospitals in the Minneapolis area agreed to standardize medication concentrations to reduce errors that could occur by staff working in facilities that used different concentrations.
- Exempla redesigned their processes for stocking and using their medication dispensing machines. The changes they made reduced inventory costs, the number of medications that the pharmacy had to send to the ICU, and the number of unused medications in the medication dispensing machine.
- Christiana Care applied the HRO concept of sensitivity to operations to prevent and more quickly detect and treat sepsis. These changes substantially lowered the impact of sepsis in their facility.
- Cincinnati Children's applied the concepts of sensitivity to operations and preoccupation with failure to recognize the need to reduce codes occurring outside the ICU. These efforts have made codes outside the ICU exceptionally rare events.
- Several systems in the network have CPOE systems in place. While these systems have much promise, they sometimes have no, or even negative effects on patient safety. Cincinnati Children's deferred to the expertise of the users of the system when designing

and implementing it. They rejected overly simplistic understandings of the potential risks and rolled out a system that substantially reduced the number of calls required to clarify orders and cut delivery time of the medications to the unit by over 50%.

- Exempla redesigned their specimen processing workstation to improve efficiency and reduce the potential for errors and rework. This process created more workspace and reduced both retesting and the need for redraws of patient specimens.
- Sentara and other systems implemented safety huddles and other processes designed to improve patient handoffs within and between units. These processes allow staff to be more sensitive to operations, understand and attend to risks confronting particular patients, and defer to the expertise of the providers who have been caring for the patient most recently.

These and the other examples described in the appendices should provide you with a broader understanding of the potential applications of HRO concepts to the challenges you face. Obviously, even the most detailed explanations of these changes might omit key details, and your facility would need to adapt what others have done to make it work for you. But these examples should demonstrate that a culture built on a high reliability mindset is one that will lead to safer, better, and more efficient care for your patients.

Spreading Improvements to Other Units and Facilities

No system participating in the HRO Learning Network was satisfied that their innovations and improvements had been embraced by all of the units and facilities in their systems that could benefit from them. Although it would be wonderful to feature a system that has mastered the process of rapidly spreading improvements, it is unsurprising that this is an unsolved challenge. Oftentimes people fear change because it is unknown, disruptive to work patterns, and can take more time to implement. Change does not occur overnight, but takes time, and these initiatives are new so it can be difficult to implement them. Much of this challenge relates to the need to establish and sustain a culture that is built on high reliability concepts. Without leadership and a culture that encourages constant reflection about system risks and opportunities for improvement, initiatives that worked elsewhere may fail. As a result, spreading improvements across a system is part of an even broader challenge: the challenge of spreading a high reliability culture across a system. Cultures change slowly, but systems in the network identified a number of suggestions for facilitating this process across units, to physicians, and across systems.

Between-Unit Spread

- Aggregating data and sharing it across the hospital has been used by several of the systems to raise awareness of key issues and to motivate other units to improve to a standard being set in other units. Some hospitals post unit performance data in public places to communicate the norm of transparency and accountability.
- Stories were regarded as key to spreading ideas. Specific ideas related to sharing stories effectively included:
 - Capture people doing good things and share those stories. These stories reinforce a culture where doing good gets as much attention as avoiding bad.

- Talking openly about mistakes and near mistakes reinforces the message that they can occur everywhere and that they should be acknowledged when they occur. This was regarded as essential to creating a high reliability culture across the whole organization.
- Sharing stories from and about all types of staff and from patients helps reinforce the principle of equality and teamwork.

Spread to Physicians

Every system present agreed that developing and implementing HRO concepts for staff other than physicians was much easier than doing the same thing with physicians. Although difficult, ideas for supporting spread to physicians include:

- Framing changes in ways that appeal to physicians' needs. When physicians view a change as something that will make them more efficient, they are much more likely to support it.
- Don't even try implementing changes focused on physicians without very strong executive and physician leadership. The few success stories that were shared involving physicians all occurred where strong leadership support existed.
- Beginning by making successful changes that involve other staff. These successes increase the willingness of physicians to try them. One hospital in Sentara's system is introducing Red Rules for physicians, but this is still a work in progress.
- Allowing physicians to violate some rules based on their clinical judgment—but only if they document the reason for the exception. Some systems felt that allowing these types of exceptions also encourage mindfulness required to be an HRO.

Spreading Improvements Across Systems

- Sharing data system-wide can be effective in creating awareness of performance differences between hospitals. If improvements are substantive and effectively measured, this can create demand for those improvements so that other hospitals can achieve similar improvements.
- Creating informal and even formal settings for peers from different facilities to network and share ideas with each other can help spread good ideas. A number of improvements that have spread in Sentara have occurred because of informal discussions between peers.
- Some systems have tried formal rollouts from one hospital to others in the system. It was not clear whether these efforts worked better than spread that occurred informally.
- Seeing where spread may be occurring informally and then supporting those efforts with well trained staff was a strategy that appeared to work well. This assures that the interest in change already exists and maximizes the impact of the trained staff.

Using This Information

The preceding section reflects a very broad range of applications of high reliability concepts to the practical challenges faced by hospitals and their leaders. While the appendices provide more detail about many of the concepts there are not step-by-step detailed descriptions of exactly how to implement any of the interventions that we describe. What worked for these hospitals will not work exactly the same way for you; you and others in your facility will need to develop strategies for planning, implementing, and measuring your initiatives that match your environment, your culture, and adapt to your unique challenges and opportunities.

If you have read through the preceding section, we hope you now:

- **Understand high reliability concepts more clearly.** While the concepts are simple, they can also be threatening. Really embracing them will require that you openly acknowledge and respond to risks your patients face and that you reject a hierarchical approach to decision making in favor of one that defers to the expertise of others—even when they are less senior in the organization or from professions different from your own. To become a high reliability organization you will need to both understand these concepts and support a culture that makes their application possible.
- **Learn from examples of how these concepts have been applied in hospitals.** We hope you were intrigued and excited by the range of improvements that are described in this document. Some represent small and rapid changes that are likely to produce modest improvements while others are major initiatives that require extended periods of planning and considerable resources. Hospitals in the HRO Network are certainly not the only ones who are experimenting with ways to make their patients safer and their quality better. But the breadth of their efforts means that the examples offer something of value to every hospital leader.
- **Apply HRO concepts to the most pressing needs you face.** Many people who work in hospitals—even those who are leaders—sometimes feel that they lack the organizational support needed to make substantive improvements. It's clear that executive and even board level support are enormously valuable in becoming a high reliability organization, but it's also clear that each person has opportunities to make improvements. We suggest you consider starting with smaller initiatives that don't necessarily require extensive support from others. As you begin to model and use the HRO concepts described in this document you'll learn a great deal. You can also achieve some small successes that can lay the groundwork for bigger initiatives. Each system in the HRO Network made progress slowly and incrementally.

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Appendixes available on AHRQ Web site: <http://www.ahrq.gov/qual/hroadvice>