

High-Reliability Organizations: Changing the Culture of Care in Two Medical Units

Daved van Stralen, M.D.

“What the fire department does is solve problems the public cannot or will not solve themselves.”¹ The melodrama of a crisis easily distracts one from observing the organizational structure of problem-solving in emergencies, and can interfere with teaching new members desired behaviors. All emergencies, regardless of severity, are resolved by problem-solving.

A critically ill patient, dying while the physicians work to make a diagnosis, must have urgent yet high-risk treatments performed to sustain life. Action must occur before the medical team can collect sufficient information, and before that information can reach the attending physician for orders. Decisions then made by a central authority (the physician) must be transmitted to the operations team (nurses and respiratory care practitioners) before further deterioration of the patient can cause sufficient change to, effectively, create a new patient. In these situations, the culture of medicine turns to experience and reason, particularly evidence-based medicine, to safely perform these functions. Within this culture, the physician has the role of decision maker and central authority in a vertical hierarchy.

The intensive care unit (ICU) follows this medical model, which works well with deterministic problems, when the situation determines the intervention and the intervention determines the outcome. For example, the identification of a specific bacterium in sputum determines the diagnosis of a specific pneumonia which, in turn, determines the choice of antibiotic. The choice of antibiotic then determines effectiveness of the cure.

Problems can develop when uncertainty (a poorly identified situation) has a time-dependent quality (demands intervention) with a degree of risk (safety). Problems also develop when multiple interventions become available, each with unknown probabilities of success or failure. Experience and reason may not identify effective decisions in these situations, and the vertical hierarchy may not allow the responsiveness and flexibility necessary to manage evolving problems. The combination of uncertainty, risk, and time-dependence (the indeterminate problem) vexes deterministic systems with rigid, vertical hierarchies.

1 William J. Corr, Captain II, Los Angeles City Fire Department, Retired. Personal communication.

The risk of medical complications to patients has dramatically increased as both patients and medical care become more complex. The medical community now wrestles with solutions to the problem of patient safety and medical error.² Only recently has this search turned to organizations outside of medicine.

Organizations such as military combat units, coast guard units, fire suppression, emergency medical services, and law enforcement historically have functioned in environments in which the indeterminate problem is routine. After years of trial-and-error learning, these organizations have developed a structure for relatively error-free operations. The knowledge and techniques developed by these organizations can improve medical care culture. This is the story of two such organizations—the development of a pediatric intensive care unit, and the transformation of a nursing home into a chronic intensive care unit.

The Pediatric Intensive Care Unit (PICU)

In the late 1970s and early 1980s, pediatricians began to treat critically ill or injured children in newly developed PICUs. These programs did not develop from clinical research, as had adult critical care, but by early pediatric intensive care practitioners incorporating the experience and research of adult intensive care into their pediatric practice.

In 1989, a university medical center recruited two pediatric intensive care physicians to design and develop a PICU with the medical center's existing nursing and respiratory care staff. Medically unstable children, or those with the potential to become unstable, would be admitted to the PICU from within the hospital or from referring hospitals in a geographic area three times the size of Vermont. Though the PICU had the capacity to care for twenty-five children, the initial census was seven to ten children. Nursing and respiratory staff at the medical center consisted of Registered Nurses (RNs) and Respiratory Care Practitioners (RCPs).

The two pediatric intensive care physicians drew upon their past experience in nonmedical fields. One had a military career as a naval aviator during the Viet Nam War; the other had a previous career as a paramedic with a major urban fire department. The former referred to his Navy experience, where he saw the results of a command structure that did not appear to support the pilots who entered hazardous environments. He believed that people would function more effectively in high-stress environments if they received good support from higher in the hierarchy, and wanted his PICU to show support for the bedside caregiver. The former paramedic drew upon lessons in emergency work learned from veterans of combat, field emergencies, and major fires. He had observed the effects of not having a tradition in medicine of decision-making or leadership that functioned in emergency, high-hazard situations.

2 *To Err Is Human: Building a Safer Health System*, L. T. Kohn, J. M. Corrigan, and M. S. Donaldson, eds. (Washington, DC: The National Academies Press, 2000).

The medical model of gathering information, developing an assessment or diagnosis, and initiating a treatment plan did not provide sufficient means to treat medically dynamic disease states using novice critical care staff members. The pediatric intensive care physicians drew upon their previous nonmedical careers to develop methods for caregivers to use in these uncertain, high-risk medical situations. The challenge came from the lack of exposure of the experienced medical caregivers to uncertainty decision-making.

The PICU grew fairly rapidly within four years. From an initial average daily census of seven, the average number of patients admitted quickly reached twenty, and annual admissions soon reached 1,800. This number of beds and annual admissions placed the PICU in the top six percent in size in the United States.³ Pollack and his colleagues found mortality rates of 7.8 percent for PICUs with more than eighteen beds, while those with less than six beds had a mortality rate of 4.1 percent. This PICU had a mortality rate of 5.2 percent in 1996. To identify areas for improvement, especially important in the absence of published data for comparison or the means to manage the indeterminate problem of uncertainty, risk, and time-dependence; the PICU used itself as a benchmark.

Goals for the PICU

The unit grew in size faster than the experience of PICU members, and before the staff could appreciate the importance of action in live-or-die situations. Therefore, any information the intensive care physicians introduced had to be sufficiently compelling so that the staff would put it to use immediately. To set the initial goals of training staff to manage live-or-die situations, and to teach decision-making in uncertainty, they again drew upon their past experience.

The new program came from what one physician identified as wrong from his U.S. Navy experience, and what the other identified as good from his firefighting EMS experience. Combining the negative and positive aspects of their experience led to the goals of engendering trust through support of the bedside caregiver; addressing unrecognized fear; and improving decision-making skills for uncertainty. The knowledge and techniques taught had to have immediate utility, because of the disparity of this approach from what medical caregivers had learned from past lectures or experience. It must “explain yesterday” or “be used tomorrow.”

Knowledge that would benefit the patient did not provide nearly as great a motivation to a caregiver to learn and apply than knowledge that would benefit the caregiver. For example, a physician might order frequent monitoring of a patient’s vital signs. Sometimes the caregiver, based on tradition or experience, took this as unnecessary or an interference with other tasks that the caregiver believed should take precedence. When this happened, the “frequent evaluations” often would be “fudged,” delayed, or not even performed: all with the excuse that time constraints did not allow completion of the

3 M. M. Pollack, T. C. Cuerdon, and P. R. Getson, “Pediatric Intensive Care Units: Results of a National Survey,” *Critical Care Medicine* 21:4 (1993): 607–614.

assignment. Through compelling theory and examples, the caregiver would learn to appreciate the fact that monitoring for early signs of deterioration might prevent deaths when they heard true stories of occurrences in which a lapse of attention or observation by a good caregiver had led to a poor outcome that *had a negative effect on that caregiver*.

The stories that produced the greatest interest focused on why the caregiver believed it was necessary to act in that manner; that assumed there are no dumb decisions or poor judgment, and that mistakes were unintended. The approach then became important to the caregiver, and developed into a means of providing skilled, high-quality care. If the intensive care physicians had imposed this learning, the caregivers would have become alienated from the developing PICU culture rather than developing a passion for and feeling of inclusiveness for the new culture.

Support of the bedside caregiver in controversies had two benefits. First, people who feel supported will engage hazardous situations with a greater ability to observe and act. Second, they are more likely to remain with the job. Over time, these caregivers will gain greater experience, and provide enhanced monitoring, decision-making, and leadership to the care team. Experienced caregivers will identify warning signs indicating early deterioration that would have been missed by others. Identification of early symptoms of deterioration allowed interventions to begin when the treatments have greater efficacy and safety. This gave caregivers internal, personal pride in their role in saving a child's life.

A high-trust system modeled after the fire department service began to grow. When any team member called for help, he or she would receive it without question. Nobody criticized anyone for "crying wolf": all were taught by the intensive care physicians through precept. Any time the team believed a child had deteriorated, caregivers would respond without criticism. In time, they began to focus on this high-trust approach in a more structured fashion, with lectures and explanations of the high-trust culture.

At times, staff would make decisions the intensive care physicians would not have made. This created the predicament of having to accept some less-than-satisfactory solutions. By not correcting the individual and showing how his or her answer to the problem could work, the caregivers would listen, trust, and identify errors and mistakes they had made. This directly led to more effective approaches in care generated by the bedside caregiver.

As nurses felt more supported, they became more open in presenting unclear patient situations to residents and attending physicians. This led to increased trust within themselves, which increased their acceptance of the unpredictable and of novel approaches to problem-solving. The team began to identify patients earlier in the course of a disease, and resident physicians became more integrated into the team.

Trust began to develop between staff, but trust in one's self during an emergency did not develop without the involvement of the intensive care physicians to support these new behaviors and extinguish the old ones. For example, staff would work as fast as possible, as if speed were a tool to address threats and danger rather than focus on the smooth delivery of care. During one of the early, instructional situations, the team was resuscitating a child in respiratory failure from epiglottitis, a dangerous swelling from infection in the upper airway. The team's conventional treatment response was to hurriedly give medications and place a breathing tube into the trachea. This would occur as rapidly as possible, often with the caregivers' bodies moving faster than their minds could work. The intensive care physicians stopped the process in mid-action several times to allow the team to manually breathe for the child. Once the staff had calmed down, they realized they could keep the child alive with minimal tools. The feeling of emergency quickly passed, and smooth operations commenced. Speed, they had learned, came from smooth operations—not from hurried, panic-induced activity.

Stress reduction focused on matching demands to resources.⁴ A person has internal attributes native to his or her abilities, skills, and knowledge, as well as external resources from the system including their education, training, and the support of those around them. In education and training, a "hands-off" approach worked well in which the caregiver would stand back and let the pediatric resident manage the situation or perform the procedure. Perturbations within a smooth-running setting would cause an alert for any indicated intervention. On-scene support and nonthreatening critique during resuscitations became the expected routine. This produced a pediatric resident confident in his or her ability to solve problems and conduct resuscitations.

Initial risk awareness education of bedside caregivers as a group took several years. Risk education included expected complications from diseases and treatments, as well as how to identify the unexpected. Excessive emphasis on risk awareness, though, produced hyper-vigilance in the team,⁵ which resulted in situations where the team tried multiple interventions and actually began to treat their treatments. Stopping the excessive treatment allowed the team to stop other medical treatments.

During times of low patient load or the absence of high-risk patients, the team began to lose their risk awareness, which increased errors. The phrase: "Sometimes you have to fall apart to fall together" was used to call attention to the increased possibility of risks. This also offered an opportunity to educate staff about all of the risks encountered during critical care. The vigilance of the caregivers toward both individuals and the system ensured the program did not deteriorate and place a patient at risk.

4 R. W. Novaco, "Anger and Coping with Stress: Cognitive and Behavioral Interventions" in *Cognitive Behavior Therapy: Research and Application*, J. P. Foreyt and D. Rathjen, eds. (New York: Plenum Press, 1978).

5 I. L. Janis and L. Mann, *Decision Making, A Psychological Analysis of Conflict, Choice and Commitment* (New York: The Free Press, 1977).

Unrecognized fear responses were the greatest behavior issue addressed in the program. Fear has a hidden but active influence on behavior in high-hazard environments. Unrecognized fear reactions caused major problems in team formation and in interactions with physicians who did not participate in this model, and transient physicians and nurses who pass through the PICU for the occasional patient.

Fear manifests itself in a physiologic manner. Though described physiologically as the “fight or flight” response, it appears behaviorally as anger, plausible avoidance, and confused mental states. Adrenaline mediates the fight and flight response, while cortisol mediates the freeze response commonly found in infants and prey species.⁶

As a social interaction, fight presents as anger and argument generally focused on an individual rather than a situation or problem. Flight, to avoid engagement with the situation, shows as plausible avoidance such as checking another patient in stable condition or delaying critical decisions by asking for information, when the problem demands a decision such as in live-or-die situations.

If an attending physician yells or shows any other anger behavior, it reflects the physician’s fear and not the performance of the team. Team members who believed the anger resulted from a member’s poor performance would act to demonstrate improving or adequate performance. Since the anger comes from the inability to safely and effectively reach an objective, the team member would never assuage the physician’s anger, but actually perpetuate it. However, if the team member could identify objectives that the physician or the team could reach, then the small successes and subsequent information flow that occurred could reduce the situational tension.

Freeze mediated by cortisol leads to the inability to think.⁷ When the pediatric residents felt this brain immobility, they found that returning to an objective they had previously reached would lead them back to clear thinking. Independently, several of them found that evaluation of the airway tube used for breathing would clear their minds, and their brain would return to functionality.

Understanding that these fear responses were neurochemical reactions triggered by external events helped many of the PICU staff to direct efforts to resolve the fear response, rather than allow perpetuation and the subsequent downward spiral in individual and team performance.

The teaching of *decision-making in uncertainty* occurred early in the development of the PICU. Traditional decision-making in medicine consists of data collection for an informed diagnosis that allows a treatment specific to the disease. This reduces the risk of injury that comes from the treatment in comparison to the benefits of the treatment. However, to engage in life-threatening uncertainty, one must begin intervention before all of the information is available.

6 N. H. Kalin, “The Neurobiology of Fear,” *Scientific American* (May 1993).

7 *Ibid.*

Looking to paramedic care as practiced in the 1970s helped introduce a new way of thinking in emergencies: “Doctors evaluate and paramedics decide.” This led to discussions of how environment can limit decision-making, and the need for an internal check of a decision’s actions. John Boyd’s OODA Loop Decision-making (Observe, Orient, Decide, Act; then observe response to Action)⁸ became instrumental in the development of rapid decision-making that would give novice emergency caregivers the ability to out-manuever dynamic disease processes. Important to this rapid decision-making was the use of patterns which the caregivers previously had used as the basis for management of the critically ill or injured child. This system gave the team the ability to make decisions before they had complete knowledge of the circumstances of a situation.

Faced with such an uncertain situation, it frequently was easier to identify an objective first to give direction of one’s actions. These objectives may have long time horizons, such as discharge from the PICU with normal physiologic function, or short time horizons, such as acquire and maintain the airway during resuscitation. If the objective could not be reached smoothly or in a reasonable time, the individual would decompose an objective to a series of objectives that could be reached in stepwise fashion. For example, one could decompose airway acquisition to neck extension followed by jaw thrust and suction for oral secretions.

Decision-making by identifying objectives rather than the situation; decomposing the objectives as necessary, and the use of OODA loops could allow decisions and authority to migrate to the bedside. If the patient should suffer rapid physiologic decompensation, the team could just as rapidly develop a response and intervention. In effect, they would out-manuever the disease. In these situations, doing nothing is harmful (compare with the oft-quoted phrase in medicine: “First, do no harm”); but this interactive, real-time model allowed the team to learn what works through action.

The method developed to provide care placed greater importance on a common interpretation of early signs of deterioration and shared objectives. Bedside staff would change every twelve hours, and a particular caregiver may not have the same patient on consecutive days. Resident physicians would change service every month. The intensive care physicians would change service every week. Institutional knowledge, manifested through individuals, gave a consistent approach that could identify problems and intervene before the disease process became irreversible.

Resident physicians were not responsible for knowing answers, only for learning them. As the attending physicians, the intensive care physicians had the responsibility for knowing what to do and how to manage the critically ill patient. All would accept the actions of the team members: no one would second-guess decisions or discount the observations of others. Calling for help was not a sign of weakness, but represented active and aggressive communica-

8 R. Coram, *Boyd: The Fighter Pilot Who Changed the Art of War* (New York: Little Brown and Company, 2002); G. T. Hammond, *The Mind of War: John Boyd and American Security* (Washington, DC: Smithsonian Books, 2001).

tion during rapidly-evolving situations. Members of the team began participating in patient discussions as the team acknowledged the value of everyone's knowledge and experience.

To teach decision-making during uncertainty, an individual would be guided to develop two, alternative interventions. Depending on the level of sophistication of the individual, this could occur early in the presentation or as the last choice in a chain of decisions. At some point, the individual had to choose the treatment that would be followed. If a team member wanted to try a therapy, he or she had to present benefits, risks, possible outcomes, and a time limit for evaluating the therapy for effectiveness.⁹ The individual needed to explain not only signs of success, but signs of failure; and how to recognize them if the therapy did not work.

At times, several body systems such as lungs, heart, and kidneys interacted with several disease processes such as infections and inflammatory responses. The resulting dynamics would lead to confusion because multiple variables were out of the normal range. To bring such complexity to a manageable state, the intensive care physicians would list all of the problems involved. Upon completion, the list could be grouped into three-to-four independent problems showing that, as a general rule, the patient would have only a few problems, each of which was manifested with multiple variables. Instead of a list of fifteen variables to manage, the staff had three or four independent problems. When listed on a board, the team clearly saw that the first three items were relatively inconsequential, simply items they routinely encountered or treated. This demonstrated the Availability Construct of decision-making: that the first things one thinks of are not necessarily the most important, but only the most available to the mind.¹⁰

The use of a new model in a traditional and established field required that the team closely watch for errors, mistakes, and variance. Focus on failure over success had a significant role in safely resolving high-risk, live-or-die situations. The staff, as is natural, would remember their successes, while emergency workers tend to remember their failures. During emergency management of a patient, the team had to continually evaluate decisions or actions were wrong. *Confirmation* bias describes the phenomenon that the first thing one thinks of is the most important.¹¹ One of the intensive care physicians urged the team to search for information that disproves one's hypothesis or action, in effect, to develop a *nullification* bias.

While this model emerged from personal experience with naval aviation combat conditions, and from fire and paramedic services in the 1970s, academic structure initially came from the field of social ecology. After seven years of PICU development the intensive care physicians adopted the codification of High Reliability Organization theory in the PICU.¹² This theory expanded their work by providing an over-arching theory for explaining how high-risk

9 I. L. Janis and L. Mann, *Decision Making, A Psychological Analysis of Conflict, Choice and Commitment*.

10 A. Tversky and D. Kahneman, "Availability: A Heuristic for Judging Frequency and Probability" in *Judgment under Uncertainty*, D. Kahneman, P. Slovic, and A. Tversky, eds. (Cambridge: Cambridge University Press, 1982), 163–178.

11 R. S. Nickerson, "Confirmation Bias: A Ubiquitous Phenomenon in Many Guises," *Review of General Psychology* (1998): 175–220.

12 K. H. Roberts, "Some Characteristics of One Type of High Reliability Organization," *Organization Science* 1 (1990): 160–176.

systems could become highly reliable in delivering care. With the ability to articulate these principles, the resident physicians could extend this model of care into their private practices.

The Loss of High Reliability

During the first eight years, five intensive care physicians joined the PICU. These new physicians retained the traditional model of a physician, with central authority and the belief that trust was a sign of naivety. They did not allow decisions to migrate because that gave the appearance of a physician who lacked knowledge. Initiative on the part of the bedside caregiver began to disappear. As staff members made fewer decisions, they also made fewer observations of the patient's condition—particularly early signs of trouble. In time, RNs lost this model, and new resident physicians never learned it. RCPs retained it as part of their culture, mostly by teaching it away from the presence of these new intensive care physicians, and limiting its use in communication with the physicians.

The counter-intuitive nature of high reliability compared to the medical model that physicians learn in medical school makes it difficult for many physicians to adopt it as a model for care. The new intensive care physicians saw the initial PICU program as unsafe. Security began to come from appeal to authority such as the attending physician's judgment, a research article, a medical text, a laboratory value, or a protocol. Self-protection came less from intellectual strength and more from defensive or offensive explanations, maneuvers, and intimidation. Within one year, both founding intensive care physicians left the PICU. One became the medical director of a nearby nursing home.

Nursing Home Care

In 1996, a nearby pediatric nursing home changed its license from an intermediate care facility (providing care to disabled children who needed close supervision) to a sub-acute care facility (SCF) for children whose disability was great enough that they relied on at least two technologies to live. Generally, these technologies are a tracheostomy tube for breathing and a gastrostomy tube for feeding. Although requiring a higher level of care, staffing is similar to a nursing home: certified nursing attendants (CNAs) with minimal medical education and training, and licensed vocational nurses (LVNs). One RN served on a shift as the charge nurse, and covered the entire facility. Several RCPs provided respiratory care and ventilator management for the four children dependent on a home mechanical ventilator (HMV).

Ratios of staffing nurses and RCPs to patients also followed a nursing home pattern. Patient-to-nurse staff ratios operated about 4-6:1, compared to a PICU with a patient:RN ratio of 2:1. RCPs in a PICU care for the mechanical ventilators usually were at a patient:

RCP ratio of 4:1, while this SCF had a ventilator:RCP ratio of 6-8:1, with additional non-ventilator-dependent patients adding to the patient load. A general practice pediatrician visited the facility daily, and saw each patient weekly.

Fairly early on, the SCF came into conflict with the state licensing administration regarding the safety of a freestanding SCF not attached to, or affiliated with, a hospital. To demonstrate to the state a commitment to improve the quality of care, the facility contracted with the nearby medical school for a medical director. The SCF needed a physician with a knowledge and experience of technology-dependent children including continuous mechanical ventilation. Complicating the recruitment of qualified staff was the newness of this type and level of care, the image in the medical community of nursing home care in general, and the ongoing review by the state. This environment also amplified small problems into major problems that endangered the solvency of the facility.

The former PICU intensive care physician came to the SCF with the goal of using the PICU culture and the principles of HRO as tools to change the nursing home into a SCF with home mechanical ventilator-dependent (HMV) patients. This would involve the successful application of the characteristics of HROs¹³ and the elements of mindfulness,¹⁴ which had been codified from high-tempo organizations such as naval aircraft carriers, into the low-tempo nursing home organization and environment.

The basis for this change also would involve the use of the firefighting service and paramedic culture, adapted for dynamic states such as the fire and rescue scene, in an environment in which change occurs slowly and expectedly. The indeterminate problem (uncertainty, time-dependence, and risk) would apply since the patients could not communicate (uncertainty), decision loops, although slower than at a fire scene, would still be slower than the patient's disease progression (time dependence), and patients could die from complications of their disability (risk). A strategy evolved that derived from an observation by Joe Martin (Battalion Chief, Los Angeles City Fire Department, retired), "What you do every day is what you will do in an emergency." Routine SCF operations would be designed to easily and smoothly expand into emergency operations.

Because nursing home staff generally provided low-risk medical care, the former PICU intensive care physician developed risk awareness and self-efficacy in the caregivers. Unrecognized fear came from corporate management because of the pressure from the state to improve performance, and from criticism from the medical community regarding care for the profoundly disabled. Decision-making followed the PICU model.

13 Ibid.

14 K. E. Weick and K. Sutcliffe, *Managing the Unexpected: Assuring High Performance in an Age of Uncertainty* (San Francisco: John Wiley and Sons, 2001).

Nursing Home to Chronic Intensive Care

Risk awareness became the first concept for bedside staff to learn because of the state's concerns regarding safety. During individual and group sessions, the SCF staff demonstrated a lack of belief that they provided high-risk care, worked in a dangerous environment, or that their clients could die. To remedy this, the new medical director invited everyone to go to the parking lot for a two- to three-hour picnic. This stunned them, and they began to explain why they could not participate—that a child could die from dislodgment or plugging of the tracheostomy airway, aspiration of secretions or stomach fluids into the lungs, or falling out of bed over the guard rails. This awareness that children in the SCF could die suddenly helped to introduce methods of decision-making that would allow bedside staff to immediately engage a problem.

Risk awareness alone does not lead to reliability: it must change behaviors to acknowledge that risk. Later on, bedside clinical discussions helped staff to link risk with clinical interventions. One can evaluate risk as a probability, the odds an event will occur, or a possibility, the ease with which an event will occur. The concept of possibility facilitated a discussion of ambiguous or vague risks containing great threats.

Education focused on early signs of deterioration, when findings tend to have greater ambiguity and when benign processes would share findings of serious problems. Strong responses to these signs allowed caregivers to engage the problem when interventions were within their scope of practice, most effective, and with the least side effects or complications. The objective of early intervention was to increase the chance of success and to decrease the chance of failure.

A climate of unrecognized fear among management and bedside staff had developed in the SCF from the business practices used to maintain financial solvency, and from interactions with the local medical community and state licensing agency. Fear behaviors included fault finding, excuses, poor communication practices, avoidance behaviors, focus on individuals over the system, and failure to confront situations. The new medical director used the same design goals in the SCF as had been used for the ICU, but proceeded in a different manner. The SCF staff chose this career for the low tempo, and the opportunity to develop relationships with their clients and families. (Nursing homes care for residents or clients because there are no acute illnesses to treat: hospitals provide medical care for acute illness and therefore have patients.)

The more difficult part came from working with administration. Fear motivated a lot of behavior because of punitive measures from the state imperiling the facility's survival, and the personal management style of the senior administrator. An early attempt to schedule a regular meeting for all administrative and management staff failed to stop accusations, fear, and blame. So the medical direc-

tor created new rules and included only clinical management, and a separate meeting with the senior administrator. The rules for the new Clinical Staff Meeting included: (1) No shame, name, or blame; (2) No assigning jobs, tasks, or projects to other people; (3) If a task is important, someone will volunteer; (4) If a task is not completed by the next meeting, that is OK, with no explanations necessary; and (5) After several weeks, we must evaluate uncompleted tasks as not needed, not important at that time, or needing more resources. This improved communication, understanding, and cooperation among all clinical staff. Clinical decisions now were made by a group of clinicians with no undue administrative influences.

Self-efficacy and resilience were critical for developing the SCF into an HRO. Self-efficacy is the belief that one can influence outcome.¹⁵ Resilience is the use of resources on hand for problem-solving, and is similar to improvisation. The SCF caregivers have little respect in the medical community for their choice of employment, and work without immediate physician supervision and with fewer medical resources.

Caregivers learned self-efficacy by progressive mastery of decision-making through the use of bifurcations in the same process as used in the PICU. Wrong decisions were addressed by the physician providing more information until the correct response was given. This serves to identify how much information a staff member uses in decision-making, and what areas of knowledge need improving. The final decision in all cases is made between two choices. The staff member's choice is the one used.

When faced with uncertainty, structure and rigidity often provide comfort. In this new approach, comfort came from the team and self-efficacy—that one can and will solve the problem.

Decision-making techniques as used in the PICU, along with risk awareness and self-efficacy, allow decisions to migrate up and down the hierarchy toward the individual with the most expertise in each situation. In these situations, expertise does not equate to experience.

Because there was not a continuous physical presence of a physician at the facility, a senior RCP managed ventilator problems. In time, this became an indirect reward system for those RCPs with risk awareness and decision-making skills, and they played a greater part in management. Any RCP could reach this level by participating in the decision-making exercises described above in the PICU.

Creation of this new model for this type of care necessitated a focus on "ignorance in medicine." New methods of treating disease cannot be developed without an acknowledgement of ignorance about the best way to care for these children. False and presumed knowledge were dangerous and best prevented by freely saying: "I don't know." The team began identifying medical objectives that would guide them in developing ways to give these profoundly handicapped children a childhood.

15 A. Bandura, *Self Efficacy: The Exercise of Control* (New York: Freeman, 1997).

Work at the nursing home further refined the use of the principles found to be successful in the PICU. However, as bedside and management staff internalized these values, norms, and behaviors, the SCF began to admit children needing a higher level of service than that provided in comparable facilities. Most transferred patients came from the PICU rather than a hospital ward, as is usual for a SCF. When the condition of the children deteriorated, they often would remain at the SCF including more than forty children who developed acute respiratory failure with sufficient severity to receive mechanical ventilation of the type used in the PICU, and numerous children with severe acute asthma receiving PICU treatment modalities. This occurred without a change in patient:staff ratios, which remained at nursing home levels; and an increase in the level of service without an increase in staffing, cost, or errors. During this time, the state licensing division changed their belief about the facility, and began using it as an example of how to provide this level of care.

Results

During the first five years of the SCF's existence, the nursing home ventilator census increased from four HMs of the type used by nonmedical family members to forty mechanical ventilators of the type found in the PICU. Also, several disease conditions that routinely would lead to transfer to the PICU, such as ventilator-associated pneumonia and acute asthma, remained at the SCF for treatment.

But also a theory developed about care as it became evident that children benefited in unforeseen ways. Children who had received mechanical ventilation for survival now played and laughed, and attended school. Children with a previous diagnosis of persistent vegetative state could now operate computers and learn to read. High reliability and safety helped relieve the burden of disease and technology to allow each child to have a childhood: in fact, technology now enhanced life. If the technology is applied well, a technology-dependent, chronically unstable child will smile.

Conclusion

Methods to support front-line caregivers, make decisions under uncertainty, and improve individual performance in high-risk environments can create HROs *de novo*, reduce risk to the patient, and decrease the cost of medical care. A basic approach starts with problem-solving: "HRO is just problem-solving."¹⁶

16 Racquel Calderon, RCP, RRT, School of Allied Health Professions, Loma Linda University, Loma Linda, CA.